

TEAMWORK IN SPORT

by

Desmond McEwan

BA (Hons) MacEwan University, 2010

MSc McMaster University, 2012

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

in

The Faculty of Graduate and Postdoctoral Studies

(Kinesiology)

THE UNIVERSITY OF BRITISH COLUMBIA
(Vancouver)

September, 2017

© Desmond McEwan, 2017

Abstract

In spite of the assumption that *teamwork* is an important variable within the context of sport, formal research on this construct has been surprisingly limited. As such, the purpose of my dissertation was to examine teamwork in sport with respect to theoretical, measurement, and applied considerations. This dissertation consists of six studies which are presented in seven chapters. The introduction (chapter 1) provides a general overview of teamwork and its potential importance within sport. The first study (chapter 2) was a theoretical and integrative review of teamwork in sport. Within this chapter, a working definition of teamwork in sport, a multidimensional conceptual framework for understanding and investigating this construct, as well as a discussion of how it may relate to important variables in sport are presented. Chapter 3 consists of two studies: study 2 involved the development of a questionnaire to measure teamwork, titled the *Multidimensional Assessment of Teamwork in Sport (MATS)*; study 3 involved an examination of the psychometric properties related to this instrument. An assessment of various group- and individual-level correlates of teamwork in sport was carried out in the fourth study, which is presented in chapter 4. The fifth study, a systematic review and meta-analysis assessing the effectiveness of controlled teamwork training interventions, is reported in chapter 5. This review was used to inform the development of a theory-based and evidence-informed protocol for enhancing teamwork in sport, which is described in the first part of chapter 6. This teamwork training protocol was then tested through a pilot intervention (study 6), which is detailed in the second part of chapter 6. In chapter 7, a general discussion is provided with regard to the implications of the dissertation studies, the contributions of this research to the field of sport psychology, limitations of this body of work, as well as considerations for future research on teamwork in sport.

Lay Summary

Although it might be assumed that team members need to be able to work well together in order for a sports team to be effective, research on *teamwork* in sport has actually been quite limited. Therefore, the purpose of this dissertation was to examine this construct across six studies. This research provided: (a) a definition and framework for understanding what exactly teamwork is; (b) a questionnaire to measure teamwork in sport; (c) evidence that teamwork is related to several other important variables in sport (e.g., team cohesion, individuals' enjoyment in their sport); and (d) a framework for improving teamwork in sports teams. Together, this work has helped open up a new line of enquiry within the field of sport psychology.

Preface

The studies from chapters 2-6 are written in a ‘manuscript format’. These studies have either already been published, are currently under review for publication, or are being prepared for submission to a peer-reviewed journal.

Chapter 2. This study has been published in a peer-reviewed journal. The citation for this publication is: **McEwan, D.** & Beauchamp, M. R. (2014). Teamwork in sport: A theoretical and integrative review. *International Review of Sport and Exercise Psychology*, 7(1), 229-250. doi: 10.1080/1750984X.2014.932423. My contribution involved the formulation of the research question and manuscript preparation.

Chapter 3. A manuscript of these two studies is currently under review for publication in a peer-reviewed journal. My co-authors for this submission include Bruno Zumbo, Mark Eys, and Mark Beauchamp. My contribution involved the formulation of the research question, data collection, data analysis, and manuscript preparation. Ethical approval was granted by the University of British Columbia Research Ethics Board (ID: H15-00768 for study 2 and H15-02939 for study 3).

Chapter 4. A manuscript of this study is being prepared for submission (as a brief research report) to a peer-reviewed journal. My contribution to this study involved formulation of the research question, data collection, data analysis, and manuscript preparation. Ethical approval was granted by the University of British Columbia Research Ethics Board (ID: H15-02939).

Chapter 5. A manuscript of this study has been published in a peer-reviewed journal. The citation for this publication is: **McEwan, D.**, Ruissen, G. R., Eys, M. A., Zumbo, B. D., & Beauchamp, M. R. (2017). The effectiveness of teamwork training on teamwork behaviours and team performance: A systematic review and meta-analysis of controlled interventions. *PLOS ONE*, *12*(1), e0169604. doi: 10.1371/journal.pone.0169604. My contribution involved the formulation of the research question, literature search, study selection, data analysis, and manuscript preparation.

Chapter 6. A manuscript of this study is being prepared for submission to a peer-reviewed journal. My contribution to this study involved formulation of the research question, data collection and team training interventionist, data analysis, and manuscript preparation. Ethical approval was granted by the University of British Columbia Research Ethics Board (ID: H16-01994).

Table of Contents

Abstract.....	ii
Lay Summary	iii
Preface.....	iv
Table of Contents	vi
List of Tables	ix
List of Figures.....	x
Acknowledgements	xi
Dedication	xii
Chapter 1: General Introduction	1
Chapter 2: Teamwork in Sport: A Theoretical and Integrative Review.....	6
Towards an Integrative Framework of Team Effectiveness in Sport.....	6
Inputs of Team Effectiveness.....	10
Outcomes of Team Effectiveness	10
Mediators of Team Effectiveness	11
Defining Teamwork in Sport	12
A Conceptual Model of Teamwork	14
Emergent States	28
Considerations for Research on Teamwork and Team Effectiveness in Sport	30
Conclusion.....	36
Chapter 3: The Development and Psychometric Properties of the Multidimensional Assessment of Teamwork in Sport (MATS).....	37
Study 2.....	41
Study 3.....	45

Methods	46
Results	48
Discussion	58
Chapter 4: Correlates of Teamwork in Sport: A Brief Report	67
Methods	69
Results	72
Discussion	73
Chapter 5: The Effectiveness of Teamwork Training on Teamwork Behaviours and Team Performance: A Systematic Review and Meta-Analysis of Controlled Interventions	78
Methods	85
Results	90
Discussion	118
Chapter 6: The Development and Efficacy of a Teamwork Training in Sports Program (TTSP).....	128
Teamwork Training in Sport	129
Methods	146
Results	152
Discussion	154
Chapter 7: General Discussion	160
Summary and Implications of the Current Research	160
Limitations of the Current Research and Future Directions	167
Conclusion.....	178
References	179
Appendix A: Recruitment Poster for Study 2 – Athlete Review (Chapter 3).....	205
Appendix B: Letter of Information for Study 2 – Athlete Review (Chapter 3).....	206

Appendix C: Consent Form for Study 2 – Athlete Review (Chapter 3)	208
Appendix D: Demographic Form for Study 2 – Athlete Review & Study 3 (Chapter 3); Study 6 (Chapter 6)	210
Appendix E: Version 1 of the MATS (Pre-Focus Group, Chapter 3)	211
Appendix F: Version 2 of the MATS (Pre-Expert Review, Chapter 3).....	219
Appendix G: Letter of Information for Study 2 – Expert Review (Chapter 3).....	227
Appendix H: Letter of Information for Study 3 (Chapter 3)	229
Appendix I: Passive Consent Forms for Athletes’ Guardians of Study 3 (Chapter 3)	231
Appendix J: Consent Form for Study 3 (Chapter 3)	233
Appendix K: Version 3 of the MATS (Post-Expert Review, Chapter 3)	235
Appendix L: Summary of Items Deleted and Added to MATS Following Study 2.....	243
Appendix M: Follow-Up Survey for Study 4 (Chapter 4).....	245
Appendix N: Letter of Information for Study 6 (Chapter 6)	249
Appendix O: Parent Letter & Passive Consent Form for Study 6 (Chapter 6).....	251
Appendix P: Participant Consent Form for Study 6 (Chapter 6).....	253
Appendix Q: Sample Teamwork Training Workbook for Study 6 (Chapter 6)	256
Appendix R: Summary of Secondary Training Strategies for Study 6 (Chapter 6)	281

List of Tables

Table 3.1	Preparation items, ICCs, and factor loadings.....	49
Table 3.2	Execution items, ICCs, and factor loadings.....	52
Table 3.3	Evaluation items, ICCs, and factor loadings.....	54
Table 3.4	Adjustments items, ICCs, and factor loadings.....	56
Table 3.5	Management of Team Maintenance items, ICCs, and factor loadings.....	59
Table 4.1	Descriptive statistics and intercorrelations for teamwork scores and sport outcomes related to team cohesion, collective efficacy, satisfaction with performance, player commitment, and player enjoyment.....	74
Table 5.1	Summaries of controlled interventions included in meta-analysis.....	93
Table 5.2	Summary results of controlled studies assessing the effects of teamwork interventions on teamwork.....	106
Table 5.3	Summary results of controlled studies assessing the effects of teamwork training interventions on team performance.....	110
Table 5.4	Moderator results for interventions assessing teamwork as the outcome variable.....	113
Table 5.5	Moderator results for interventions assessing team performance as the outcome variable.....	115
Table 6.1	Teamwork dimensions directly targeted by each training strategy.....	133
Table 6.2	Descriptions of each team participating in the teamwork training study.....	148
Table 6.3	Mean scores for each team and condition at three time-points of teamwork training study.....	153

List of Figures

Figure 2.1.	Conceptual framework for teamwork and team effectiveness in sport.....	9
Figure 3.1.	Four-factor, second-order model representing the preparation phase of RTP.....	50
Figure 3.2	Four-factor, second-order model representing the execution phase of RTP.....	53
Figure 3.3	Two-factor model representing the evaluation phase of RTP.....	55
Figure 3.4	Five-factor, second-order model representing the adjustments phase of RTP.....	57
Figure 3.5	Two-factor model representing the Management of Team Maintenance.....	60
Figure 5.1	Results of literature search (PRISMA Flow Diagram).....	91
Figure 5.2	Funnel plot for studies assessing the effects of teamwork training on teamwork.....	108
Figure 5.3	Funnel plot for studies assessing the effects of teamwork training on team performance.....	112
Figure 6.1	Conceptual framework of teamwork training in sport.....	131

Acknowledgements

I am beyond grateful to my supervisor, Dr. Mark Beauchamp, who has truly provided me with more than I could have ever imagined from a supervisor. You are a transformational leader and, in my mind, the kind of supervisor that anyone in academia should strive to be. I cannot repay all that you have done for me, but I will take the examples you have provided and will strive to pay it forward to the individuals that I work with in the future.

I would also like to thank my committee members, Dr. Bruno Zumbo and Dr. Mark Eys, for your time, guidance, and support throughout my PhD. Special shout-out as well to my mentors and friends, Rebecca Bassett-Gunter, Jenn Tomasone, and Shane Sweet. All of you helped make this dissertation something that I can be proud of.

I would also like to acknowledge the Social Sciences & Humanities Research Council (SSHRC), Sport Canada, and the University of British Columbia for funding my work and making it possible to pursue my dream of obtaining a PhD. A special thanks as well to the staff and administrators from UBC's Faculty of Education and the School of Kinesiology.

Of course, I must thank my family and friends—the 'Struggz' group, CFK fam, past and present lab-mates—for all of the support, laughs, and discussions over the years (and for listening even when you had no idea what I was talking about). To my parents: obviously, I cannot thank you enough for all that you have done for me these past 30-something years. Without you, I would not be where I am today. I hope to embody the values that you have shown me of humility, hard work, perseverance, and—fittingly—teamwork.

Finally, to my rock, Alicia (and our fur-baby, Ella, of course!). Words can't express what your support has meant to me. I honestly don't think I could have made it through all of this in one piece without you. Thanks for being you and for always being in my corner.

Dedication

For Alicia and my parents, Lesley & Ivan.

Chapter 1: General Introduction

What makes a sports team successful? This question has been a central line of inquiry over decades of research within sport psychology. Perhaps the most tempting answer to this question is to simply obtain a collection of highly-skilled and athletically-gifted individuals. For instance, one might assume that a basketball team will perform at a high level if its players can all dribble, shoot, pass, and jump well. Although technical proficiencies such as these are no doubt critical to team success, those involved in sports could likely point to a range of examples where a group of highly-skilled *individuals* did not actually result in a successful *team*. In fact, it has even been shown that having *too much* individual talent on a sports team can actually be detrimental to team performance, as it can undermine interdependent behaviours (e.g., coordination) between members (Swaab, Schaerer, Anicich, Ronay, & Galinsky, 2014). Thus, it would seem reasonable to hypothesize that in order for teams to be effective, team members must be able to work well together (i.e., display effective *teamwork*). While there is a considerable amount of evidence supporting this hypothesis across a range of group contexts (e.g., health care, business, military, academia, aviation; Marks, Mathieu, & Zaccaro, 2001; Mathieu, Maynard, Rapp, & Gilson, 2008; Rousseau, Aubé, and Savoie, 2006), research on this construct in sport settings has actually been surprisingly scant (Carron, Martin, & Loughhead, 2012). As such, the current state of the literature on *teamwork in sport* is littered with assumptions and anecdotes as opposed to actual scientific evidence.

In an effort to help fill this considerable gap in the field of sport psychology, my doctoral dissertation focused on improving our current (limited) understanding of teamwork in sport. Specifically, four primary research questions were embedded within this line of work: (1) *what exactly is teamwork in sport?*; (2) *how can teamwork be measured?*; (3) *is teamwork important in sport settings?*; and (4) *how can teamwork be improved in sport teams?*. This dissertation was

guided by a process of *construct validation*, which comprises the evidence and rationale supporting the trustworthiness of data derived from a focal measure (i.e., teamwork) as well as its relationships with other variables (Hubley & Zumbo, 1996; Messick, 1995). From this view, construct validation is considered an ongoing process that occurs over the course of several studies, with various aspects of validity being examined throughout (Hubley & Zumbo, 1996; Messick, 1995). For instance, the ultimate goal of this research may indeed be to help improve team functioning through some sort of team building intervention. In order to do this, however, a measure of teamwork is required to ensure that this construct has actually been improved as a result of the intervention. In order to develop that test instrument of teamwork, a well-articulated conceptual framework and definition is first required to ensure that data derived from this measure conform to the underlying theoretical construct (Hubley & Zumbo, 1996; Messick, 1995; Smith, 2005). Hence, validity needs to be considered at the outset of a research program as opposed to being viewed as some ‘one-off’ procedure in a single study of test development (Anastasi, 1950; Hubley & Zumbo, 1996; Smith, 2005).

In an attempt to answer the four aforementioned research questions, this dissertation consists of six studies. To address the first question (i.e., ‘what is teamwork in sport?’), the first study involved a theoretical and integrative review of teamwork in sport (chapter 2). This paper involved summarizing the (limited) work that has been done on teamwork in sport as well as the (much more extensive) research that has been done on teamwork in contexts beyond sport (e.g., health care, business, military settings). As a result of this review, a working definition and theoretical framework of teamwork in sport was developed. This paper provided an improved understanding of the specific behaviours/dimensions that comprise this multidimensional construct. This review was also essential in identifying how teamwork is distinct from other

psychosocial constructs in sport (particularly, team cohesion), how teamwork fits within a broader framework of team effectiveness, as well as the range of potential research questions related to teamwork in sport. Thus, study 1 provided a foundation upon which the remaining five studies of this dissertation (as well as research on teamwork in sport beyond this dissertation) can be built.

Two studies were then pursued in chapter 3 in order to address the second research question (i.e., ‘how can teamwork be measured?’). Study 2 involved developing a questionnaire to assess teamwork in sport, which was guided by the definition and conceptual framework from study 1. Specifically, after creating a preliminary version of a teamwork questionnaire—which we titled the *Multidimensional Assessment of Teamwork in Sport (MATS)*—qualitative feedback on this instrument was obtained from team sport athletes and coaches as well experts in the field of sport psychology. This was done in order to examine the content (i.e., the relevance, representativeness, and technical quality of items in relation to teamwork in sport) and substantive (i.e., participants’ judgements and understanding of the questionnaire) aspects of validity (cf. Messick, 1995). Based upon the results of study 2, the MATS was then modified and completed by a heterogeneous sample of team sport athletes in study 3 in order to examine the structural validity (i.e., the fidelity of the scoring structure of the MATS to the theoretical framework of teamwork provided in study 1) of measures derived from the questionnaire. These studies resulted in a conceptually-sound (i.e., aligning with the theoretical framework provided in study 1) and psychometrically-robust measure of teamwork in sport.

The third research question of this dissertation (i.e., ‘is teamwork important in team sports?’) was then examined in study 4 (chapter 4). Specifically, four to six weeks after completing the MATS, a subset of participants from study 3 completed measures of other

theoretically- and empirically-relevant psychosocial constructs, including team cohesion, collective efficacy, satisfaction with individual and team performance, enjoyment within one's sport, and commitment to one's team. Hence, the external aspect of validity (i.e., determining the relevance of teamwork) was assessed by testing the extent to which participants' scores on the MATS correlated with scores on these salient constructs in team sport. The results from this study suggested that teamwork is indeed related to a range of group-level variables (to a large extent) and individual-level variables (to a moderate extent).

Two studies were then conducted to address the fourth broad objective of this dissertation (i.e., 'how can teamwork be enhanced in sport settings?'). Specifically, study 5 (chapter 5) involved a systematic review and meta-analysis of the extant controlled intervention research on teamwork training. This was done in order to examine (a) how teamwork has been trained in other team contexts (e.g., health care, business, military), and (b) the effectiveness of those various teamwork training interventions. In general, the findings from this study suggested that teamwork training interventions have a significant effect on teamwork (in the medium-to-large effect size range), particularly when they involve experiential activities for team members (e.g., group discussions, provision of opportunities to practise teamwork) rather than passive learning strategies (e.g., didactic lectures). This study also reiterated that there have not yet been any controlled intervention studies that have attempted to specifically target/enhance teamwork in sport.

The results from study 5 were then used to inform the development of a teamwork training protocol that can be applied to sport contexts. Specifically, in chapter 6, the various teamwork training strategies that have been utilized in other contexts were first summarized. Within these summaries, considerations and examples of how these strategies could be applied to

sport teams were provided. A 10-week pilot (non-randomized) controlled trial examining the efficacy of this novel *Teamwork Training in Sport Program (TTSP)* was then carried out in study 6. Specifically, I sought to examine whether differences in teamwork (as measured by the MATS) were evident over the course of 10 weeks between teams who participated in the TTSP compared to those who did not. Overall, the results of this study suggested that teamwork among sports teams can be enhanced through intervention.

To conclude the dissertation, chapter 7 consists of a general discussion of the six studies subsumed within this research. This includes a synopsis of the findings from these studies, the contributions of this work to the field of sport psychology, various limitations of the research that was conducted, as well as potential future directions for research on teamwork in sport. In summary, this dissertation provides: (a) an enhanced understanding of the nature of teamwork in sport; (b) a questionnaire that can be utilized by both sport psychology researchers and applied practitioners to assess a sport team's perceived level of teamwork; (c) evidence that teamwork is an important variable to consider in sport; and (d) a training program that can be used to enhance teamwork in sport.

Chapter 2: Teamwork in Sport: A Theoretical and Integrative Review

In spite of the intuitive belief, as well as anecdotal evidence, that team members need to work well together in order to achieve their desired outcomes, research into the distinct components of *teamwork*—and, more broadly, *team effectiveness*—in sport has been fragmented at best (Carron et al., 2012). Indeed, as recently pointed out by Carron et al. (2012), “Although some progress seems to be happening in business and the military, so far the nature of teamwork has not aroused much interest in sport” (p. 323). So what exactly makes for an effective sports team? In particular, what behaviours comprise teamwork? Are the answers to these queries obvious/straightforward? Have they already been resolved using different terminology? Research from other areas of psychology—most notably from organizational settings—suggests that the nature of teamwork is a complex phenomenon that is far from resolved (Carron et al., 2012).

The overall purpose of this chapter is to provide a theoretical and integrative review of teamwork in sport. We do so by drawing from research and theoretical perspectives that have been used within other areas of enquiry (e.g., organizational psychology), as well as what is currently known in sport psychology, to provide an integrated model of teamwork and team effectiveness in sport. We begin our discussion by illustrating and articulating a conceptual framework of team effectiveness to show how the multidimensional construct of teamwork fits within this broader model. We then focus our attention on teamwork and discuss each of the individual dimensions in this teamwork model. Within this discussion, we propose a working definition of teamwork in sport, as one has yet to be put forward (Carron et al., 2012). Finally, we provide some considerations for potential avenues of future research in sport.

Towards an Integrative Framework of Team Effectiveness in Sport

Decades of research across several contexts suggests that highly effective teams are, quite simply, able to accomplish things (i.e., their objectives) that less effective teams are unable

(Mathieu et al., 2008). In contrast to the relative lack of research on team effectiveness in sport settings, a large number of studies have been conducted in other areas of team psychology, such as health care, business, the military, and academia. Half a century ago, McGrath (1964) provided an Input-Process-Outcome (IPO) framework that guided the early research of team effectiveness. In this framework, *inputs* are described as antecedent variables that enable and constrain team members' interactions, such as individual team member characteristics, team-level factors, and broader organizational and environmental variables (Mathieu et al., 2008). These antecedents combine to drive team *processes*, which (a) refer to interactions between members, and (b) convert inputs to outcomes through cognitive, verbal, and behavioural activities (Marks et al., 2001; Mathieu et al., 2008). *Outcomes* are the by-products of team activities that are valued by one or more parties (e.g., team members, organizational heads, team supporters) and indicate whether a team has successfully realized its purposes (Marks et al., 2001; Mathieu et al., 2008).

While McGrath's (1964) framework served as a useful starting point for team researchers, it has evolved over the decades. In their literature review of team effectiveness, Mathieu et al. (2008) provide a more dynamic and comprehensive Input-Mediator-Outcome (IMO) framework, which advances the basic IPO model in several ways. First, the *mediator* component of the IMO model still includes team processes but also acknowledges that many constructs linking team inputs to outcomes are not actually team *processes* but, rather, *emergent states*. That is, they are cognitive, attitudinal, motivational, and affective states that result from previous team experiences, develop over time, and become new inputs to subsequent processes and outcomes (e.g., team cohesion, collective efficacy; Marks et al., 2001). Second, this model demonstrates the multiple levels of influence that team inputs have on team mediators and

outcomes, and also accounts for the nested nature of teams (cf. Chan, 1998). Specifically, individual-level variables (e.g., members' motivation, self-efficacy) fall within a particular team context (e.g., team norms, shared leadership), which fall within broader external contexts (e.g., cultural influences, organizational funding). Third, rather than viewing teams as static entities that progress in a linear fashion, this model illustrates the dynamic nature of teams. Specifically, teams are complex, adaptive, and dynamic systems that evolve via developmental processes and episodic cycles (Ilgen, Hollenbeck, Johnson, & Jundt, 2005). Hence, team effectiveness is best viewed as a series of related input-process-outcome episodes, with emergent states developing over time (Mathieu et al., 2008; Paradis & Martin, 2013).

Of all of the past research on team effectiveness, teamwork—a type of team process that focuses on members' *behaviours*—has been the most extensively studied construct (Marks et al., 2001). Figure 2.1 shows a conceptual model of teamwork and team effectiveness that can be applied to sport. This framework combines an adapted version of Mathieu et al.'s (2008) IMO framework with an adapted version of Rousseau et al.'s (2006) teamwork behaviours framework to show how teamwork fits within a broader conceptualization of team effectiveness. The Rousseau et al. (2006) framework is based on a review of the teamwork literature; specifically, it incorporates 29 frameworks that have been used to test teamwork and also takes into account additional behavioural variables that researchers have found to be relevant to teamwork. Our conceptual framework also addresses the temporal and situational factors that should be taken into consideration when conducting team effectiveness research. Moreover, this framework is informed by examples and extant research on team effectiveness in sport. The horizontal arrow at the bottom of the Figure denotes the *developmental processes* that teams go through as they mature (e.g., over the course of a season; Mathieu et al., 2008). This framework also includes the

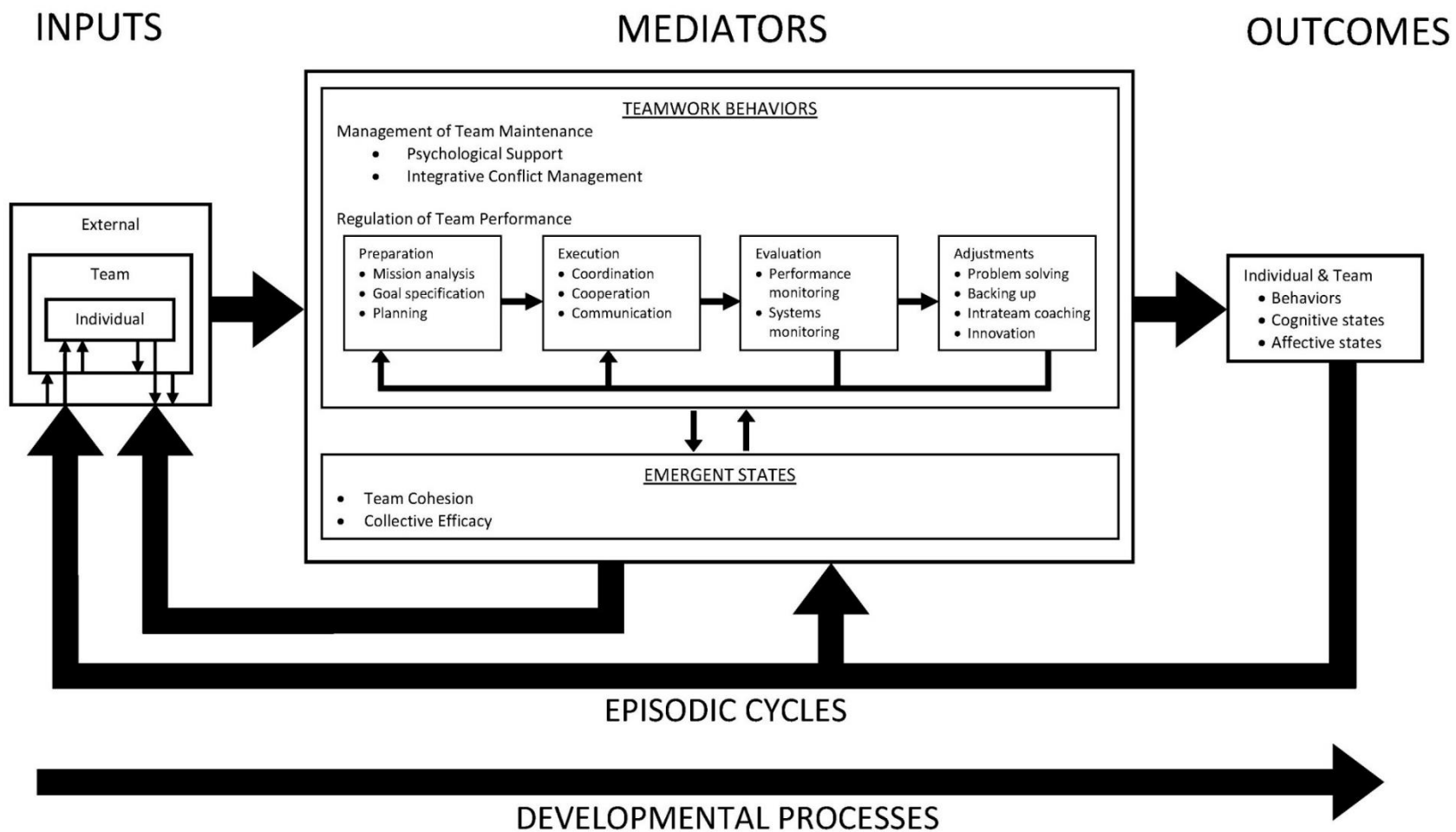


Figure 2.1. Conceptual framework for teamwork and team effectiveness in sport. Adapted from Mathieu et al.'s (2008) Input-Mediator-Outcome framework and Rousseau et al.'s (2006) teamwork behaviours framework.

episodic cycles that are thought to occur as teams transition from one episode to another (e.g., from game to game; Mathieu et al., 2008). Specifically, team inputs influence mediators which subsequently affect both team outcomes as well as team inputs; in turn, team outcomes influence future mediators and inputs. Each of the components of this conceptual framework are described in the following sections.

Inputs of Team Effectiveness

A wide range of individual-, team-, and external-level input variables have been studied in team effectiveness research. At the individual level, inputs involve team member attributes such as personality, attitudes, achievement orientation, teamwork orientation, and competencies (Mathieu et al., 2008). Inputs at the team level include variables such as task interdependence, team size, leadership, and team training (Mathieu et al., 2008). The highest level comprises external variables, which include both organizational (e.g., resources available for the team, organizational policies) and environmental (e.g., cultural or political influences) factors (Mathieu et al., 2008). The broad, higher-level constructs influence lower-level constructs in a top-down manner (as shown by the downward vertical arrows within the *Inputs* section in Figure 2.1). For instance, the amount of funding that a team has may influence which coaches they are able to hire, which, in turn, could impact individual attributes. Bottom-up influences can also occur (as denoted by the upward vertical arrows), which results in a reciprocal exchange of influence between these input variables. For instance, talented athletes may attract highly-skilled coaches, which could subsequently attract more funding money for the team.

Outcomes of Team Effectiveness

Hackman and Katz (2010) suggest that the simplest way to assess the outcomes of team effectiveness is to determine the extent to which the team has achieved its pre-defined purposes.

In sports, these purposes may include individual- and/or team-level *behaviours*, *cognitive states*, and *affective states*. At the individual level, an important behavioural outcome to assess is youth sport dropout rates, since adolescent participation in organized team sports is currently in decline (e.g., Canadian Heritage, 2013; National Sporting Goods Association, 2011). At the group level, perhaps the most obvious behavioural outcome of team effectiveness is team performance (e.g., win-loss records or important team statistics). Examples of key cognitive states might include self-efficacy (Bandura, 1997) or motivation (Deci & Ryan, 2000) at the individual level, and a team's social identity (Hogg & Terry, 2000) or shared mental models (Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005) at the group level. Finally, affective measures may include individuals' anxiety (Beauchamp, Bray, Eys, & Carron, 2003) or enjoyment within their sport (McCarthy, Jones, & Clark-Carter, 2008), and a team's collective mood (Totterdell, 2000).

Mediators of Team Effectiveness

Mediating mechanisms have played a central role in team effectiveness research (Marks et al., 2001). These mechanisms include team processes (e.g., teamwork) as well as emergent states (e.g., team cohesion), which influence each other reciprocally (as shown by the vertical arrows within the *Mediators* box of Figure 2.1). For instance, improving cooperation between members can result in an increase in cohesion, which, in turn, can further improve cooperation. The distinction between team processes and emergent states is important. In particular, it may be tempting to contend that teamwork is simply another term for team cohesion and, as such, a comprehensive examination of teamwork is not warranted since dozens of studies have already been conducted on team cohesion in sports (see Carron, Colman, Wheeler, & Stevens, 2002 for a review). However, it has been argued that teamwork is a type of team *process* while team cohesion is more aptly characterized as an *emergent state* (e.g., Ilgen et al., 2005; LePine,

Piccolo, Jackson, Mathieu, & Saul, 2008; Marks et al., 2001; Mathieu et al., 2008). That is, as a process, teamwork comprises observable behaviours that describe the nature of member interactions that lead to team outcomes (Marks et al., 2001). In contrast, as an emergent state, team cohesion is a by-product of team experiences that varies as a function of inputs, processes, and outcomes, and affects new inputs to subsequent mediators and outcomes (Marks et al., 2001). In volleyball, for example, teamwork behaviours would include processes such as creating team goals or players communicating effectively with each other, and cohesion would be a by-product that is shaped by these processes. Hence, there is more to being an effective team than merely being a cohesive one. Complementary findings from a vast amount of research in other areas of social psychology also suggests that team cohesion is indeed related to (and to some extent derives from) but is not synonymous with teamwork (Ilgen et al., 2005; LePine et al., 2008; Marks et al., 2001; Mathieu et al., 2008).

Defining Teamwork in Sport

As there has not been a thorough examination of the nature of teamwork in sports, it is perhaps unsurprising that there have also been no attempts to define what teamwork is in this context (cf. Carron et al., 2012). This presents a problem because if we cannot define teamwork, we cannot measure it, and if we cannot measure it, we cannot know whether we have improved it (Carron et al., 2012), such as through team building interventions. Carron et al. (2012) suggest that this lack of definitional clarity may be due to its perceived simplicity; that is, teamwork is merely *what teams do*. However, as we will demonstrate throughout this chapter, teamwork is a complex and multidimensional construct that cannot be vaguely represented by these three words.

In light of the research on teamwork behaviours and in line with the conceptual model of teamwork (described in detail below), a working definition of teamwork is proposed as: A *dynamic process involving a collaborative effort by team members to effectively carry out the independent and interdependent behaviours that are required to maximize a team's likelihood of achieving its purposes*. As will be further delineated in the following sections of this chapter, there are several things to note in this definition. First, as a dynamic process, teamwork develops over time through developmental processes and episodic cycles (as shown in Figure 2.1). Indeed, various temporal and situational factors impact team member interactions. Second, while some member tasks can be considered independent (or individual) behaviours and others can be considered interdependent, it is vital that tasks are performed in unison with teammates' behaviours in order for a team to 'work' best. In association football, for instance, a valuable team member is one who can not only dribble and kick the ball adequately (independent skills) but can also work in concert with teammates (interdependent skills) so that the team can benefit from each member's unique abilities. Third, we specifically use the term 'behaviour' to emphasize that teamwork is a mediator (within the IMO team effectiveness model) that focuses on behavioural processes. Fourth, the definition suggests that—all other things being equal (i.e., input variables)—teams who work well together have a greater likelihood of realizing their purposes compared to teams who do not (cf. LePine et al., 2008). These purposes may include short-term goals (e.g., winning a match, improving players' self-efficacy) as well as longer term objectives (e.g., winning a league championship, decreasing athlete dropout from sport in subsequent years).

A Conceptual Model of Teamwork

As shown in Figure 2.1, teamwork can be broken down into two main components. The *management of team maintenance* includes behaviours that function to keep the team together. The *regulation of team performance* comprises behaviours devoted to the achievement of team goals. These two components parallel the two respective processes that Kurt Lewin (1935), the father of group dynamics, originally proposed all groups to be involved in: *maintenance* and *locomotion*. Our discussion of teamwork begins with the management of team maintenance and then proceeds to the regulation of team performance.

Management of team maintenance. As team success requires members to work together, these social interactions can present personal or interpersonal problems that can diminish team performance (De Dreu & Weingart, 2003). Thus, managing these issues is an essential part of being an effective team. This management consists of two processes: *psychological support* and *integrative conflict management*.

Psychological support. In team sports, athletes may experience personal issues that can affect team functioning, such as decreased self-efficacy, frustration regarding one's role within the team, and anxiety over job security (Rosenfeld & Richman, 1997). When members experience these types of difficulties, teammates can help by providing psychological support, which refers to the voluntary assistance that team members provide to reinforce a sense of well-being for their teammates (Rousseau et al., 2006). This support may take several forms such as providing emotional support (e.g., nonjudgmental listening or providing comfort), esteem support (e.g., pointing out a teammate's capabilities to improve his/her confidence), informational support (e.g., providing advice or instructions), and tangible support (e.g., providing rides to practice or financial assistance) (Holt & Hoar, 2006; Rosenfeld & Richman,

1997; Tamminen & Gaudreau, 2014). Previous research in sport has shown that this support is associated with a wide range of benefits such as reduced burnout (e.g., DeFreese & Smith, 2012), as well as improved performance (e.g., Freeman & Rees, 2009), confidence (e.g., Freeman & Rees, 2010), self-determined motivation (e.g., DeFreese & Smith, 2012), and coping (e.g., Kristiansen & Roberts, 2010). It is essential that a supportive team environment is created so that team members can feel comfortable with (a) asking for support from others when they need it rather than struggling alone, and (b) taking initiative in reaching out to teammates who they feel could benefit from psychological support. While most previous research has assessed how members within a team utilize psychological support as a means of coping with personal issues, it has been suggested (e.g., Tamminen & Gaudreau, 2014) that future research assesses the efficacy of *communal coping* strategies in sport. That is, rather than each member dealing with common stressors in a one-on-one manner, it may be useful for teams to work through shared stressors together as a whole (Tamminen & Gaudreau, 2014).

Integrative conflict management. Interpersonal conflicts are virtually inevitable when a collection of individuals are brought together as a group. In certain instances, disagreements between members can be beneficial, such as by improving team decision-making (Schulz-Hardt, Jochims, & Frey, 2002). However, overall, strong and negative correlations have been found between team conflict and team performance among organizational teams (De Dreu & Weingart, 2003). In sports, it has been shown that conflict regarding player roles within interdependent sport teams corresponds with diminished player role efficacy (Beauchamp & Bray, 2001), which, in turn, is related to decreased role performance (Beauchamp, Bray, Eys, & Carron, 2002). Thus, while some conflict is to be expected and can even allow teams to address inefficiencies in functioning that they may not have otherwise noticed, it is important that teams work through

interpersonal problems to avoid prolonged conflict and, in turn, decreased team performance (De Dreu & Weingart, 2003). In other words, team success is not so much a matter of whether conflicts arise but, rather, whether they are dealt with in an efficient and constructive manner (Sullivan & Feltz, 2001; Tekleab, Quigley, & Tesluk, 2009). Recommendations for resolving intrateam conflict in sport have been offered based on preliminary research, such as by engaging in team building exercises when teammates initially come together (which should include identifying clear player roles, expectations, and codes of conduct), addressing conflict soon after it arises, having mediators to help resolve interpersonal issues, and having structured team meetings (Holt, Knight, & Zukiwski, 2012; Mellalieu, Shearer, & Shearer, 2013). Nonetheless, as a relatively recent area of study in sport, future research identifying the most effective integrative conflict management strategies is warranted.

Regulation of team performance. In pursuit of their goals, teams go through a series of recurring phases, each of which is characterized by multiple independent and interdependent behaviours (Marks et al., 2001). The *regulation of team performance* consists of four distinct phases—preparation, execution, evaluation, and adjustments—each of which is composed of specific teamwork behaviours, described in the following section.

Preparation. Prior to task execution, it is useful to devote time towards analyzing and planning task-relevant activities (Hacker, 2003). The first part of this preparation phase is known as *mission analysis*. This involves team members collectively defining and evaluating the team's purposes, including the identification of its main tasks, the operative environmental conditions, team abilities, time constraints, and resources available for carrying out the mission (Marks et al., 2001; Rousseau et al., 2006). For a pre-adolescent sports team, its purpose may be developing individuals' technical and interpersonal skills, such as learning the importance of working

together as a team. For an older, more competitive team, its overarching purpose may simply be winning. A clearly defined mission ensures that all members understand the team's objectives. In essence, effective teamwork starts with having members 'buy in' to the team's mission. Moreover, a well-defined, progressive, and consensual team purpose has been shown to stimulate members' interest and motivation in team and individual tasks, improve team efficiency, and facilitate more positive member interactions (Lakhani, Benzies, & Hayden, 2012; Yukelson, 1997). Conversely, a vague or undefined mission can result in members performing as per their personal interpretations of the team's purpose or according to their own egocentric agenda, such as improving individual statistics.

After defining the team's mission, team members can then set outcome or performance goals that fall within this team purpose. *Goal specification* involves the identification of the level of performance that team members must attain in order to fulfill the team's mission (Marks et al., 2001; Rousseau et al., 2006). In regards to group performance in a variety of areas within social psychology, a recent meta-analysis found large effects (Cohen's $d = 0.80$) for setting specific and difficult (but attainable) goals (Kleingeld, van Mierlo, & Arends, 2011). Another meta-analysis found that goal setting is effective for improving individual sport performance (effect size = .34; Kylo & Landers, 1995). Specific goals that can be objectively measured provide an explicit level of performance for which members can strive to attain within a particular timeline (Locke & Latham, 2002). Difficult goals challenge team members to go beyond their perceptions of how well they can perform, although this can be somewhat of a balancing act as motivation can decrease for individuals who continually fail to achieve their goals (Locke & Latham, 2002). Having goals can also (a) motivate, energize, and direct individuals' efforts towards behaviours

that improve the likelihood of goal attainment, and (b) reduce the likelihood of individuals to engage in goal-irrelevant actions (Locke & Latham, 2002; Rousseau et al., 2006).

Within sports teams, it is important that members' goals align with the team's goals. Therefore, it may be useful for teams to first set specific and challenging team goals, identify what needs to be done at an individual level in order to achieve these collective goals, and then challenge members to each set individual goals—based on their roles and responsibilities within the team—that will help the team accomplish its previously defined collective goals. At times, it may be necessary for certain team members to take on goals that, although still essential to the team's purpose, garner less personal attention or glory than other players'. For instance, if all players of an ice-hockey team merely set goals related to the number of points they hope to accumulate over the course of a season, it is unlikely that this team will be as successful as a team whose members set individual outcome goals related to effective collective functioning (e.g., number of blocked shots, number of body checks finished, minimal amount of penalty minutes). This further stresses the importance of having team members first commit to the team's mission so that individual interests are subordinate to the broader team purpose. It may also prove beneficial to break long-term goals down into shorter-term goals to help maintain member motivation and focus in their task pursuits over the course of a season (cf. Locke & Latham, 2002).

Once outcome goals have been clearly specified, teams should then set process goals, in which courses of action are established for achieving these outcome goals (Rousseau et al., 2006). Whereas goal specification identifies the team's ultimate destination (i.e., *what* they will strive to achieve), *planning* (or *strategy formulation*; Marks et al., 2001) involves the formulation of process goals that put members on a specified path towards mission accomplishment (i.e., *how*

they will accomplish these desired outcomes). This discussion results in a performance plan, which, if executed correctly, enhances a team's probability of realizing its ultimate mission (Rousseau et al., 2006). An effective performance plan describes the distribution of work among members, the order and timing of task-related activities, and members' role responsibilities, while also taking into consideration various situational and time constraints, available team resources, anticipated changes in the environment, and members' abilities (Marks et al., 2001; Rousseau et al., 2006). Similar to goal specification, teams can create both long-term and short-term performance plans. Long-term plans could involve behaviours that are to be carried out throughout a team's season, such as maintaining healthy nutrition, aerobic and anaerobic training, and planning periods of rest and recovery. Short-term plans may include developing game strategies specifically tailored for an upcoming opponent, planning particular drills during practice, and setting a game day schedule.

Planning also involves the formulation of contingency strategies, which are alternative plans and strategy adjustments in response to possible changes in the performance environment (Marks et al., 2001; Rousseau et al., 2006). Despite their best efforts, teams are not always able to obtain their goals according to their a priori performance plans and there are many occasions when this occurs as a result of certain roadblocks getting in the way. While some barriers cannot always be anticipated (e.g., unexpected changes in player personnel), others can be planned for. Contingency plans (also referred to as *implementation intentions*) consist of "if... then..." statements whereby teams map out alternative strategies for goal attainment, in case the principal strategies do not prove to be effective ("if situation X is encountered, then I/we will initiate goal-directed behaviour Y"; Gollwitzer & Sheeran, 2006). Creating these statements makes goal attainment more likely than merely holding a goal intention ("I/we intend to reach goal Z"). A

meta-analysis found that implementation intentions have a positive moderate-to-large effect on goal attainment (Cohen's $d = .65$), promote the initiation of goal striving, and reduce disengagement from failing courses of action (Gollwitzer & Sheeran, 2006). A handball team, for example, may develop a strategy for an upcoming game that might include a few offensive plays that they believe will exploit the defensive weaknesses of the opposing team. In addition to this strategy, contingency plans should be made in case there are changes in the environment during the games that can be foreseen, such as the opponents switching to a different defensive formation. Creating contingency plans allows teams to mitigate the negative effects that certain barriers can have on accomplishing team goals. Without effective strategies and contingency plans, teams can be disorganized and risk wandering aimlessly, so to speak, in pursuit of their stated objectives. As reflected in the proverb commonly attributed to French author Antoine de Saint Exupéry (1900-1944): 'a goal without a plan is just a wish.'

Execution. The next phase of teamwork behaviours involves putting into action what was planned in the preparation phase (Rousseau et al., 2006). Three task-related collaborative behaviours make up the task execution phase: coordination, cooperation, and communication. The first dimension, *coordination*, involves managing the sequence and timing of team members' interdependent actions (Marks et al., 2001; Rousseau et al., 2006). Although many studies have assessed coordination in organizational teams, limited work has been done with sport teams (cf. Eccles, 2010). Nevertheless, in interdependent team sports, proper task execution by one member is only contributive to the attainment of team goals when other members also execute their roles and responsibilities effectively and synchronously. In basketball, for instance, offensive plays are drawn up in which each player is given a detailed assignment for each play. One player may need to set up at a particular spot on the court to shift the defense, while another

simultaneously sets a screen for a teammate, who then needs to cut across the court at a particular angle, and so forth. Thus, in order for the team to be successful in scoring a basket, players' interdependent actions must be executed in concert with each other. This implies that merely compiling a group of highly skilled players will not necessarily result in a successful team (Eccles & Tenenbaum, 2004). That is, individuals' task contributions are only beneficial to the team when they are in sync with their teammates' actions, especially in sports that are highly interdependent.

Cooperation involves team members working together during collective task execution while in pursuit of the team's common purpose (Rousseau et al., 2006; Yeatts & Hyten, 1998). Although similar to coordination, it is important to note that these two constructs are conceptually different. With coordination, the contributions of one team member are contingent upon the corresponding contributions from his/her teammates—team success depends on teammates' actions being timed properly and synchronized with each other. In comparison, cooperation implies that a group of individuals acts together for a mutual benefit—team success depends on each member's efforts in helping each other and working collaboratively on the task at hand. While evidence from sport settings regarding cooperation during task execution is limited, recent evidence suggests that it is a significant predictor of team performance, especially in highly interdependent sport teams (Halevy, Chou, Galinsky, & Murnighan, 2012). Indeed, by cooperating, team members can accomplish group and individual objectives that they would not be able to complete otherwise (Sinclair, 2003; Yeatts & Hyten, 1998). For instance, a set of forwards in a rugby union team may be comprised of many powerful athletes; however, if these players do not work together in unison during a scrum, they are unlikely to be successful against a set of forwards who do. Although further research on cooperation in athletic settings is

necessary (such as how it can be improved), it is clear that the Aristotelian adage ‘the whole is greater than the sum of its parts’ certainly applies to team sports.

Communication, which has also been referred to as *information exchange* or *information sharing*, is the extent to which team members share task-related information with each other (Rousseau et al., 2006). This exchange allows for moment-to-moment adjustments to be made, such as modifications to the team’s tactical strategy that was previously created during the planning phase. In organizational settings, it has been suggested that communication is the single most important predictor of a team’s success (Pentland, 2013). Although the relative lack of research in sports prevents us from making similar proclamations, effective communication between team members nonetheless appears to be critical in team sports (cf. Jones, 2002). In crew rowing, for instance, the main job of the coxswain is to verbally pass along important information to the rowers such as various stroke commands and the team’s position relative to their opponents. For their part, the rowers must be able to understand and react properly to the coxswain’s instructions. Thus, the team’s success is just as dependent on the effective communication between the coxswain and the rowers as it is on the physical abilities of the rowers. Studies have begun to delve into the importance of communication for improving team performance in sports (e.g., Lausic, Tennebaum, Eccles, Jeong, & Johnson, 2009; Sullivan & Feltz, 2003). For instance, Lausic et al. (2009) found that more successful doubles tennis teams engaged in a greater frequency of information exchange and also utilized more action plan statements during matches (e.g., talking about the upcoming rally; “I’ll serve it wide and you make a fake move to the net”) compared to less successful teams who had more task-irrelevant statements (e.g., “this shoe is driving me crazy”). While communication patterns in terms of both quantity and quality will vary across sports, studies from organizational settings as well as recent

research in sport clearly show that effective communication is vital for successful team performance.

Evaluation. As teams move forward, it is important that they monitor both their performance as well as their environment to ensure they are on the correct path towards fulfilling their purposes (Marks et al., 2001; Rousseau et al., 2006). *Performance monitoring* involves tracking progress towards team goal attainment and consequently determining what still needs to be done (Marks et al., 2001; Rousseau et al., 2006). Is the team on the right track towards achieving its goals? Are team members following through with their process goals? Are the team's performance plans providing successful results? By addressing questions such as these, performance monitoring acts as a means of self-regulation. That is, it provides performance feedback so that members can identify mistakes and performance inadequacies (Marks & Panzer, 2004). If the team concludes that they are on an appropriate path towards obtaining their goals, they can continue on with their previous plans. Conversely, if deficiencies are noted, the team will need to make modifications in order to reach their desired levels of performance. Effective performance monitoring also involves observing teammates to ensure that they too are fulfilling their commitments, as previously laid out in the preparation phase (Marks & Panzer, 2004). This serves to increase accountability among team members and helps avoid issues such as social loafing. The deliberate effort to monitor the performance of oneself and others better enables members to react properly when gaps between desired and actual outcomes occur, and improves subsequent execution and performance (Marks & Panzer, 2004).

Systems monitoring involves tracking both the internal and external environmental conditions that are related to task accomplishment (Marks et al., 2001). In sports, internal systems monitoring may include tracking team resources (e.g., available funds, team facilities) or

any personnel changes (e.g., newly hired coaches, recently acquired players). External systems monitoring refers to tracking broader environmental conditions that may impact the team (e.g., weather patterns, league policy changes, political events). Teams that monitor the internal and external conditions that are relevant to the team are able to respond appropriately to changes that may impact team performance. Many professional curling teams, for example, rely on sponsorship money to compete in tour events. Reductions in this funding may preclude a team from entering certain competitions and, thus, may prevent them from achieving their goals. It is important to track these conditions in case any team adjustments need to be made. Determining the most effective performance and systems monitoring strategies to improve subsequent team processes and effectiveness remains an area of future study for team sport researchers.

Adjustments. Following evaluation, teams may realize that they are not on track to reach their goals for reasons such as a faulty plan, ineffective collaborative behaviours, and environmental changes (Rousseau et al., 2006). As such, team adjustments may need to be made in order to progress toward goal accomplishment. Team self-correction is the process whereby members diagnose problems in functioning and develop effective solutions (Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008). Improving teamwork behaviours may require changes such as altering outcome or process goals, and improving or altering task-collaborative strategies (Rousseau et al., 2006). Rousseau et al. (2006) identified four behavioural dimensions of team adjustment behaviours: problem solving, backing-up behaviours, intrateam coaching, and team practice innovation.

If certain difficulties are preventing a team from reaching its goals (as identified by performance monitoring), it is important that teams engage in *problem solving*, whereby members collaboratively brainstorm and implement a solution that brings their current conditions

closer to the desired outcomes (Rousseau et al., 2006; Marks & Panzer, 2004). For instance, if a team's pre-season goal was to qualify for its league's playoffs and they are currently below the playoff cut-off point, it would be prudent for members to identify any specific problems in the team's functioning; thereafter, they should identify potential alternatives, decide on the best solution(s) that is/are most likely to improve team functioning, and implement the solution(s) accordingly (Rousseau et al., 2006). As a collaborative process, all members should feel that they have a voice in working toward a solution so that they are able to build off each other's ideas and better understand different perspectives that members may not have otherwise appreciated (Wilczenski, Bontrager, Ventrone, & Correia, 2001). Thus, it is vital that team leaders in particular help facilitate discussion, get all members involved, and do not allow themselves or others to dictate the conversation. It is important to note the potential issues that can arise from the collaborative problem solving process, such as groupthink, which represents an excessive drive for unanimity that supersedes the team's drive for thorough critical thinking and problem solving (Janis, 1972). Consequently, poor group decisions can be made, such as altering team strategies that ultimately end up decreasing team success (Wittenbaum et al., 2004). Teams need to be wary of these potential repercussions—particularly highly cohesive teams who are especially prone to groupthink (e.g., Rovio, Eskola, Kozub, Duda, & Lintunen, 2009)—and be resolute on finding solutions that will most benefit the team, even if this causes disagreements throughout the process (Janis, 1972; Wittenbaum et al., 2004).

Helping another teammate perform his/her individual roles is known as *backing up* behaviours (Porter, Hollenbeck, Ilgen, Ellis, West, & Moon, 2003; Rousseau et al., 2006). Compared to individual sport athletes who have to essentially rely on their own volition to complete their tasks, a benefit of team sports is that members can receive assistance from

teammates when needed. This support may involve helping another player correct performance-related mistakes (e.g., devoting extra time after practice to help a teammate work on a particular skill), redistributing certain responsibilities of players who are feeling overloaded or burned out (e.g., a member whose playing time has been excessive), filling in for a player who is unable to complete his/her task (e.g., due to injury), and providing resources or supplies (e.g., lending a piece of equipment to a teammate; cf. Porter et al., 2003). It is important that an environment of openness and trust is created to ensure that teammates feel comfortable in asking teammates for assistance with improving their taskwork when necessary. Furthermore, backing up behaviours can only be provided when members have the time, resources, and capacity to help as needed (Rousseau et al., 2006). Interestingly, it has also been shown there may be potential negative repercussions to providing too much backing up behaviours, such as when providers fail to work on and complete their own taskwork adequately, or the receiver of these behaviours decreases their effort when completing subsequent tasks (Barnes, Hollenbeck, Wagner, DeRue, & Nahrgang, 2008). For example, a University golfer may spend the limited amount of time his/her team has at a driving range helping a teammate with their game; while this may improve the skills of the receiver of the backing up behaviour (and, therefore, seem beneficial to the team), it may also impede the provider's improvements in his/her game (which would be detrimental to the team). This underscores the need for balance between team members' roles and responsibilities. It is important to note that studies assessing the benefits and costs of backing up behaviours have come from organizational settings. Thus, research assessing whether, and the extent to which, these effects differ in sport settings is necessary.

In a similar vein to backing up behaviours, *intrateam coaching* refers to team members providing verbal constructive feedback to each other regarding task performance (Rasker, Post,

& Schraagen, 2000; Rousseau et al., 2006). This may include providing advice or instructions for more effective task execution, calling attention to potential errors, or confronting members who break team norms (Rasker et al., 2000). For instance, veteran players who have attained a multitude of experiences in their sport can ‘show the ropes’ to younger players who are struggling to perform well at their new level of competition. At an individual level, intrateam coaching can improve members’ cognitions and task performances (Rasker et al., 2000). At a team level, it can help members better understand each other’s roles and responsibilities (Beauchamp, 2005) and improve teamwork behaviours, thereby enhancing subsequent team effectiveness (Rasker et al., 2000). As with backing up behaviours, the use of intrateam coaching implies that members are open to providing as well as receiving constructive feedback. Both sides must recognize that the purpose of this verbal feedback is not to create dissention but, rather, to help teammates perform their tasks and ultimately improve team effectiveness. While further research in sport is warranted, athletes have expressed verbal feedback as being effective when it is honest, clear, constructive, and positive (Sullivan & Feltz, 2003; Yukelson, 1997).

At times in sports, teams need to introduce novel approaches to task execution in order to maintain or improve performance (Rousseau et al., 2006). As National Hockey League coach, Todd McLellan puts it: “You have to evolve; you have to change; figure out where the game is going or you get left behind” (Harrison, 2015). Known as *innovation*, this often occurs in response to changing task demands or when previous approaches have been unsuccessful (Drach-Zahavy & Somech, 2001). Situations and environments can often change unexpectedly in sports and teams must refine their courses of actions if they are to achieve their goals. For instance, if a baseball team’s defensive performance during its games includes numerous fielding errors, it may prove valuable for the team to design new drills in practice, develop creative

defensive strategies, or make changes to players' positions. Furthermore, teams in highly competitive leagues will often 'scout' one another in order to gain insight into the opposition's tendencies and prepare accordingly. While it is no doubt important that teams persist with strategies that have proven successful in the past, it may be just as essential that they utilize other innovative team tactics to avoid being predictable or 'one-dimensional'. Team innovation has been found to be most beneficial when members take the time to introduce creative ideas, learn different working methods, and share resources that provide diverse approaches to task accomplishment (Drach-Zahavy & Somech, 2001). As a result, teams are able to uncover the most optimal means of achieving their goals.

Emergent States

Two emergent states that have been studied extensively in many areas of team psychology, including sport, are *team cohesion* and *collective efficacy*.

Team cohesion. Carron et al. (1998) define team cohesion as "a dynamic process that is reflected in the tendency for a group to stick together and remain united in pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" (p. 213). Cohesion includes task as well as social components. Task cohesion represents members' attraction towards the group's instrumental objectives as well as the extent to which the group is integrated around those task-related endeavors. Social cohesion, on the other hand, represents members' attraction towards the group's social activities as well as the extent to which the group is integrated around those activities (Carron et al., 1998). In organizational settings, meta-analytic reviews have found a positive relationship between team cohesion and teamwork (LePine et al., 2008), as well as team cohesion and performance (Beal, Cohen, Burke, & McLendon, 2003). Research in sport settings has also demonstrated positive relationships between team cohesion

and certain teamwork behaviours including team goal setting (Senecal, Loughhead, & Bloom, 2007), cooperation (Prapavessis & Carron, 1997), intra-team communication (Holt & Sparks, 2001), and constructive conflict management (Sullivan & Feltz, 2001). Furthermore, positive relationships have been shown between team cohesion and input variables. For example, greater ratings of social cohesion have been found in teams whose members believe that their team leaders promote teamwork, have high performance expectations, foster acceptance of team goals, and demonstrate individual consideration for each member (Smith, Arthur, Hardy, Callow, & Williams, 2013). With regards to team outcomes, team cohesion is also positively related to performance (Carron et al., 2002) and athlete satisfaction (Aoyagi, Cox, & McGuire, 2008).

Collective efficacy. Collective efficacy is a group's shared belief in its collective ability to organize and execute courses of action required to produce given levels of attainment (Bandura, 1997). A meta-analysis showed that teamwork is strongly and positively related to collective efficacy in organizational settings (LePine et al., 2008). Various studies assessing similar relationships in sports have also been conducted. For instance, it has been shown that higher collective efficacy predicts the setting of more challenging group goals, which, in turn, predicts improved group performance on athletic tasks (Bray, 2004). The relationships between collective efficacy and various input variables have also been assessed. For instance, perceptions of collective efficacy have been found to be predicted by the provision of a coach-derived mastery team climate (where coaches emphasize learning and improvement and encourage team members to work together) rather than a performance or ego-involved climate (where coaches emphasize rivalry between members and use punitive tactics in response to performance errors; Magyar, Feltz, & Simpson, 2004). In terms of team sport outcomes, collective efficacy has been found to be positively related to measures of team performance (e.g., Myers, Feltz, & Short,

2004), athlete satisfaction (Jowett, Shanmugam, & Caccoulis, 2012), and team resilience, as teams describe overcoming adversity as a source for gaining confidence (Morgan, Fletcher, & Sarkar, 2013).

Considerations for Research on Teamwork and Team Effectiveness in Sport

Research into teamwork and team effectiveness provides many fruitful opportunities (Carron et al., 2012; Mathieu et al., 2008). This potential is perhaps greatest for sport settings, as research in these areas have been limited mainly to organizational settings. Here, we provide four suggestions for future team sport researchers to consider.

Measuring teamwork. There is a need to develop a measure or collection of measures of teamwork in sport. Such an instrument would allow researchers to assess how individuals' perceptions of teamwork influence, and are influenced by, other important variables in team sports. Measuring teamwork behaviours in a questionnaire format would be beneficial not only to researchers but applied sport psychology consultants as well. That is, consultants who are hired to improve a sport team's effectiveness could have members complete a teamwork measure to identify any noticeable gaps in the team's functioning. However, as a multidimensional construct, employing (and in some cases creating) measures that reliably and validly tap into each of the teamwork components discussed in this paper represents a substantial undertaking. Moreover, asking athletes to complete what would likely be a lengthy measure of teamwork further accentuates this challenge. As different processes are most salient at different times, one possible solution to the latter challenge is to have members complete particular questionnaires when certain processes are thought to occur (LePine et al., 2008). Specifically, measures of mission analysis, goal specification, and planning could be taken during preparation phases; coordination, cooperation, and communication assessed during execution phases (where

possible); measures of performance monitoring and systems monitoring taken during evaluation phases; and problem solving, backing up behaviours, intrateam coaching, and innovation assessed during adjustment phases. Moreover, creative methodologies have been recently implemented to examine teams in real-time and in their natural environments. For instance, state-space grid methodology—an observational technique that graphically illustrates the moment-to-moment sequences of interactions between two or more individuals (see Lewis, Lamey, & Douglas, 1999)—has recently been utilized in sport settings to assess coach-athlete (Erickson, Côté, Hollenstein, & Deakin, 2011) as well as teammate (Murphy-Mills, Bruner, Erickson, & Côté, 2011) interactions. As technologies such as this continue to advance, researchers are able to assess team dynamics in novel and exciting ways.

Team building in sport: More than just cohesion. Team cohesion has been one of the most prominent areas of research in sport psychology over the past few decades, which has produced a number of influential findings. For instance, it was recently shown that the majority of team building intervention research in sport has focused on improving team cohesion and that this emphasis has shaped our current understanding of how to improve teams (Bruner, Eys, Beauchamp, & Côté, 2013). As a consistent (moderate) relationship that has been found linking cohesion to team performance (Carron, Bray, & Eys, 2002), Bruner et al. (2013) suggest that the overwhelming focus on group cohesion within team building interventions is to be expected. That said, in light of recent meta-analytic evidence (Martin, Carron, & Burke, 2009) that additional group dynamics factors are implicated in the success of team building interventions, Bruner et al. (2013) also concluded that “the restricted focus on cohesion suggests that research conducted within the area of team building in sport is relatively narrow” (p. 37). In the meta-analysis by Martin et al. (2009), team building interventions underpinned by the development of

cohesion were related to a number of adaptive outcomes (including improved performance, cognitions, and cohesion itself), with the overall effect sizes ranging from Hedges $g = .486$ for those interventions focused on interpersonal relations, $g = .471$ for adventure programmes and $g = .161$ for combination interventions. Nevertheless, it is particularly noteworthy that team-building interventions in sport that focused on goal setting (one of the teamwork behaviours incorporated in our conceptual framework) demonstrated the strongest effect sizes (Hedges $g = .714$) in this meta-analysis. This emphasis on goal setting also reflects suggestions provided by other researchers on effective team building strategies in sport (e.g., Brawley & Paskevich, 1997).

The discussion in this chapter on teamwork—in complement to the above findings, as well as those on team building in organizational psychology (see Salas et al., 2008 for a meta-analytic review)—suggests that team building interventions should focus on more than just improving team cohesion. This disputation is certainly not to impugn the impact that cohesion research has had on team building in sport. However, merely targeting team cohesion in team building fails to account for a likely substantial amount of variance from the aforementioned teamwork variables that are involved in improving team effectiveness. Furthermore, highly cohesive teams are not inevitably effective teams; in some cases, high cohesion has even been associated with *decreased* team performance (e.g., Hardy, Eys, & Carron, 2005; Rovio et al., 2009). Finally, Martin et al. (2009) found that while cohesion has been the most frequently targeted outcome variable in team building in sport, this was among the variables least influenced by team building interventions. The authors conclude that “although people continue to use team building in hopes of increasing cohesion, it may not have the desired impact” (p. 15). This implies that there may be alternative ways of improving team effectiveness and its many

components (i.e., team processes, outcomes, emergent states). That is, rather than seeking to directly improve team cohesion alone, we posit that team building interventions may prove more useful when they directly target teamwork behaviours. By doing so, these interventions could improve team functioning and effectiveness, with increased cohesion emerging over time as a by-product (Mathieu et al., 2008; Salas et al., 2008).

Multilevel and multivariate assessment of team effectiveness. As previously mentioned, there is a nested nature to teams. That is, individual members exist within a group, which exist within broader external contexts. Simply assessing individual-level constructs (e.g., member's attitudes or abilities) without considering team- and external-level constructs fails to account for the influence that these broader variables can have on team members. For instance, while each individual team member is unique in a variety of ways (e.g., personality, skills), being on the same team is likely to result in teammates also sharing many similarities in their psychosocial attributes (e.g., self-efficacy, motivation, perceptions of the team's cohesion) with each other than with members of a different team due to team-level (e.g., different coaches' leadership behaviours) and external-level (e.g., differences between teams in funding) influences. Multilevel approaches thus provide a much more comprehensive understanding of team effectiveness.

Taking a multilevel approach can also shed light on discrepancies that may be found between studies of team dynamics. For instance, while some studies have demonstrated success of team building interventions (e.g., Senecal et al. 2007), others have produced no such significant improvements (e.g., Prapavessis, Carron, & Spink, 1996). Merely assessing a team building intervention's impact at the individual level without examining its effects on team-level constructs may result in an incomplete interpretation of the intervention's success (or failure).

Did the intervention adequately improve team-level attributes, such as the coaches' leadership qualities or interactions with their players? Were the effects of the intervention moderated by external variables, such as political influences or differences in teams' funding? Studies of team research that take on a multilevel approach have the power to substantively inform our understanding of athletes' experiences within their sport from several vantage points. In turn, research can optimize these experiences such as by educating athletes on how they can work most effectively together (i.e., member-level influences), helping coaches improve their leadership qualities or interactions with their players (i.e., team-level influences), and collaborating with governmental or organizational policy-makers (i.e., external influences).

In a similar vein, it is important that research progresses towards using multivariate analyses (e.g., assessing the effects of several independent variables on multiple dependent variables) rather than merely using univariate analyses (e.g., bivariate correlations between an independent and dependent variable) when examining teams (Carron et al., 2012). Despite the large number of team effectiveness studies that have been conducted in organizational psychology, many of these studies have merely tested whether a single process variable (e.g., coordination) affects a particular team outcome (e.g., performance), rather than testing the effects of multiple processes (e.g., coordination as well as cooperation and communication) on multiple team outcomes (e.g., team performance as well as member satisfaction). Teams, by nature, are complex. A multivariate approach helps account for the complexity of group phenomena and acknowledges the simultaneous inter-relationships that typically occur among variables (Carron et al., 2012). In sum, although simpler univariate analyses in team effectiveness research in sport may provide some initial insight into the relationships between certain variables, in order to

make theoretical progress and gain a thorough understanding of teams, research must also progress to making use of multivariate analyses.

Temporal considerations of teamwork and team effectiveness. Teams are not static entities that simply progress in a linear manner. Rather, they are dynamic, evolving over time through developmental processes as well as episodic cycles (as shown in Figure 2.1; Mathieu et al., 2008; Morgan et al., 2013). As such, temporal and situational factors that impact the various components of team effectiveness (including teamwork) should be taken into account when conducting team research. A consistent theme in numerous ‘Future Directions’ sections of team effectiveness articles is the need for studies that utilize time-sampling and longitudinal approaches. Despite these recommendations, the dynamic influence of episodic cycles and developmental processes in team research has not been sufficiently accounted for (Mathieu et al., 2008). For instance, the majority of empirical studies of teamwork have taken on a static perspective, where researchers examine teams at a single point (Marks et al., 2001). Furthermore, even when authors examine teams over an extended period of time, they often aggregate data into a summary index (e.g., mean score; Marks et al., 2001). As a result, variance across time is collapsed into a simple, static indicator, whereby temporal factors are eliminated (Marks et al., 2001). Consequently, we are left with an incomplete (and perhaps inaccurate) account of team effectiveness.

Consider the typical case of an adolescent sports team. The team will go through several phases over the course of their season, including (but certainly not limited to) meeting each other for the first time, practicing together, spending time together outside of their sporting venue, competing together in intense games, resolving conflicts, and reaching the conclusion of their season. Each of these episodes will vary from each other in terms of duration and intensity. This

raises the question of when the most ideal times for researchers to collect data may be. The answer to this question will most inevitably vary across studies and research questions, and may present logistical challenges. Indeed, this type of research is not a trivial undertaking and researchers may need to be creative in their methodological approaches. However, given the potential benefits in terms of understanding the complexities of sports teams and how best to improve their effectiveness (e.g., through teamwork interventions), we encourage researchers to embrace the challenges involved in conducting studies that take temporal and situational factors into consideration.

Conclusion

Research across many team settings suggests that multiple teamwork behaviours are an important component in being an effective team. This implication is further underscored by some (albeit limited) evidence from research in sport settings. This theoretical and integrative review is meant to stimulate sport psychology researchers to consider the range of variables within the conceptual framework presented in Figure 2.1 for understanding and improving sport teams. Such research also has the potential to inform professional practice for coaches and sport psychologists alike.

Chapter 3: The Development and Psychometric Properties of the Multidimensional Assessment of Teamwork in Sport (MATS)

Teamwork is often noted as an important variable within the vernacular of team sport. Coaches frequently emphasize the importance of players working together, with athletes similarly attributing team outcomes to the extent to which team members work well together. Despite this seeming importance of teamwork, there has been surprisingly limited research on this construct within sport settings (Carron et al., 2012; McEwan & Beauchamp, 2014). Indeed, although decades of research has accumulated within other team contexts such as health care, aviation, business, and military settings, the evidence related to teamwork in sport has been sparse, fragmented, and mostly anecdotal (McEwan & Beauchamp, 2014).

In an effort to begin to fill this gap in the field of sport psychology, McEwan and Beauchamp (2014) conducted a theoretical and integrative review in order to provide a working definition and conceptual model of teamwork in sport. They defined teamwork as “a dynamic process involving a collaborative effort by team members to effectively carry out the independent and interdependent behaviours that are required to maximize a team’s likelihood of achieving its purposes” (p. 233). Their conceptual model, including 14 dimensions of teamwork, was informed by two key team psychology frameworks. These included Mathieu et al.’s (2008) prominent Input-Mediator-Output team effectiveness model as well as Rousseau et al.’s (2006) teamwork framework that was based on a comprehensive analysis of 29 frameworks that were used to study teamwork behaviours in a range of group settings (e.g., health care, business, military). Twelve of the dimensions within McEwan and Beauchamp’s (2014) model focus on behaviours associated with team task performance (i.e., regulation of team performance), while two dimensions focus on behaviours associated with the management of team maintenance (i.e., interpersonal dynamics of a team).

With regard to *regulating team performance (RTP)*, teamwork behaviours were conceptualized by McEwan and Beauchamp (2014) to be enacted over four separate phases: (a) *preparation*, (b) *execution*, (c) *evaluation*, and (d) *adjustments*. Three behavioural dimensions comprise the preparation phase, which take place in advance of a team task (e.g., at the start of a team's season, before a game or competition). First, *mission analysis* involves defining a team's overall purpose or reasons for being together (e.g., to win a league championship, to have fun). Second, *goal specification* involves setting team goals in order to achieve those team purposes (e.g., to obtain a certain race time in team kayaking, to score a specific number of runs per game in baseball). Third, *action planning* involves establishing strategies for obtaining team goals (e.g., identifying defensive matchups in a basketball game, running drills in a practice).

Three dimensions comprise the *execution* phase of RTP, which occur during a team task (i.e., while a team is competing). First, *communication* involves the information sharing that occurs between teammates (e.g., field hockey players calling for a pass, a coxswain relaying stroke commands in crew rowing). Second, *coordination* involves teammates being synchronized with each other in terms of the sequencing and timing of their actions (e.g., quarterbacks passing the ball once their receivers have run their route in football, a track team exchanging the baton at the ideal time). Third, *cooperation* involves individual teammates working together for mutual benefit (e.g., hockey players blocking opponents' shots for the benefit of their team, a basketball player helping a teammate defend his/her check).

The third and fourth phases of RTP—evaluation and adjustments—occur after a team has completed its task (e.g., during the halftime break in soccer, following the conclusion of a tournament). The evaluation phase is comprised of two dimensions, which act as a means of self-regulation. These dimensions include *performance monitoring*, whereby teams monitor how well

they have performed (e.g., whether the team won a recent game, how effectively the team worked together) as well as *systems monitoring*, wherein teams monitor various conditions that may have affected their performance (e.g., situations during a competition, changes in team personnel).

Four teamwork behaviours comprise adjustments, the fourth phase of RTP, whereby team members might diagnose issues in team functioning and devise solutions as a result (i.e., team self-correction). First, *problem solving* involves identifying why a team has been unsuccessful (e.g., poor coordination) and how they can perform better (e.g., carrying out certain drills in practice focused on improving coordination). Second, *innovation* involves enacting novel approaches in order to enhance team task execution (e.g., altering game strategies, trying players out at new positions). Third, *intrateam coaching* occurs when teammates provide verbal feedback to each other regarding task performance (e.g., an experienced veteran player providing helpful advice to a more inexperienced player, an injured player observing team competitions and making suggestions to teammates on how they can be successful). Fourth, *backing up* behaviours involve teammates helping one another (e.g., a golfer showing his/her teammate how to execute a certain shot more effectively, redistributing the task responsibilities of players who are feeling overworked).

Rather than directly focused on team performance, the *management of team maintenance (MTM)* is focused on behaviours associated with keeping the team together, and ensuring that personal and/or interpersonal non-performance-related issues do not preclude a team from functioning effectively. Two dimensions comprise this aspect of teamwork. The first dimension, *psychological support*, involves teammates providing assistance to one another in the form of emotional (e.g., sharing and listening to each other about events going on in one's life outside of

sport), esteem (e.g., helping teammates feel confident about themselves), informational (e.g., teammates providing advice to one another), and/or tangible (e.g., providing concrete, instrumental assistance such as rides to and from practice) support. The second dimension, *integrative conflict management*, involves managing interpersonal conflicts between team members if/when they arise (e.g., resolving disagreements between teammates).

As research on teamwork in sport is still in its infancy (cf. McEwan & Beauchamp, 2014), it is perhaps unsurprising that there have not yet been any attempts to measure this multidimensional construct. The availability of a psychometrically sound measure of teamwork in sport is critical in order for this potentially important new line of research within sport psychology to progress. With this in mind, the purpose of this research was to develop a questionnaire designed to assess teamwork in sport and examine various aspects of validity associated with measures derived from this instrument. This research was guided by Messick's (1995) unified view of validity—that is, by the process of *construct validation*, which comprises the evidence and rationale that support the trustworthiness of data derived from a focal measure (Messick, 1995). From this perspective, construct validation is considered an ongoing process that occurs over the course of several studies, with six aspects of validity being examined throughout (Hubley & Zumbo, 1996; Messick, 1995). These aspects include *content* (the relevance, representativeness, and technical quality of a questionnaire and its items), *substantive* (respondents' interpretations and judgments of a questionnaire and its items), *structural* (the extent to which the model-data structure of measures from a questionnaire aligns with the theoretical framework underpinning that construct), *generalizability* (the extent to which score properties and interpretations generalize across populations, contexts, and tasks), *external* (convergence with and/or discrimination between a focal construct and other variables), and

consequential (the implications that may result from using a test, such as providing a ‘basis for action’) validity (Messick, 1995).

The first phase of this construct validation process involves fully articulating a theoretical framework and definition of the construct being studied (Clark & Watson, 1995; Cronbach & Meehl, 1955; Smith, 2005). In the context of the current research, this was carried out via the theoretical and integrative review by McEwan and Beauchamp (2014, Chapter 2). The next phase involves developing a psychometrically sound questionnaire that accurately measures the focal variable, namely teamwork in sport. This phase represented the overall focus of the research presented in this chapter, which took place over two studies. Specifically, in study 2 of this dissertation, we sought to first develop/collect a comprehensive pool of items, which was guided by McEwan and Beauchamp’s (2014) framework and definition of teamwork. Once a preliminary questionnaire was created, we sought to examine the content and substantive aspects of validity by consulting with, and obtaining feedback from, the target population (i.e., team sport coaches and athletes) as well as experts within the specific field of study (i.e., those with a doctorate related to sport psychology; cf. Messick, 1995). Thereafter, the objective of study 3 was to obtain evidence for the structural aspect of validity by examining data from a heterogenous sample of team sport athletes who completed the questionnaire (cf. Flora & Flake, 2017; Messick, 1995). By developing this questionnaire, future research can then be conducted to examine the external, generalizability, and consequential aspects of validity related to this instrument.

Study 2

Study 2 of this dissertation consisted of three parts. First, following procedures outlined by Clark and Watson (1995) and DeVellis (2003), part A of the study involved creating an initial

pool of potential items that measured the 14 dimensions of teamwork. To do so, we referred back to the theoretical framework and definition of teamwork (cf. McEwan & Beauchamp, 2014) in order to create a pool of items that reflected those teamwork behaviours. In addition, we reviewed the literature for previous attempts to measure teamwork in some way (in both sport settings and other team contexts). A total of 566 items were identified as a result of this procedure. A rigorous and iterative process was then undertaken to modify, amalgamate, and delete items where necessary (cf. Clark and Watson, 1995), which ultimately resulted in a preliminary, 74-item measure of teamwork that we titled the *Multidimensional Assessment of Teamwork in Sport (MATS)*. A five-point, Likert-type response scale (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; and 5 = strongly agree) was selected to assess the items in this preliminary measure (the preliminary version of this questionnaire is provided in Appendix E).

In part B of the study, a sample of team sport athletes or coaches were recruited by placing posters about the study (see Appendix A) throughout the UBC campus. In the end, 25 team sport athletes and five coaches (23 males, 7 females) completed, and provided feedback on, the preliminary questionnaire in a focus group format through use of a ‘retrospective think-aloud’ protocol (Willis, 2005). This was done in order to better understand how members of the target population interpret and respond to items on the questionnaire (i.e., examine response processes). Specifically, consulting with a sample of the target population in this way helps to establish evidence of the *content* (i.e., the relevance, representativeness, and technical quality of the items) and *substantive* (i.e., understanding how respondents interpret and make sense of the items) aspects of validity (Messick, 1995). These participants competed in a variety of team sports, including volleyball ($n = 15$), curling ($n = 4$), soccer ($n = 3$), rowing ($n = 2$), gridiron

football ($n = 1$), baseball ($n = 1$), ice-hockey ($n = 1$), and multiple sports ($n = 3$). The competitive level included University ($n = 18$), recreational ($n = 5$), National ($n = 4$), and local elite ($n = 3$) athletes/coaches.

After providing consent, participants were asked to complete (individually) a subset of items from the preliminary MATS (approximately 18-19 items per session). The reason for having participants only complete a subset of items (as opposed to the entire MATS) was to reduce participant burden and ensure quality within their responses and the subsequent group discussion. Participants were able to participate in multiple focus group sessions (i.e., provide feedback on separate sections of the questionnaire); on average, participants took part in two study sessions. A total of 15 focus group sessions were ultimately carried out, each of which lasted approximately 45-60 minutes and consisted of 2-4 participants. While going through the questionnaire, participants were encouraged to make notes of any aspect of the instrument that they felt lacked clarity or could otherwise be improved. Once all participants completed the questionnaire, the researcher facilitated a group discussion about the MATS. Within this discussion, participants were asked to provide feedback on the questionnaire's five-point scale, each item's representativeness of, and relevance to, teamwork within the context of team sport, wording clarity, and potential item redundancy. Specific probes for each item included the following: (a) "what, in your words, do you feel is being asked in this item?"; (b) "did the answer choices include your response?"; and (c) "did you understand how to answer this question?". After going through each item within the respective subsection of the questionnaire, participants were thanked for their participation and provided with a \$10 (CAD) honorarium. As an ongoing and iterative process, changes were made to the MATS throughout the course of this part of the

instrument development (i.e., between focus group sessions), until no further changes were identified (see Appendix F for the modified version of the MATS).

Finally, in part C of the study, a sample of eight experts from the field of sport psychology reviewed, and also provided feedback on, the questionnaire. The purpose of this expert review was to further maximize the content and substantive aspects of validity associated with measures derived from the questionnaire (cf. Clark & Watson, 1995; DeVellis, 2003). After agreeing to take part in the study, participants were sent a Word document version of the MATS. They were first given the definition of teamwork and each of its dimensions (taken from McEwan & Beauchamp, 2014). Participants then rated—on a seven-point scale from ‘-3: Not At All’ to ‘0: Uncertain’ to ‘3 Very Much’—each item's relevance to and representativeness of the definition of teamwork, clarity of wording, and item redundancy. There was also space for participants to provide comments on each item as well as any general feedback about the questionnaire. As with part B of this study, changes to the MATS were made with each iteration of feedback provided by the experts. Hence, we continued to recruit experts who would complete an updated version (i.e., based on feedback provided by previous participants) of the MATS. This process concluded once no further changes were identified.

Several modifications to the questionnaire were made as a result of parts B and C of this study (see Appendix K for the final version). Some of these changes were minor (e.g., improving the look/presentation of the questionnaire), while others were more substantive. For one, the response scale of the questionnaire was changed to a 7-point Likert-type scale (1 = completely disagree, 2 = mostly disagree, 3 = slightly disagree, 4 = neither agree nor disagree, 5 = slightly agree, 6 = mostly agree, 7 = completely agree), as the majority of participants indicated that this expanded scale allowed them to provide responses that more accurately reflected their thinking

and appraisals compared to the original 5-point scale. Second, preambles that described the dimension within each section of the questionnaire were expanded and examples included to help foster understanding of each dimension. Third, the wording of several items was modified in order to avoid the use of potentially colloquial terms and to improve the phrasing of items that participants felt were confusing. Finally, various items were deleted or combined in order to avoid item redundancy or eliminate items that were deemed inappropriate/irrelevant to team sports (see Appendix L for a summary of these modifications). These modifications resulted in a revised 70-item version of the MATS, with support for the content and substantive aspects of validity related to this instrument. The MATS displays a Grade 7-8 (aged 13+ years) reading ability score (Flesch-Kincaid Grade Level = 7.7, Flesch Reading Ease score = 55.1; cf. Flesch, 1948; Kincaid, Fishburne, Rogers, & Chissom, 1975).

Study 3

The next stage in the construct validation process involved examining the structural aspect of validity in relation to data derived from the MATS. Specifically, we sought to examine the extent to which the items from the MATS aligned with/loaded onto their respective teamwork dimension, as well as whether the factor structure of those dimensions aligned with the theoretical framework of teamwork in sport (cf. McEwan & Beauchamp, 2014). In order to accomplish this objective, a heterogeneous sample (in terms of sport type, age, sex, and competitive level) of teams and athletes completed the MATS. Five multilevel, multidimensional confirmatory factor analytic models were then analyzed in order to examine the structural properties of data derived from the MATS.

Methods

Following institutional ethics approval, participants were recruited by emailing coaches and team managers across the lower mainland of British Columbia via publicly available contact information. Within this email, we attached the letter of information that provided details about the study (see Appendix H). Coaches/managers who were interested in having their team participate in the study were asked to email the first author in order to set up a meeting time. Ultimately, 607 athletes (65.3% males) from 48 teams were recruited to participate in the study. These participants (mean age = 17.7 years, range = 13-73) competed in a range of team sports (eight hockey teams; seven basketball teams; six soccer teams; five baseball teams and curling teams; four water polo teams; three rugby teams; two volleyball teams and track and field teams; and one lacrosse team, cycling team, field hockey team, crew rowing team, swimming team, and synchronized swimming team) and competitive levels (36 elite 'rep' teams competing against other teams in the Lower Mainland of British Columbia, Canada; seven University teams; two National teams; two provincial teams; and one professional team). The researcher met with the teams where participants (i.e., athletes within those teams) were asked to complete a demographic form as well as the updated (i.e., based on study 1) 70-item MATS.

Data Analysis

Drawing directly from the a priori conceptual framework by McEwan and Beauchamp (2014), five separate multilevel confirmatory factor analyses (MLCFA) of the data from the 70-item MATS were conducted in relation to each of the four phases of RTP (preparation, execution, evaluation, and adjustment) as well as MTM (see below for model specification and rationale). The multilevel component of the analyses derived from the fact that the athletes were clustered/nested within the teams from which they were sampled. Within each model, intraclass correlations (ICCs) were calculated to estimate how much variance in each item was observed at

the group level. If item-level ICCs are greater than .20, then the clustering of the data should not be ignored (Muthén & Sartora, 1995). We also computed ordinal composite reliability (CR; Zumbo, Gadermann, & Zeisser, 2007) scores for each teamwork dimension. According to Hair, Black, Babin, and Anderson (2009), an acceptable indication of internal consistency is evident if ordinal $CR \geq .70$. Finally, we computed Average Variance Extracted (AVE) scores, which measure the convergence among the items in each model. It is recommended that the AVE values for each factor not exceed the squared correlations between that factor and any other variable (Fornell & Larcker, 1981).

In accordance with guidelines for conducting MLCFA (Brown, 2006; Muthén, & Muthén, 2017), the individual items (i.e., observed variables or indicators) were first specified to load onto their theoretically-aligned teamwork dimension (i.e., latent factors). Within the models examining the preparation, execution, and adjustments phases of RTP, these lower-order latent variables were then specified to load onto a second-order latent factor designed to reflect an omnibus/global representation of each of those phases. Specifically, preparation was modelled (see Figure 3.1) to be comprised of three lower-order latent variables measuring mission analysis (5 items), goal specification (6 items), and planning (7 items). Execution was also modelled (see Figure 3.2) to consist of three lower-order latent variables measuring coordination (4 items), cooperation (5 items), and communication (5 items). Adjustments was modelled (see Figure 3.4) to be comprised of problem solving (5 items), innovation (4 items), intrateam coaching (4 items), and backing up (5 items). Since it is not mathematically possible to test a higher-order structure from two lower-order factors (a minimum of three lower-order factors is required to do so; Brown, 2006), we specified a first-order measurement model for the evaluation phase (see Figure 3.3) that included two correlated latent factors related to performance monitoring (6 items) and

systems monitoring (4 items). Similarly, we specified a first-order measurement model for MTM (see Figure 3.5) that included two correlated latent factors related to conflict management (5 items) and psychological support (5 items).¹

The factor analyses were carried out in *Mplus* Version 8 (Muthén & Muthén, 2017). A Weighted Least Squares Means and Variance adjusted (WLSMV) method of estimation was utilized, as it has been suggested that this method performs best when conducting CFA with ordinal data (Brown, 2006). Model fit was evaluated with a variety of fit indices. First, we considered the chi-square test to examine absolute fit. However, several authors have suggested that obtaining a non-significant χ^2 value is highly unrealistic (Hu & Bentler, 1995) and that supplemental fit indices should be inspected. Thus, we computed the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). Good fit between the hypothesized model and the data occur when CFI and TLI values are close to or greater than .95, and RMSEA values are less than .10 (Brown, 2006; MacCallum, Brown, & Sugarawa, 1996).

Results

Preparation. The items as well as corresponding ICCs and standardized parameter estimates for the preparation model are presented in Table 3.1, with visual representation of this second-order model presented in Figure 3.1. This model provided good evidence of model fit: $\chi^2(df) = 616.78(150)$, $p < .0001$; RMSEA (95% confidence interval) = .072 (.066-.078); CFI = .979; TLI = .976. Ordinal composite reliability scores were .92 for mission analysis, .94 for goal specification, and .92 for planning, all of which exceeded the .70 cutoff for acceptable reliability (Hair et al., 2009). AVE values were .71 for mission analysis, .73 for goal specification, and .61

Table 3.1. Preparation items, ICCs, and factor loadings.

<u>Mission analysis</u>	<u>ICC</u>	<u>β (SE)</u>
Our team has identified an overall purpose for being together.	.29	.73 (.02)*
We have analyzed what our team's purpose should be.	.31	.84 (.01)*
We have defined a team purpose that is appropriate to us.	.31	.86 (.01)*
Our team has specified a mission on which all members agree.	.31	.85 (.02)*
Our team has established a team mission to which we are all committed.	.27	.91 (.01)*
 <u>Goal specification</u>	 <u>ICC</u>	 <u>β (SE)</u>
Our team identifies specific team goals in order to achieve our team mission.	.33	.81 (.02)*
We set challenging team goals.	.29	.74 (.02)*
Our team specifies goals that are appropriate to us.	.27	.86 (.01)*
We set team goals that are clearly understood by all members.	.24	.90 (.01)*
Our team sets goals to which all members are committed.	.29	.90 (.01)*
We establish goals on which all teammates agree.	.32	.92 (.01)*
 <u>Planning</u>	 <u>ICC</u>	 <u>β (SE)</u>
We make action plans for how we will achieve our team goals.	.16	.81 (.02)*
Our team develops plans on which we all agree.	.19	.88 (.01)*
Our team prioritizes the most important things that need to be done to be successful.	.17	.73 (.02)*
We identify responsibilities that each member has to the team.	.15	.72 (.02)*
Our team develops action plans that are clearly understood by all members.	.19	.88 (.01)*
Team members carry out the action plans that have been made.	.23	.81 (.02)*
Our team creates backup plans in case our original plans are unsuccessful	.15	.63 (.03)*

Note. ICC = intraclass correlations denoting the variance in the latent variable that is attributed to a participant's team. β = standardized parameter estimate of an item on its corresponding latent variable. SE = standard error. * $p < .001$

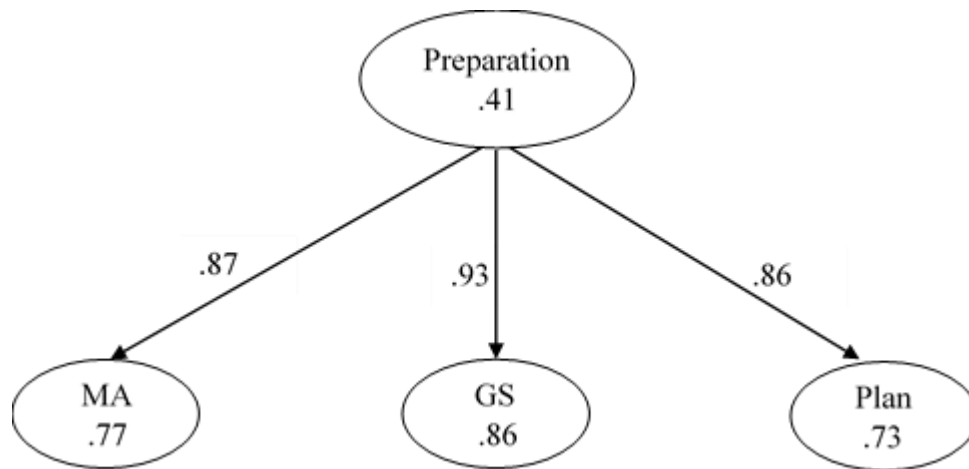


Figure 3.1. Four-factor, second-order model representing the preparation phase of RTP. MA = Mission analysis; GS = Goal specification; Plan = Planning. All parameter estimates (indicated by the arrows) are standardized beta values and are significant at $p < .001$. Factor variances are noted within the ovals and are all significant at $p < .001$.

for planning, all of which exceeded any between-factor squared correlations (Fornell & Larcker, 1981).

Execution. The items as well as corresponding ICCs and standardized parameter estimates for the execution model are presented in Table 3.2, with visual representation of this second-order model presented in Figure 3.2. The results revealed good evidence of model fit: $\chi^2(df) = 461.54(88)$, $p < .0001$; RMSEA (95% confidence interval) = .084 (.076-.091); CFI = .981; TLI = .977. Ordinal composite reliability scores were .92 for coordination, .92 for cooperation, and .93 for communication, all of which exceeded the .70 cutoff for acceptable reliability (Hair et al., 2009). AVE values were .74 for coordination, .70 for cooperation, and .74 for communication, all of which exceeded any between-factor squared correlations (Fornell & Larcker, 1981).

Evaluation. The items as well as corresponding ICCs and standardized parameter estimates for the evaluation model are presented in Table 3.3, with a visual representation of the model presented in Figure 3.3. The results revealed good evidence of model fit: $\chi^2(df) = 216.93(44)$, $p < .0001$; RMSEA (95% confidence interval) = .080 (.070-.091); CFI = .983; TLI = .979. Ordinal composite reliability scores were .92 for performance monitoring and .90 for systems monitoring, both of which were well above the .70 cutoff for acceptable reliability (Hair et al., 2009). AVE values were .66 for performance monitoring and .69 for systems monitoring, both of which exceeded any between-factor squared correlations (Fornell & Larcker, 1981).

Adjustments. The items as well as corresponding ICCs and standardized parameter estimates for the adjustments model are presented in Table 3.4, with a visual representation of this second-order model presented in Figure 3.4. The results revealed good evidence of model fit: $\chi^2(df) = 1021.92(149)$, $p < .0001$; RMSEA (95% confidence interval) = .098 (.093-.104); CFI =

Table 3.2. Execution items, ICCs, and factor loadings.

<u>Coordination</u>	<u>ICC</u>	<u>β (SE)</u>
Overall, team members coordinate actions well with each other.	.27	.86 (.01)*
Team members are in the correct physical position while executing their tasks.	.22	.82 (.02)*
Team members execute their tasks with the correct timing.	.25	.87 (.01)*
The actions of all team members are properly sequenced with each other.	.27	.90 (.01)*
<u>Cooperation</u>	<u>ICC</u>	<u>β (SE)</u>
In general, team members work together effectively.	.35	.88 (.01)*
Team members work together as one unit rather than a bunch of individuals.	.33	.85 (.01)*
Teammates help each other when needed.	.29	.81 (.02)*
All team members execute their tasks with full effort.	.29	.82 (.02)*
Members do anything that is necessary for the team's benefit.	.21	.81 (.02)*
<u>Communication</u>	<u>ICC</u>	<u>β (SE)</u>
Our team communicates well with each other.	.28	.90 (.01)*
Teammates communicate an ideal amount with each other.	.20	.86 (.01)*
Team members communicate in a clear manner.	.18	.86 (.01)*
Team members communicate in a time-efficient manner.	.21	.84 (.01)*
<u>Team members communicate at the appropriate times.</u>	<u>.21</u>	<u>.84 (.01)*</u>

Note. ICC = intraclass correlations denoting the variance in the latent variable that is attributed to a participant's team. β = standardized parameter estimate of an item on its corresponding latent variable. SE = standard error. * $p < .001$

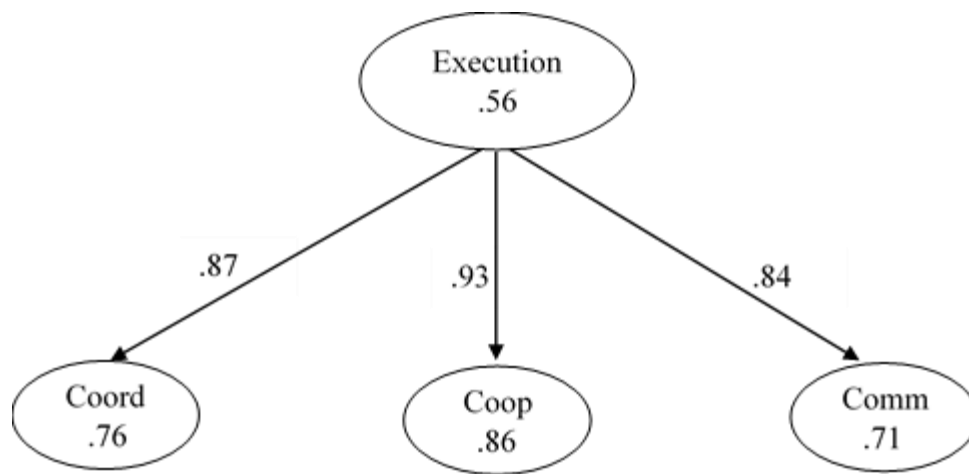


Figure 3.2. Four-factor, second-order model representing the execution phase of RTP. Coord = coordination; Coop = cooperation; Comm = Communication. All parameter estimates (indicated by the arrows) are standardized beta values and are significant at $p < .001$. Factor variances are noted within the ovals and are all significant at $p < .001$.

Table 3.3. Evaluation items, ICCs, and factor loadings.

<u>Performance monitoring</u>	<u>ICC</u>	<u>β (<i>SE</i>)</u>
Our team monitors its performance.	.30	.81 (.02)*
We evaluate our progression towards team goal accomplishment.	.21	.86 (.01)*
We assess how we are all performing as individuals.	.25	.77 (.02)*
We assess which performances have been successful.	.21	.86 (.01)*
We assess which performances have been unsuccessful.	.18	.77 (.02)*
Our team notes what we still need to do to accomplish our goals.	.15	.79 (.02)*
 <u>Systems monitoring</u>	 <u>ICC</u>	 <u>β (<i>SE</i>)</u>
Our team monitors any information that may affect us.	.12	.87 (.01)*
Our team monitors situations that occur during competitions.	.15	.89 (.01)*
We keep track of changes in personnel that occur within our team.	.14	.80 (.02)*
We monitor external factors that may impact our team.	.14	.77 (.02)*

Note. ICC = intraclass correlations denoting the variance in the latent variable that is attributed to a participant's team. β = standardized parameter estimate of an item on its corresponding latent variable. *SE* = standard error. * $p < .001$

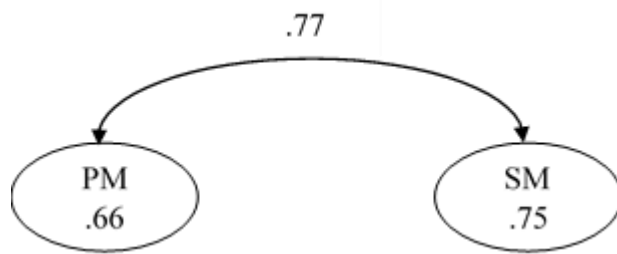


Figure 3.3. Two-factor model representing the evaluation phase of RTP. PM = Performance monitoring; SM = Systems monitoring. The parameter estimate (indicated by the double-sided arrow) is a standardized beta value and is significant at $p < .001$. Factor variances are noted within the ovals and are both significant at $p < .001$.

Table 3.4. Adjustments items, ICCs, and factor loadings.

<u>Problem solving</u>	<u>ICC</u>	<u>β (SE)</u>
Our team problem solves when we have not performed well.	.26	.79 (.02)*
All team members contribute ideas for how we can get better.	.18	.76 (.02)*
If our team is unsuccessful, we identify the reasons why this has occurred.	.21	.81 (.02)*
We consider a variety of potential solutions to problems in team performance.	.15	.86 (.01)*
Our team implements solutions to improve our performance.	.22	.87 (.01)*
<u>Innovation</u>	<u>ICC</u>	<u>β (SE)</u>
Our team modifies our approaches when necessary.	.19	.85 (.01)*
We utilize new tactics when previous plans prove to be unsuccessful.	.16	.84 (.01)*
Our team applies creative approaches if we are not performing well.	.20	.87 (.01)*
If we are unsuccessful as a team, we adjust our plans at the appropriate time.	.21	.88 (.01)*
<u>Intrateam coaching</u>	<u>ICC</u>	<u>β (SE)</u>
Team members provide verbal feedback to each other about how to improve their individual performance.	.20	.82 (.02)*
Members of this team take time to give advice to each other on their personal performance.	.25	.86 (.01)*
Team members willingly receive constructive advice from their teammates on their own performance.	.24	.85 (.02)*
Teammates discuss how they can overcome individual performance-related problems.	.27	.91 (.01)*
<u>Backing up</u>	<u>ICC</u>	<u>β (SE)</u>
Teammates demonstrate to each other how they can improve their personal performance.	.24	.88 (.01)*
Teammates take time to assist other members perform better.	.22	.88 (.01)*
Members of this team willingly receive help from teammates for improving their performance.	.23	.87 (.01)*
Teammates fill in for each other when needed.	.21	.79 (.02)*
Team members assist teammates with their responsibilities to the team if necessary	.27	.87 (.01)*

Note. ICC = intraclass correlations denoting the variance in the latent variable that is attributed to a participant's team. β = standardized parameter estimate of an item on its corresponding latent variable. *SE* = standard error. * $p < .001$

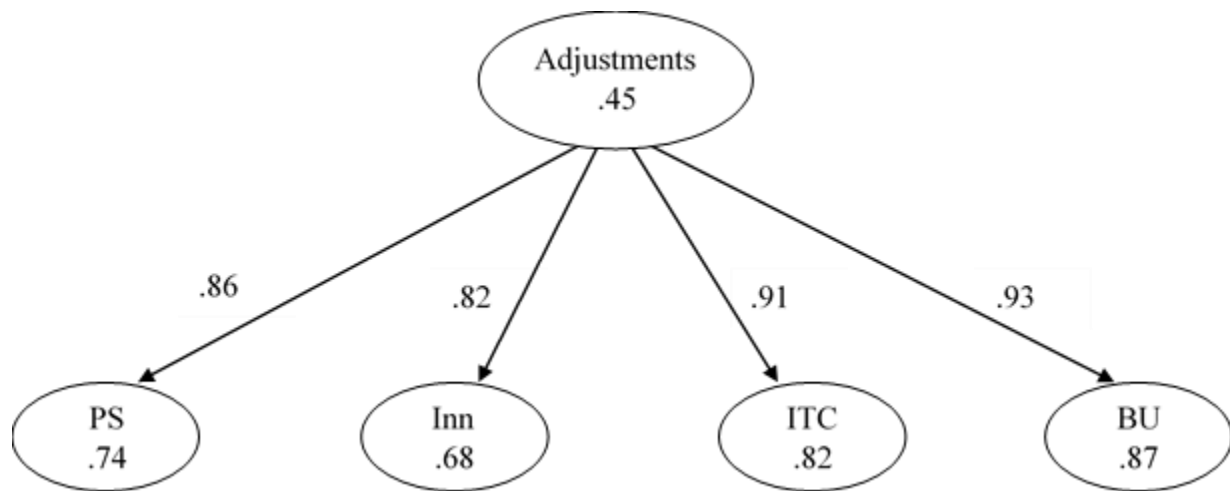


Figure 3.4. Five-factor, second-order model representing the adjustments phase of RTP. PS = Problem solving; Inn = Innovation; ITC = Intrateam coaching; BU = backing up. All parameter estimates (indicated by the arrows) are standardized beta values and are significant at $p < .001$. Factor variances are noted within the ovals and are all significant at $p < .001$.

.962; TLI = .956. Ordinal composite reliability scores were .91 for problem solving, .92 for innovation, .92 for intrateam coaching, and .93 for backing up, all of which were well above the .70 cutoff for acceptable reliability (Hair et al., 2009). AVE values were .67 for problem solving, .74 for innovation, .74 for intrateam coaching, and .74 for backing up, all of which exceed any between-factor squared correlations (Fornell & Larcker, 1981).

Management of team maintenance (MTM). The items as well as corresponding ICCs and standardized parameter estimates for the MTM model are presented in Table 3.5, with a visual representation of the model presented in Figure 3.5. The results provided good evidence of model fit: $\chi^2(df) = 164.80(44)$, $p < .0001$; RMSEA (95% confidence interval) = .067 (.056-.078); CFI = .995; TLI = .994. Ordinal composite reliability scores were .92 for integrative conflict management and .96 for psychological support, both of which were well above the .70 cutoff for acceptable reliability (Hair et al., 2009). AVE values were .71 for integrative conflict management and .81 for psychological support, both of which exceed any between-factor squared correlations (Fornell & Larcker, 1981).

Discussion

The overall objective of this research was to develop a conceptually and psychometrically sound instrument to measure teamwork in sport. Specifically, in study 2 we sought to (a) develop a comprehensive pool of items that directly aligned with the a priori theoretical framework of teamwork in sport provided by McEwan and Beauchamp (2014), (b) refine that item pool and develop a preliminary measure of this construct, and (c) obtain feedback from, and examine the response processes of, team sport participants as well as experts in sport psychology on that instrument. Thereafter in study 3, a heterogeneous sample of team sport athletes completed the questionnaire, and the psychometric properties of data derived from the instrument were

Table 3.5. Management of Team Maintenance items, ICCs, and factor loadings.

<u>Integrative conflict management</u>	<u>ICC</u>	<u>β (SE)</u>
Teammates resolve conflicts with each other effectively if they arise.	.27	.84 (.01)*
Teammates address conflicts directly with each other.	.20	.66 (.02)*
Conflicts between team members are solved in a respectful manner.	.30	.88 (.01)*
Teammates try to find solutions to conflicts that are best for the team.	.29	.94 (.01)*
Conflicts are resolved in a time-efficient manner.	.23	.87 (.01)*
 <u>Psychological support</u>	 <u>ICC</u>	 <u>β (SE)</u>
Members provide support to teammates who are experiencing personal struggles	.27	.91 (.01)*
Members of this team provide emotional support to each other.	.34	.93 (.01)*
Teammates encourage one another to feel confident about themselves.	.28	.89 (.01)*
Team members provide advice to each other for dealing with personal issues.	.30	.91 (.01)*
Team members provide practical assistance to each other when their teammates need help.	.32	.92 (.01)*

Note. ICC = intraclass correlations denoting the variance in the latent variable that is attributed to a participant's team. β = standardized parameter estimate of an item on its corresponding latent variable. *SE* = standard error. * $p < .001$

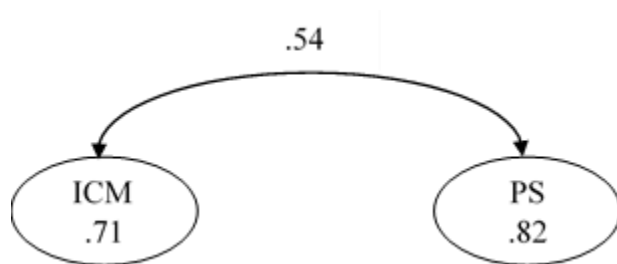


Figure 3.5. Two-factor model representing the Management of Team Maintenance. ICM = Integrative conflict management; PS = Psychological support. The parameter estimate (indicated by the double-sided arrow) is a standardized beta values and is significant at $p < .001$. Factor variances are noted within the ovals and are all significant at $p < .001$.

examined. The results of the multilevel, multidimensional confirmatory factor analyses provided empirical support for model-data fit that directly aligns with the teamwork in sport framework provided by McEwan and Beauchamp (2014). Specifically, we found that all individual items (that were developed in study 2) loaded onto their theoretically-aligned dimension of teamwork, while accounting for the multilevel structure of the data (i.e., players clustered within teams). Furthermore, the dimensions reflecting mission analysis, goal specification, and planning loaded onto a higher-order factor of ‘preparation’; the dimensions of communication, coordination, and cooperation loaded onto a higher-order factor of ‘execution’; and the dimensions of problem solving, innovation, intrateam coaching, and backing up loaded onto a higher-order factor of ‘adjustments’. Support was also found for the measurement models related to ‘evaluation’—which involved correlated first-order latent factors corresponding to performance monitoring and systems monitoring—and ‘management of team maintenance’—which included correlated first-order factors corresponding to integrative conflict management and psychological support. In addition, we found support for the reliability for measures derived from each of the subscales of the MATS. As a result of these two studies, a 70-item questionnaire—titled the Multidimensional Assessment of Teamwork in Sport (MATS)—was created with evidence supporting the content, substantive, and structural aspects of validity related to the measure.

The MATS provides a timely addition to the sport psychology literature, in light of recent calls to examine group-level variables beyond team cohesion, particularly those that examine team (behavioural) processes (e.g., Beauchamp, McEwan, & Waldhauser, 2017; Bruner, Eys, Beauchamp, & Côté, 2013; Collins & Durand-Bush, 2015). With a psychometrically robust measure of teamwork in sport, research on this potentially important group variable can develop. For example, in organizational settings, teamwork has been found to be critical in bolstering

outcomes such as improved group cohesion (LePine et al., 2008), collective efficacy (LePine et al., 2008), member satisfaction (Griffin, Patterson, & West, 2001), and team performance (McEwan, Ruissen, Eys, Zumbo, & Beauchamp, 2017). The logical next step is to examine the extent to which teamwork (via measures derived from the MATS) relates to, and influences, other important group-level and individual-level behavioural, affective, and/or cognitive variables (e.g., team cohesion, collective- and self-efficacy, team and individual performance) in the context of sport.

Although we recognize that the 70-item MATS is somewhat lengthy, the questionnaire provides a comprehensive measure of a complex construct that consists of 14 dimensions. This length is comparable to other instrument that measure multiple dimensions of a construct such as Chelladurai and Saleh's (1980) Leadership Scale for Sports which consists of 40 items measuring five dimensions of leadership behaviour, or Cattell's 16PF test which consists of 185 items measuring 16 dimensions of personality (Cattell & Cattell, 1995). Furthermore, rather than constructing separate questionnaires to assess the different phases or dimensions of teamwork, a strength of the MATS is that it can provide a comprehensive/complete *profile* of a team's level of teamwork (i.e., measuring performance-related behavioural processes that occur before, during, and after a team task, as well as assessing the management of team maintenance). Moreover, given the evidence supporting model-data fit for each of the five separate models that were tested in study 3, it is possible for researchers in future to delimit their examination of teamwork to certain components of teamwork such as a particular phase (e.g., the preparation phase vis-à-vis mission analysis, goal specification, and planning) or a specific dimension (e.g., the extent to which teammates resolve conflict with each other effectively). For instance, if investigators are only interested in the extent to which team members work well together *while*

playing their sport (i.e., coordination, cooperation, and communication), they could simply have teams complete the 14 items that correspond to this execution phase—scores of a team’s level of coordination, cooperation, and communication, as well as a general score of teamwork execution would be provided in this instance.

This measure may also be relevant to, and useful for, those involved in conducting interventions in sport (e.g., sport psychology consultants). Given the pervasive importance of maximizing team effectiveness in sport, it would seem worthwhile to examine if teamwork can be trained in sport settings, and if such training results in improved team performance. Previous applied sport psychology research utilized a ‘performance profiling’ approach whereby team members rated their team on an array of attributes, which resulted in a ‘team profile’ based on group means for each characteristic (e.g., Dale & Wrisberg, 1996). The characteristics that appeared to be low and in particular need of intervention were then targeted via open group discussions and team goal setting (Dale & Wrisberg, 1996). A similar approach could be similarly applied with the MATS, by having members complete this measure and then providing the team with a ‘teamwork profile’. This would provide feedback on how the team scored on the MTM and the four phases of RTP. From there, coaches, sport psychology consultants, and athletes on the team could target the key components of teamwork that they identify as having the greatest need for improvement, such as by utilizing some form of team goal setting (Eys, Patterson, Loughhead, & Carron, 2006). This applied work may also provide further evidence of validity, namely in terms of the consequential aspect of measures derived from the MATS (cf. Messick, 1995). That is, researchers could examine any (intended or unintended) implications of administering the questionnaire and using the ensuing teamwork scores as a basis for

action/intervention (i.e., can the MATS be used to help enhance teamwork as part of a teamwork training intervention?).

To our knowledge, the MATS is the first comprehensive instrument (in any team setting) that examines the 14 dimensions of teamwork that were outlined within Rousseau et al.'s (2008) framework (upon which McEwan and Beauchamp's model was based). Thus, there is potential for this questionnaire to be adapted and tested within other team settings (e.g., health care, education, business). For instance, a wide range of studies point to the particular importance of teamwork within health care settings (e.g., Chakraborti, Boonyasai, Wright, & Kern, 2008). However, a comprehensive assessment of all 14 dimensions of teamwork (cf. Rousseau et al., 2008) does not currently exist within the health field. Adapting the MATS to this context may provide a more complete assessment—beyond the instruments that are currently available—of how effectively medical team personnel work together. Research using adaptations of the MATS in other contexts such as this would also provide support for measurement generalizability (cf. Messick, 1995).

Despite the potential contributions of this research to the field of sport psychology, it is not without limitations. For one, it is worth noting that the Flesch Reading Ease score for the MATS is considered 'quite difficult' (cf. Flesch, 1948; Kincaid et al., 1975), and a minimum eighth grade reading level (aged 13+ years) is recommended. Although this indicates that the MATS could be used with teams from a wide range of ages, an amended version of the questionnaire would likely be required for researchers interested in examining teamwork with younger populations (i.e., children younger than 13 years of age).

In addition, drawing from recommendations by Clark and Watson (1995), we sought to recruit athletes from a range of team sports, competitive levels, sexes, and ages in study 3.

However, we recognize that there were some boundaries with our sample. For instance, although all teams were involved in competitive sport, at varying levels, we only had access to one professional team and two National-level teams. Hence, it may be worth testing the MATS with a greater number of teams competing at the highest levels of competition within their sport in order to ascertain the generalizability of measures derived from this instrument (cf. Messick, 1995). Furthermore, although we were able to include teams from 15 different sports, there were some team sports that were not included in our sample (e.g., bobsled, doubles tennis, gridiron football). Thus, it would be worthwhile to further examine the structural aspects of validity related to the MATS by sampling from a broader range of sports than was done in study 3. Indeed, it has been suggested that an instrument needs to be tested with a range of different samples across multiple studies as part of an *ongoing* process of construct validation (Flora & Flake, 2017).

In conclusion, the current research provides a potentially substantive and timely contribution to the field of sport psychology. Specifically, the availability of a conceptually and psychometrically sound instrument that measures teamwork will enable researchers to examine the extent to which teamwork (or certain phases or dimensions of this construct) relates to other salient psychosocial (e.g., cohesion, collective efficacy) and behavioural (e.g., team effectiveness) constructs in team sport settings. Moreover, the MATS will allow those concerned with intervention to assess any potential changes that might result from teamwork training in sport.

Endnotes

¹ Readers may note the absence of a third-order hierarchical (wherein items from the 12 RTP dimensions were specified to load onto their respective RTP dimensions, which then loaded onto one of the four RTP phases—preparation, execution, evaluation, or adjustments—which then loaded onto a general RTP factor) multilevel (athletes at level 1 and teams at level 2) measurement model. We did not do this for three main reasons. First, as previously noted, the ‘evaluation’ phase of teamwork was theorized to be comprised of two correlated dimensions (performance monitoring and systems monitoring); therefore, it is not mathematically possible to examine a *higher-order* factor of evaluation (a minimum of three dimensions would be required to do so; Brown, 2006). Thus, in order to examine a third-order model of RTP, these two dimensions would either have to (a) be specified to load directly onto the general factor of RTP, or (b) load onto one of the other phases (i.e., preparation, execution, or adjustments), which would then load onto the higher-order RTP factor. Neither of these alternatives would accurately reflect the a priori conceptual model of teamwork (cf. McEwan & Beauchamp, 2014). Second, from a theoretical perspective, the a priori framework provided by McEwan and Beauchamp (2014) conceptualized the RTP component of teamwork as consisting of four *distinct phases that take place separately over time*. Thus, it would not make sense to have a single measurement model that collates measures of these different phases that have distinct time/context referents. Third, such a model would likely suffer from problems with convergence given the considerable number of parameters that would need to be estimated in such a complex third-order, multidimensional, multilevel model (i.e., within and between parameter estimates across 60 items and 16 factors). In summary, it would not have been possible to carry out a third-order multilevel CFA that accurately reflects the underpinning conceptual model.

Chapter 4: Correlates of Teamwork in Sport: A Brief Report

The ability of team members to work well together has been identified as a significant contributor to team effectiveness across a range of group contexts, such as business, health care, military, and academic settings (LePine et al., 2008; Mathieu, Maynard, Rapp, & Gilson, 2008). Specifically, teamwork has been shown to be associated with various group-level constructs, including team cohesion (i.e., the extent to which team members are united around their group objectives), collective efficacy (i.e., the confidence a team has in its collective abilities to perform team tasks), and team performance (LePine et al., 2008). In addition to these group-level variables, teamwork has also been found to be associated with various individual-level constructs such as commitment to one's team (Rafferty, Ball, & Aiken, 2001), enjoyment/satisfaction of one's job/role within a team (LePine et al., 2008; Rafferty et al., 2001), and member performance (Stevens & Campion, 1999).

Despite the above-noted evidence concerning teamwork in different contexts, research on this construct within sport settings has been limited. In an attempt to stimulate research on teamwork in sport, McEwan and Beauchamp (2014) conducted a theoretical and integrative review that drew from two key team psychology frameworks within the organizational psychology literature as well as the limited extant research conducted to date on teamwork in sport (see chapter 2). This resulted in the provision of a theoretical framework/model as well as a definition of teamwork in sport. Briefly, teamwork in sport has been conceptualized as a collaborative effort by team members to carry out the independent and interdependent behaviours that are required in order to maximize a team's likelihood of achieving its purposes (McEwan & Beauchamp, 2014). There are five overarching aspects of teamwork—*preparation, execution, evaluation, adjustments*, and the *management of team maintenance (MTM)*—which are comprised of 14 behavioural dimensions. Preparation involves behaviours that occur in

advance of a team task, which includes specifying a team's mission/reasons for being together, team goals, and action plans. Execution involves behaviours that are enacted during a team task, including communication, cooperation, and coordination. Evaluation and adjustments occur after a team task. Evaluation involves monitoring team performance and various conditions affecting performance. Adjustments (which are enacted in response to the evaluation behaviours) involves problem solving how team performance can be improved, implementing innovative strategies to enhance team functioning, coaching/providing performance-related verbal feedback to teammates, and backing up/helping teammates improve. Finally, MTM involves behaviours associated with keeping the team together and ensuring that personal and/or interpersonal issues do not preclude a team from functioning effectively; this includes managing conflict between members and providing psychological/interpersonal support to one another.

Building on this foundational base, McEwan et al. (chapter 3) developed a conceptually- and psychometrically-sound measure of this construct, titled the *Multidimensional Assessment of Teamwork in Sport (MATS)*. This questionnaire measures the 14 aforementioned dimensions of teamwork and can also be used to derive scores on each of the five overarching aspects.

Although preliminary evidence indicates that the MATS displays sound reliability and factorial validity, it remains to be ascertained whether (and the degree to which) teamwork is associated with other salient variables in sport. This research is critical from a construct validation perspective, as it tests the *external* aspects of validity (cf. Messick, 1995). Specifically, the theoretical framework of teamwork in sport provided by McEwan and Beauchamp (2014) suggests that teamwork is related to various emergent states (e.g., team cohesion), as well as group- (e.g., team performance) and individual-level (e.g., team member enjoyment) outcomes. As such, the purpose of this study was to examine the extent to which teamwork correlates with

other important constructs in sport, including team cohesion, collective efficacy, satisfaction with one's team and individual performance, commitment to one's team, and enjoyment in one's sport. We hypothesized that there would generally be significant, positive correlations between teamwork and the aforementioned external variables. Such relationships have been shown in other team contexts (e.g., LePine et al., 2008, Rafferty et al., 2001, Stevens & Campion, 1999) and, thus, we anticipated that these results would extend to sport settings. In the absence of any compelling theoretical or evidence-based explanations in relation to which specific aspects of teamwork would be most strongly (or weakly) correlated with the aforementioned external variables (cf. Messick, 1995), we did not present any a priori hypotheses in this regard, but examined these relationships as exploratory research questions.

Methods

Participants

This study was conducted as part of a larger study examining the psychometric properties of the MATS (see chapter 3). The sample for the current study consisted of 195 athletes (85% males) from 19 Canadian sports teams, who had participated in study 3. Five teams were adult-aged, while 14 were adolescent (mean age = 17.3, range = 13 – 73). These teams competed in a range of sports, including hockey (five), baseball (five), curling (three), water polo (two), volleyball (one), rugby (one), lacrosse (one), and soccer (one). The majority of teams were elite 'rep' teams competing against other local teams in the lower mainland of British Columbia (16 teams), while two teams competed at the provincial level, and one competed in University sport.

Materials and Procedure

Time 1. At the first session of the study, participants completed the *Multidimensional Assessment of Teamwork in Sport (MATS)*. The MATS is a 70-item questionnaire that examines

14 dimensions of teamwork. Each item is scored on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). Evidence of good model-data fit has been shown for five measurement models corresponding to the preparation, execution, evaluation, adjustments, and management of team maintenance (MTM) aspects of teamwork (see chapter 3). The preparation subscale consists of the ‘mission analysis’ (5 items), ‘goal specification’ (6 items), and ‘planning’ (7 items) dimensions. The execution subscale consists of the ‘coordination’ (4 items), ‘cooperation’ (5 items), and ‘communication’ (5 items) dimensions. The evaluation subscale consists of the ‘performance monitoring’ (6 items) and ‘systems monitoring’ (4 items) dimensions. The adjustments subscale consists of the ‘problem solving’ (5 items), ‘innovation’ (4 items), ‘intrateam coaching’ (4 items), and ‘backing up’ (5 items) dimensions. Finally, the MTM subscale consists of the ‘integrative conflict management’ (5 items) and ‘psychological support’ (5 items) dimensions. Support for the reliability of measures derived from each subscale was found in chapter 3. In the current study, ordinal composite reliabilities (Zumbo et al., 2007) ranged from .91 (systems monitoring) to .96 (psychological support). Participants’ perceived level of teamwork was assessed by calculating their mean observed scores (from 1 to 7) on each of the dimensions within each respective subscale (e.g., a score for preparation was provided by calculating participants’ mean coordination, cooperation, and communication scores). Higher observed scores reflect higher perceived levels of teamwork.

Time 2. Approximately four to six weeks after the time 1 assessments (contingent upon the team’s schedule and availability), participants took part in a second session where they completed measures of team cohesion, collective efficacy, satisfaction with team and individual performance, enjoyment in one’s sport, and commitment to one’s team (36 total items). Ordinal composite reliability scores (Zumbo et al., 2007) were calculated for measures of enjoyment,

commitment, and satisfaction with performance, as the scales from these questionnaires entail ordinal data. Coefficient alpha scores (Cronbach, 1951) were calculated for measures of cohesion and collective efficacy, as the scales for these measures more closely reflect continuous data.

To examine cohesion, adult participants (aged 18≤) completed the 18-item *Group Environment Questionnaire* (GEQ; Carron, Widmeyer, & Brawley, 1985), while adolescent participants completed the 18-item *Youth Sport Environment Questionnaire* (YSEQ; Eys, Lougheed, Bray, & Carron, 2009). Measures of task cohesion (the extent to which team members are united around their team's *instrumental* objectives) as well as social cohesion (the extent to which team members are united around the group's *social* activities/relationships) are provided (Carron et al., 1985; Eys et al., 2009). In both questionnaires, items are scored on a 9-point scale, from 1 (strongly disagree) to 9 (strongly agree); hence, higher scores on the two measures indicate greater perceptions of task and social cohesion. Support has been shown for the validity and reliability of data derived from both the GEQ (Carron et al., 1985) and the YSEQ (Eys et al., 2009; Eys et al., 2013). In the current study, coefficient alpha was .81 for social cohesion and .87 for task cohesion for measures of the GEQ. For the YSEQ, coefficient alpha was .95 for task cohesion and .92 for social cohesion.

The *Collective Efficacy Questionnaire for Sports* (Short, Sullivan, & Feltz, 2005) was used to measure collective efficacy. Specifically, the 4-item *Ability* subscale of this questionnaire examines participants' confidence in their team's collective ability to outperform opposing teams. Items are scored on a 10-point scale from 1 (not at all confident) to 10 (extremely confident); thus, higher scores indicate higher levels of collective efficacy. Previous studies have found support for the reliability and validity related to data derived from this instrument (Short et al., 2005). Coefficient alpha was .97 in the current study.

The *Athlete Satisfaction Questionnaire* (Reimer & Chelladurai, 1998) was used to measure participants' satisfaction with performance. At the team level, satisfaction was assessed with the 3-item *Team Performance* subscale of this instrument. At the individual level, satisfaction was examined with the 3-item *Individual Performance* subscale. Items are scored using a 7-point scale from 1 (not at all satisfied) to 7 (extremely satisfied), with higher scores indicating greater satisfaction with performance. Support for the reliability and validity of measures derived from both subscales of this questionnaire have been shown (Reimer & Chelladurai, 1998). In the current study, ordinal composite reliability was .95 for satisfaction with team performance and .91 for satisfaction with individual performance.

The *Sport Commitment Model* (Scanlan, Carpenter, Schmidt, Simons, & Keeler, 1993) was used to measure participants' ratings of enjoyment in their sport and commitment to their team. To assess enjoyment, the 4-item *Sport Enjoyment* subscale was administered. Items from this instrument are scored on a 5-point scale from 1 (not at all) to 5 (very much). The 4-item *Sport Commitment* subscale was used to measure commitment. Three of the items from this instrument are measured on a 5-point scale from 1 (not at all) to 5 (very much), while one item is measured on a 5-point scale from 1 (nothing at all) to 5 (a lot of things). Higher scores on both subscales reflect higher levels of enjoyment and commitment. Evidence of reliability and validity of measures derived from both subscales of this instrument has been found (Scanlan et al., 1993). In the current study, ordinal composite reliability was .96 for enjoyment and .92 for commitment.

Results

Data were analyzed using *SPSS* software (Version 24; IBM SPSS Predictive Analytics, Chicago IL). Missing data was handled using listwise deletion. Bivariate correlations were calculated between the five aspects/subscales of teamwork and team cohesion, collective

efficacy, satisfaction with performance, enjoyment, and commitment (see Table 4.1). All of the correlations were significant ($p < .001$). Large effect sizes were evident for the correlations between teamwork and task cohesion ($r = .49 - .69$), collective efficacy ($r = .49 - .63$), and satisfaction with team performance ($r = .48 - .61$). Small-to-medium effect sizes were shown between teamwork and social cohesion ($r = .34 - .36$), satisfaction with individual performance ($r = .22 - .34$), commitment to one's team ($r = .20 - .37$), and individuals' enjoyment in their sport ($r = .20 - .32$).

Discussion

The purpose of this study was to examine correlates of teamwork in sport. We hypothesized that teamwork would be positively related to various group constructs—including team cohesion, collective efficacy, and satisfaction with team performance—and individual variables—including enjoyment within one's sport, commitment to one's team, and satisfaction with one's individual performance. Overall, the findings from this study supported this hypothesis and also corroborate previous findings on teamwork in other team contexts (e.g., LePine et al., 2008; Mathieu et al., 2008; Rafferty et al., 2001; Stevens & Campion, 1999). Thus, the extent to which sport team members work well together appears to correlate (to a large extent) with the degree to which they are: (a) united around the team's task purposes, (b) confident in their team's collective abilities to be successful in their sport, and (c) satisfied with their team's performance. Moreover, teamwork in sport appears to be weakly to moderately correlated with the extent to which team members: (a) are united around the social aspects of their team; (b) enjoy participating in their sport; (c) are committed to their team; and (d) are satisfied with their personal performance in their sport. In sum, the degree to which members of a team work well together not only correlates with other group-level variables in sport but also

Table 4.1. Descriptive statistics and intercorrelations for teamwork scores and sport outcomes related to team cohesion, collective efficacy, satisfaction with performance, player commitment, and player enjoyment.

Variable	M	SD	1a	1b	1c	1d	1e	2	3	4	5	6	7	8
1 Teamwork	5.14	1.08	.90*	.93*	.82*	.95*	.84*	.71*	.38*	.64*	.63*	.33*	.30*	.30*
1a Preparation	5.41	1.10	—	.82*	.72*	.76*	.65*	.64*	.34*	.63*	.56*	.34*	.37*	.32*
1b Execution	5.00	1.24		—	.70*	.84*	.72*	.67*	.36*	.60*	.57*	.22*	.20*	.22*
1c Evaluation	5.41	1.13			—	.78*	.55*	.49*	.34*	.49*	.48*	.29*	.22*	.20*
1d Adjustments	4.95	1.20				—	.81*	.68*	.35*	.56*	.61*	.30*	.25*	.27*
1e MTM	4.99	1.40					—	.69*	.35*	.54*	.59*	.33*	.30*	.31*
2 Task cohesion	6.54	1.73						—	.58*	.67*	.67*	.42*	.47*	.44*
3 Social cohesion	6.92	4.52							—	.46*	.41*	.31*	.30*	.24*
4 Collective efficacy	7.22	2.25								—	.71*	.35*	.32*	.38*
5 Team satisfaction	4.58	1.58									—	.33*	.24*	.28*
6 Individual satisfaction	5.39	1.06										—	.49*	.55*
7 Commitment	4.40	0.84											—	.18*
8 Enjoyment	4.46	0.88												—

Note: * $p < .001$. Scale ranges are 1-7 for teamwork, 1-9 for task and social cohesion, 1-10 for collective efficacy, 1-7 for satisfaction of individual performance and team performance, and 1-5 for commitment and enjoyment. The correlations between the five aspects of teamwork and the seven external variables are noted in bold.

with individual-level constructs, albeit to a lesser extent. These differences in effect sizes are perhaps unsurprising given that teamwork was conceptualized and measured as a group-level construct. That is, one might expect that teamwork would correlate with other group-level variables to a greater extent compared to individual-level variables.

Of additional note, the effect sizes in this study between teamwork and task cohesion were larger than those between teamwork and social cohesion. At this point, we can only speculate why this finding occurred since (a) our results were correlational and (b) previous research on cohesion in other team contexts appear to have used an amalgamated/omnibus measure of cohesion (e.g., LePine et al., 2008). However, it is reasonable to hypothesize that this finding emerged due to the fact that (according to McEwan & Beauchamp, 2014) teamwork reflects the extent to which team members work well together in order to *achieve the team's purposes*. Since the purposes of competitive sports teams (which were the types of teams in our sample) often focus on fulfilling *task* or *instrumental* objectives (e.g., performing well as a team, winning games or competitions), it is perhaps unsurprising that teamwork would tie more closely to the unity of a team around those instrumental purposes (i.e., task cohesion) as opposed to around its social objectives/interpersonal relationships (i.e., social cohesion).

Overall, these results provide further evidence of *construct validity* (cf. Messick, 1995) with regard to teamwork in sport. As previously mentioned, the *external* aspects of validity are concerned with the extent to which measures of a focal construct (in this case, teamwork) are related to measures of other theoretically relevant constructs (Messick, 1995). With the results of the current research in mind, future research on teamwork in sport should continue to examine other components of the team effectiveness model by McEwan and Beauchamp (2014). One avenue might include examining the impact of various 'input' variables on teamwork, such as

the composition of team members with regard to personalities, attitudes, competencies, and so forth (individual-level inputs), the effects of teamwork training (team-level inputs), and organizational/environmental factors (e.g., organizational funding, cultural influences). Moreover, it is theorized that teamwork has a reciprocal relationship with emergent states (e.g., team cohesion, collective efficacy) that occurs over time, such that changes in a team's level of teamwork influences those emergent states, which in turn have a further effect on teamwork, and so forth. Research testing this autocorrelation hypothesis would be valuable in order to further understand the effect that these constructs have on each other over the course of a team's time together. In addition, it is theorized (cf. Marks et al., 2001) that teamwork is impacted by various developmental processes and episodic cycles that teams go through over time (e.g., from one game to another). Research examining this aspect of the team effectiveness model (cf. McEwan & Beauchamp, 2014) would also help foster a greater understanding of teamwork in sport.

In spite of the insights provided by this study, several limitations are also worth noting. First, as with any correlational study, conclusions regarding causality cannot be made. Thus, although research in other settings has found that teamwork causally leads to other outcomes such as greater cohesion or higher levels of performance (e.g., Mathieu et al., 2008), it would be premature to make similar conclusions in sport based on this study. Moreover, since the teams in our sample came from an array of sports and age groups, we were unable to obtain any objective measures of performance, as performance indices vary across sports (e.g., legal body checks in ice-hockey versus base-hits in baseball) and age groups (e.g., legal body checks in ice-hockey would not be relevant to younger age groups where body checking is prohibited). Thus, a subjective measure of *satisfaction* with performance was utilized, which should not be considered synonymous with (team or individual) objective performance. In addition, our sample

was comprised of 85% males, and consisted of only one team who competed nationally and two teams who competed at the provincial level. Although the remaining teams were competitive in nature, they were in a relatively lower level of competition (that is, elite ‘rep’ teams competing against other teams in and around their geographical area). Although there does not appear to be any reason to hypothesize that the results obtained in this study would not be found with teams competing at the highest levels of competition, additional research is nonetheless required in order to test the generalizability of these findings. Finally, the observational design and relatively small sample size in this study prevented us from conducting any advanced analyses beyond correlations, such as mediational models (e.g., whether teamwork mediates/explains the relationships between other variables) or multilevel modelling (i.e., accounting for the nesting of athletes within teams in this data).

In summary, this study provides preliminary evidence that teamwork in sport is associated with a range of adaptive group- and individual-level variables in sport. Through this, further support for the validity—namely, the external aspect of validity—of measures derived from the MATS was provided. Future research should continue to examine other aspects of validity and—more broadly—examine how teamwork is affected by, and affects, other variables of team effectiveness within sport settings.

Chapter 5: The Effectiveness of Teamwork Training on Teamwork Behaviours and Team Performance: A Systematic Review and Meta-Analysis of Controlled Interventions

From road construction crews and professional soccer squads to political parties and special operations corps, teams have become a ubiquitous part of today's world. Bringing a group of highly-skilled individuals together is not sufficient for teams to be effective. Rather, team members need to be able to work well together in order for the team to successfully achieve its purposes (LePine et al., 2008; Rousseau et al., 2006). As a result, there has been a proliferation of research assessing whether, and how, teams can be improved through teamwork training. A wide range of studies have shown positive effects of teamwork interventions for improving team effectiveness across team contexts such as health care (e.g., Morey et al., 2002), military (e.g., Smith-Jentsch et al., 2008), aviation (e.g., Brannick, Prince, & Salas, 2005), and academia (e.g., Padmo Putri, 2013). Similarly, improvements in teamwork have been observed as a result of training with a variety of team types including new teams (e.g., Jankouskas, 2010), intact teams (e.g., McCulloch, Mishra, Handa, Dale, Hirst, & Catchpole, 2009), and those created for laboratory-based experiments (e.g., Bjornberg, 2014). In sum, the extant empirical evidence to date appears to suggest that teams can be improved via teamwork training.

What is Teamwork?

Within teams, members' behaviours can be categorized in terms of both *taskwork* and *teamwork* processes (Rousseau et al., 2006). Marks et al. (2001) differentiated between the two by suggesting that "taskwork represents *what* it is that teams are doing, whereas teamwork describes *how* they are doing it with each other" (p. 357). Specifically, while taskwork involves the execution of core technical competencies within a given domain, teamwork refers to the range of interactive and interdependent behavioural processes among team members that convert team inputs (e.g., member characteristics, organizational funding, team member composition)

into outcomes (e.g., team performance, team member satisfaction) (Marks et al., 2001; Rousseau et al., 2006). Some examples of teamwork (and respective comparisons to taskwork) include: the seamless communication between a surgeon, nurse, and anaesthesiologist, rather than the technical competencies of these practitioners; the synergy between a quarterback and receiver to complete a passing play, rather than their respective skill sets related to throwing or catching a football; the collaborative adjustments a flight crew makes in response to adverse weather or system problems, rather than each individual's aviation skills; and so forth. Research from an assortment of studies indicates that teamwork—the focus of the current paper—is positively related to important team effectiveness variables, including team performance, group cohesion, collective efficacy, and member satisfaction (LePine et al., 2008).

Teamwork has been conceptualized within several theoretical models. For example, in their review, Rousseau et al. (2006) reported that 29 frameworks related to teamwork have been published. Although there is much overlap across these models, there are also some notable differences. These relate to the number of dimensions of teamwork being conceptualized as well as the specific labelling of these dimensions. One thing that is generally agreed upon, however, is that teamwork is comprised of multiple observable and measurable *behaviours*. For instance, two highly cited frameworks by Marks et al. (2001) and Rousseau et al. (2006) consist of 10 and 14 dimensions of teamwork, respectively. In general, teamwork models focus on behaviours that function to (a) regulate a team's performance and/or (b) keep the team together. These two components coincide with the two respective processes that Kurt Lewin (1935), the widely recognized father of group dynamics, originally proposed all groups to be involved in: *locomotion* and *maintenance*.

With regard to regulating team performance (i.e., locomotion), teamwork behaviours include those that occur (a) before/in preparation for team task performance, (b) during the execution of team performance, and (c) after completing the team task (Rousseau et al., 2006). First, with regard to teamwork behaviours that occur *before/in preparation* for team task performance, these include the active process of defining the team's overall purpose/mission, setting team goals, and formulating action plans/strategies for how goals and broader purposes will be achieved. These behaviours help ensure that all team members are clear in terms of what is required of them in order for the team to function effectively. Second, teamwork behaviours that occur *during the execution* of team tasks include actions that correspond to members' communication, coordination, and cooperation with each other. At this stage, team members translate what they have previously planned (during the preparation phase) into action. Third, in terms of teamwork behaviours that occur *after completing* the team task (i.e., reflection), these include monitoring important situations and conducting post-task appraisals of the team's performance and system variables (e.g., internal team resources, broader environmental conditions), solving problems that are precluding team goal attainment, making innovative adjustments to the team's strategy, and providing/receiving verbal and behavioural assistance to/from teammates. Hence, team members determine whether their actions have moved them closer towards accomplishing the team goals and objectives, and whether any modifications are required in order to facilitate future success. In addition to these three dimensions concerned with the regulation of team performance, a fourth dimension of teamwork involves behaviours that function to keep the team together (i.e., maintenance). These behaviours focus on the team's *interpersonal dynamics*, and include the management of interpersonal conflict between members and the provision of social support for members experiencing personal difficulties. Managing

interpersonal dynamics is critical as it is theorized that teams cannot operate effectively when these issues are present (Rousseau et al., 2006).

How Can Teamwork Be Trained?

Teamwork interventions have utilized a number of training methods in order to target the regulation of team performance (i.e., preparation, execution, reflection) and management of team maintenance (i.e., interpersonal dynamics) dimensions. These intervention strategies generally fall under one of four categories (cf. McEwan, Waldhauser, Faulkner, & Beauchamp, under review). First, the most basic approach to training and developing teamwork involves providing didactic education to team members in a classroom-type setting, such as lecturing about the importance of providing social support within the team or promoting ways to manage interpersonal conflict among teammates. Some studies have found this type of training to be useful for enhancing team effectiveness (e.g., Cheater, Hearnshaw, Baker, & Keane, 2005). A second category of team training involves utilizing a more interactive workshop-style format, wherein team members take part in various group activities, such as having discussions about the team's purposes and goals (e.g., Aaron, McDowell, & Herdman, 2014) or working through case studies together (e.g. Ellis, Bell, Ployhart, Hollenbeck, & Ilgen, 2005). The third broad category of team training involves simulation training, wherein teams experientially enact various teamwork skills, such as interpersonal communication and coordination, in an environment that mimics upcoming team tasks (e.g., airline simulators or medical patient manikins). Although often used as a means of fostering taskwork competencies (e.g., teaching new surgeons how to perform the technical skills of a medical operation), simulation training has also been found to be an efficacious approach to teamwork intervention (e.g., Achille, Schulze, & Schmidt-Nielsen, 1995). In addition to these three training approaches that occur outside of the team task

environment (i.e., training within classroom and simulation settings), teamwork can also be fostered by incorporating team reviews in-situ (i.e., where the team actually performs its tasks), which allows teams to monitor/review their quality of teamwork on an ongoing basis. These team reviews involve some form of team briefs before (e.g., creating action plans), during (e.g., monitoring team members' actions), and/or after (e.g., assessing the team's performance) team task execution, and have also been shown to be efficacious in previous studies (e.g., Villado & Arthur, 2013).

The effectiveness of teamwork interventions can be determined with an assortment of criteria, including team- and individually-based behaviours, cognitions, and affective states. Hackman and Katz (2010) posit that team effectiveness can be determined by examining the extent to which the team has achieved its a priori objectives. Since the broad purpose of forming a team is to produce something of value, it is perhaps unsurprising that the most widely tested criterion of team effectiveness has been team performance (Argote & McGrath, 1993; Bommer, Johnson, Rich, Podsakoff, & MacKenzie, 1995; Mathieu et al., 2008). Thus, although teams come from an array of settings and are idiosyncratic in their own ways, one question that essentially all teams address at some point during their tenure is whether they are performing well. For example, is that road construction crew fixing potholes adequately? Does the local soccer squad have a respectable winning percentage? Has an elected political party successfully completed the tasks for which they campaigned? Did a special operations corps achieve the mission it set out to accomplish? When taken in concert, questions related to team performance are often of central interest when characterizing a team's effectiveness.

In addition to assessing the outcome variable of team performance, researchers have also been interested in whether teamwork training actually improves teamwork itself. The efficacy of

these interventions can be determined with a number of objective (e.g., products produced by an industry team), self-report (e.g., questionnaires regarding perceived social support amongst team members), and third-party assessments (e.g., expert ratings of team behaviours). Both general/omnibus measures of teamwork (e.g., O’Leary, Haviley, Slade, Shah, Lee, & Williams, 2010) as well as those assessing specific dimensions of teamwork (e.g., communication—Marshall, Harrison, & Flanagan, 2009) have been operationalized to examine the effectiveness of these interventions. For example, do team goal setting activities actually result in members creating and pursuing effective team goals? Does simulation training improve the requisite coordination processes among aviation cockpit crews? Has a didactic lecture contributed to improved conflict management among team members? Answering these types of questions is important for determining whether an intervention is actually efficacious in changing the variable that is targeted for improvement (i.e., teamwork behaviours).

The Current Review

Prior to outlining the purposes of this systematic review, it is important to recognize that previous quantitative reviews have been conducted that addressed—to some degree—teamwork training. In preparation for this systematic review, we conducted a scoping review which revealed that eight previous meta-analyses have assessed teamwork intervention studies in some way (McEwan et al., under review). For example, some reviews included studies that were only conducted with certain team types (e.g., intact teams—Salas, Nichols, & Driskell, 2007) or within a particular context (e.g., sports—Martin et al., 2009; medical teams—O’Dea, O’Connor, & Keogh, 2014). Others were delimited to specific training programs/strategies that were restricted to a narrow range of teamwork strategies (e.g., O’Dea et al., 2014; Klein, DiazGranados, Salas, Le, Burke, Lyons, & Goodwin, 2009; Kleingeld et al., 2011; Salas et al.,

2007; Tannenbaum & Cerasoli, 2012). Finally, studies that used a combination of teamwork *and* taskwork intervention components have been systematically reviewed (Salas et al., 2008); however, these types of interventions result in a limited ability to determine the extent to which the resulting effects were due to teamwork training versus taskwork training.

It should also be noted that all but one (Salas et al., 2007) of these previous reviews pooled together studies that included a control condition (i.e., wherein teams do not receive any type of teamwork training) and those that did not (as mentioned above, that study only analyzed the effects of certain teamwork strategies). This is an important consideration, as it has been suggested that controlled and uncontrolled studies should not be combined into the same meta-analysis due to differences in study quality (which is a major source of heterogeneity) and since stronger conclusions can be derived from controlled interventions compared to uncontrolled interventions (e.g., Higgins & Green, 2008). Therefore, while previous systematic reviews have provided valuable contributions to the teamwork literature, a systematic review that assesses the effects of controlled teamwork interventions across a range of contexts, team types, and involving those that targeted diverse dimensions of teamwork appears warranted. In doing so, a more comprehensive assessment of the efficacy of these teamwork interventions is provided, while also having the capacity to look at the potential moderating effects of various sample, intervention, and measurement characteristics. Moreover, by including only controlled studies, one is able to make stronger conclusions regarding the observed effects.

The overall purpose of this study was to better understand the utility of teamwork training for enhancing team effectiveness. Specifically, a meta-analysis was conducted on controlled studies (i.e., comparing teams who have received teamwork training to those who have not) that have examined the effects of teamwork interventions on teamwork and/or team performance. To

better disentangle the effectiveness of these studies, we also sought to assess potential moderators of these main effects; that is, to determine whether there are certain conditions under which the independent variable of teamwork training more strongly (or weakly) causally influences the dependent variables of teamwork behaviours or team performance (Wu & Zumbo, 2008). The specific moderators that were assessed included: (a) the team context/field of study, (b) the type of teams that were trained, (c) the primary type of intervention method employed, (d) the dimensions of teamwork that were targeted in the intervention, (e) the number of dimensions targeted, (f) the types of measures used to quantify the training effects, and (g) in studies where teamwork was assessed as an outcome variable, the dimensions of teamwork that were measured. It was hypothesized that teamwork training would have a positive and significant effect on both teamwork and team performance and that these effects would be evident across a range of the aforementioned sample, intervention, and measurement characteristics/conditions.

Methods

Literature Search

Searches for potential articles were conducted in the following databases: *PsycInfo*, *Medline*, *Cochrane Central Register of Controlled Trials*, *SportDiscus*, and *ProQuest Dissertations and Theses*. Hand searches were also conducted across thirteen journals that typically publish articles on group dynamics (e.g., *Group Dynamics: Theory, Research, and Practice*; *Small Group Research*, *Journal of Applied Psychology*; *Personnel Psychology*, *Human Factors*; *Academy of Management Journal*, *Journal of Sport & Exercise Psychology*). In each database and journal search, the following combination of search terms were used: (*team* OR *interprofessional* OR *interdisciplinary*) AND (*intervention* OR *training* OR *building* OR *simulation*) AND (*teamwork* OR *mission analysis* OR *goal specification* OR *goal setting* OR

planning OR strategy OR coordination OR cooperation OR communication OR information exchange OR information sharing OR monitoring OR problem solving OR backing up OR coaching OR innovation OR adaptability OR feedback OR support OR conflict management OR situation awareness OR confidence building OR affect management). An additional search was conducted within these databases and journals using the search terms (*TeamSTEPPS OR Crew Resource Management OR SBAR* [Situation-Background-Assessment-Recommendation]), as several articles in the initial search used these specific training programs. We also searched the reference sections of the articles from past teamwork training review papers as well as from articles that initially met inclusion criteria to determine if any additional articles could be retrieved. The searches were conducted in September 2015 and no time limits were placed on the search strategy. Each article was first subjected to title elimination, then abstract elimination, and finally full-text elimination.

Eligibility Criteria

To be included in the meta-analysis, a study needed to have examined the effects of teamwork training by comparing the teamwork or team performance of teams in an experimental condition (i.e., those who received teamwork training) with those in a control condition (i.e., where teams did not receive teamwork training). Cross-sectional/non-experimental studies were excluded, as were intervention studies that did not include a control condition. As this review was only concerned with teamwork interventions, studies that focused on training taskwork—whether independent of, or in addition to, a teamwork intervention—were excluded. For example, as previously mentioned, simulation-based training (SBT) has been used as a means of training individuals to perform technical skills and also to enhance teamwork. In order for a SBT intervention to be included in this meta-analysis, it had to be clear that only teamwork (not

technical skills) was being targeted during training. In order to address the primary research question, the study had to provide data on at least one teamwork dimension and/or team performance. The study also needed to provide sufficient statistics to compute an effect size. In cases of insufficient data, corresponding authors were contacted for this information. The articles were delimited to those published in the English language.

Data Analysis

Articles that met the aforementioned eligibility criteria were extracted for effect sizes and coded independently with respect to seven moderators by the first author as well as trained second coder from our *Psychology of Exercise, Health, & Physical Activity (PEHPA)* laboratory. Interrater reliability for the coding of these moderators was over 90%, κ (SE) = 0.80 (0.01). The moderators examined were based on a scoping review conducted in advance of this meta-analysis (McEwan et al., under review) and included (1) the context within which an intervention was conducted (*health care, aviation, military, academia, industry, or laboratory experiment*), (2) the type of team targeted (*intact or new*), (3) the primary training method applied to conduct the intervention (*didactic education, workshop, simulation, or team reviews*), (4) the dimension(s) of teamwork (*preparation, execution, reflection, and/or interpersonal dynamics*) targeted in the intervention as well as (5) the number of dimensions targeted (between one and four), (6) the type of measure used to derive effect sizes (*self-report, third party, or objective measures*), and—when teamwork was assessed as the criterion variable—(7) the specific dimension(s) of teamwork that were measured (*general, preparation, execution, reflection, and interpersonal dynamics*).

Once coded, data were entered into the software *Comprehensive Meta-Analysis, Version 2* (Borenstein, Hedges, Higgins, & Rothstein, 2005) and analyzed as a random-effects model

(DerSimonian and Laird approach). This type of model assumes that there is heterogeneity in the effect sizes across the included studies and is the appropriate model to use in social science research, as opposed to a fixed-effects model (which assumes that effect sizes do not vary from study to study) (Borenstein, Hedges, Higgins, & Rothstein, 2009; Field & Gillett, 2010). Where possible, effect sizes for each study were derived from means, standard deviations, and sample sizes at baseline and post-intervention (Borenstein et al., 2009; DeCoster & Claypool, 2004). If these statistics were not fully provided, they were supplemented with *F*-statistics, *t* scores, correlations, and *p*-values to compute the effect size. Each study was given a relative weight based on its precision, which is determined by the study's sample size, standard error, and confidence interval (i.e., the more precise the data, the larger the relative study weight) (Borenstein et al., 2009).

In instances where a study provided data to calculate multiple effect sizes (such as when several measures of the criterion variable—teamwork or team performance—were examined), these effects were combined into one overall effect size statistic (i.e., a weighted average) for that study. This was done to ensure that those studies that had multiple measures of teamwork or team performance were not given greater weight compared to studies that only provided one effect size (i.e., only had one measure of performance or teamwork), which could potentially skew the overall results (Borenstein et al., 2009). The exception to this occurred when articles reported the effects of more than one intervention (i.e., had multiple experimental conditions), each of which had a unique teamwork training protocol. In these cases, an effect size from each intervention was computed. Thus, these articles would contribute multiple effect sizes to the total number of comparisons within the meta-analysis. To correct for potential unit-of-analysis errors in these particular articles, the sample size of the control condition was divided by the number of

within-study comparisons (cf. Higgins & Green, 2008). For example, if three different types of teamwork interventions were compared to one control condition (e.g., which had a sample size of 30 participants), the n of the control condition was divided by 3 (i.e., $30/3 = 10$) when calculating the effect sizes of those interventions. Cohen's d was used as the effect size metric to represent the standardized effect (i.e., the average magnitude of effectiveness) of teamwork interventions on teamwork and team performance (Cohen, 1992). Standard errors and 95% confidence intervals were computed to test for the accuracy of the standardized effects obtained.

To reduce heterogeneity and improve the interpretability of the results, studies were pooled into those that measured teamwork as its criterion variable and those that measured team performance. Pooling studies in this manner not only reduces heterogeneity but also allowed us to identify the extent to which teamwork interventions impact team performance and, separately, the extent to which they affect teamwork processes. Heterogeneity within the meta-analysis was also assessed by computing a Q value—which estimates the variability in the observed effect sizes across studies—and an I^2 statistic—which estimates the ratio of the true heterogeneity to the total observed variation across studies. High Q and I^2 statistics can be problematic for interpreting the results of a meta-analysis and can also indicate that outlier studies are included. Outliers were, therefore, identified and excluded from subsequent moderator analyses in two ways. First, sensitivity analyses were carried out by removing a single intervention from the meta-analysis and noting the resulting effect size—this estimates the impact that each individual intervention has on the overall effect size of teamwork or team performance. If the resulting effect size with an intervention removed (i.e., $K - 1$) is substantially different than the effect size with that intervention present, this may suggest that it is an outlier and needs to be removed (Borenstein et al., 2009). Second, we noted any studies that had abnormally high effect sizes and

standardized residuals (above 3.0), especially when these values were accompanied by narrow confidence intervals. If heterogeneity (Q and I^2) is substantially reduced upon removal of a study, this further confirms that the study is an outlier and should be omitted from subsequent subgroup/moderator analyses.

Once the two pools of studies were produced, bias within each pool was assessed. First, publication bias was examined by calculating a fail-safe N statistic, which estimates the number of unpublished studies with null findings that would have to exist to reduce the obtained effect size to zero (Rosenthal, 1979). If this number is sufficiently large—Rosenberg (2005) recommends a critical value of $5N+10$ —then the probability of such a number of studies existing is considered to be low. For example, if 20 studies were included in a meta-analysis, then the resulting fail-safe N should be larger than 110 (i.e., $5*20 + 10$); if this value was not larger than 110, then publication bias is likely within this pool of studies. We also obtained two funnel plots (one for studies where teamwork was the outcome variable and one for team performance as the outcome) to provide a visual depiction of potential publication bias. An Egger's test was also conducted to measure the symmetry of these two funnel plots (Borenstein et al., 2009). If the test statistic is significant ($p < 0.05$), this denotes that the distribution around the effect size is asymmetric and publication bias is likely present (Borenstein et al., 2009).

Results

Literature Search

The literature search from the five databases returned 22,066 articles, while the hand searches of the 13 journals returned 3797 articles, vetting of studies from previous team training reviews returned 191 articles, and the ancestry search of reference lists returned 471 articles (see Figure 5.1). After removing duplicates, 16,849 articles were subject to title and abstract

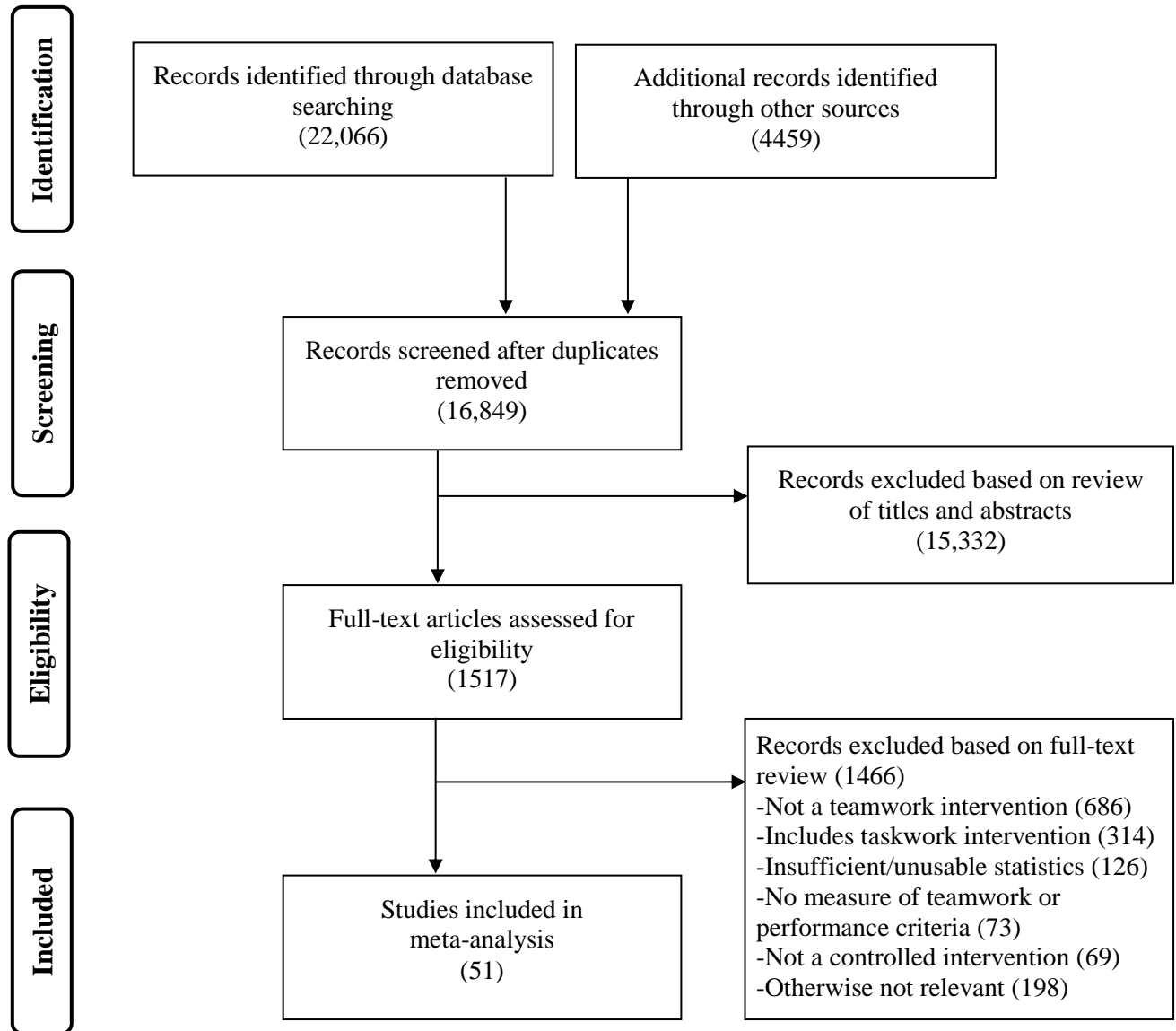


Figure 5.1. Results of literature search (PRISMA Flow Diagram)

screening, where they were dichotomously coded as ‘potentially relevant’ or ‘clearly not relevant’. 1517 potentially relevant articles were then full-text reviewed and coded as meeting eligibility criteria or as ineligible for the following reasons: (1) not a teamwork intervention; (2) teamwork-plus-taskwork intervention; (3) insufficient statistics to compute an effect size; (4) not including a measure of teamwork or team performance; (5) not including a control group; or (6) otherwise not relevant. As a result of this eligibility coding, 51 articles were included in the meta-analysis (see citations marked with an asterisk within the References section for a list of the studies included). 13 of these studies reported results on two or more interventions, bringing the total number of comparisons (k) to 72 with 8439 participants (4966 experimental, 3473 control). See Table 5.1 for descriptions of each study with regard to study context, type of team and participants, targeted teamwork dimensions of the intervention, number of effect sizes, the criteria measured, and an overview of the intervention.

Summary Statistics

Results of the overall effect of teamwork interventions on teamwork processes along with summary statistics, sensitivity analyses (i.e., the final column marked ‘ES with study removed’), and forest plots for this pool of studies are presented in Table 5.2. This pool included a total of 39 interventions from 33 studies. The results revealed that teamwork interventions had a significant, medium-to-large effect on teamwork, $d (SE) = 0.683 (0.13)$, 95% CI = 0.43 – 0.94, $Z = 5.23$, $p < 0.001$; $Q (df) = 660.7 (38)$, $I^2 = 94.2$. The fail-safe N was 3598, which is sufficiently large, as it exceeds the critical value of 205 ($5 \times 39 + 10$). The funnel plot for this pool of studies is presented in Figure 5.2. Egger’s value for this funnel plot was not significant ($B = 0.364$, $SE = 1.30$, 95% CI = -2.26 – 2.99, $t = 0.28$, $p = 0.78$), which also suggests that bias was not present. Two studies were identified as outliers within this pool of studies: Morey et al. (2002) and

Table 5.1. Summaries of controlled interventions included in meta-analysis.

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
HEALTH CARE				
Chang 2008	New: medical students, office staff without clinical experience, and junior surgical residents forming 24 teams (12 intervention, 12 control); 2 members per team	Reflection (feedback)	5: performance	<u>Experimental</u> : Teams received verbal feedback from experienced instructor on team task performance. <u>Control</u> : Teams received little or no verbal feedback on team task performance.
Cheater 2005	Intact: 22 teams within five hospitals (11 intervention teams, 77 members; 11 control teams, 64 members)	General teamwork intervention	1: general execution	<u>Experimental</u> : Seven staff members from the five hospitals first took part in a two-day facilitation workshop focused on their roles as facilitator, values clarification and individual learning styles, team building and group working skills, dealing with conflict, project management, and an introduction to the intervention programme. The programme consisted of five 1.5-to-2-hour meetings over the following six months. <u>Control</u> : No training.
Clay-Williams 2013	Intact: doctors, nurses, and midwives from five hospitals assigned to classroom-only intervention (12 participants), simulation-only intervention (12 participants), classroom-plus-simulation intervention (16 participants), or control condition (19 participants); ~4 members per team)	General teamwork intervention	3: general teamwork	<u>Classroom-only</u> : <i>Crew Resource Management (CRM)</i> training in one-day course involving facilitated discussion, case studies, video vignettes, role-plays, and practice of teamwork. <u>Simulation-only</u> : <i>CRM</i> -style one-day training, addressing the same competencies as classroom-only training by participating in and observing scenarios in the patient simulation facility. <u>Classroom-plus-simulation</u> : included both classroom and simulation training described above, two weeks apart <u>Control</u> : No classroom or simulation training.
Deneckere 2013	Intact: orthopedic surgeons, pneumologists, head nurses, nurses, physiotherapists, and social workers from 30 hospitals (17 intervention, 346 members; 13 control, 235 members); ~20	Preparation (vision), execution (coordination, communication), reflection (feedback, innovation), interpersonal dynamics (conflict management)	3: coordination, innovation, conflict management	<u>Experimental</u> : Workshop training in care pathways development. <u>Control</u> : No training.

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	members per intervention team			
Emmert 2011	New: health profession students (24 intervention participants; 22 control participants)	General teamwork intervention	3: general teamwork	<u>Experimental</u> : Three-hour course on applying teamwork skills to the geriatric population. <u>Control</u> : Three-hour attention control course that was unrelated to teamwork.
Jankouskas 2010	New: nursing and medical students (12 intervention participants, 12 control participants); 4 members per team	Preparation (goal setting, plan), execution (communication, coordination), reflection (situation awareness, performance monitoring, backing up, problem solving)	7: performance (4), communication, situation monitoring, general teamwork	<u>Experimental</u> : <i>Crew Resource Management (CRM)</i> program: didactic presentation of team processes, videotaped scenario practice using human patient simulator, and instructor-led group reflection of simulation. Training sessions lasted 3 hours. <u>Control</u> : Participants received a review of basic life support skills.
Kim 2014	Intact: nurses and physicians from two healthcare organizations (1 intervention, 25 members; 1 control, 36 members)	Preparation (mission analysis, goal setting, planning), execution (cooperation, communication), reflection (feedback, performance monitoring, situational awareness, problem solving, backing up), interpersonal dynamics (conflict management)	4: communication (2), general teamwork (2)	<u>Experimental</u> : <i>TeamSTEPPS</i> program consisted of one 1.5-hour education session; one 10-minute simulation, based on class concepts with a 20-minute debriefing session; and a 2-hour CD consisting of modules and video vignettes. <u>Control</u> : No training.
Marshall 2009	New: medical students in 17 teams (8 intervention, 83 members; 9 control, 85 members)	Preparation (planning), execution (communication, coordination), reflection (problem solving, intrateam coaching, feedback)	1: communication	<u>Experimental</u> : <i>ISBAR (Identify, Situation, Background, Assessment, Recommendation)</i> program consisted of 40-minute, small-group teaching session consisting of group discussions on the importance of communication, critique of videos showing suboptimal communication, introduction of <i>ISBAR</i> tool, video of <i>ISBAR</i> in use, and paper-based scenarios and role plays of students practising the use of the tool. <u>Control</u> : No training.
Morey 2002	Intact: emergency department physicians, nurses, and technicians from nine hospitals (6 intervention hospitals [3 military, 3 civilian], 684 members; 3 control hospitals)	Preparation (planning), execution (communication, cooperation, coordination), reflection (problem solving, situational awareness),	2: Performance, general teamwork	<u>Experimental</u> : Eight-hour workshops consisting of approximately 16 participants per session. Included videos of good and poor teamwork, practical team exercises for participants to practice teamwork (e.g., task prioritization,

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	[1 military, 2 civilian], 374 members); ~114 members per intervention team	interpersonal dynamics (conflict management)		case review from a teamwork perspective), and analysis/discussion of clinical vignettes conveying good and poor teamwork. <u>Control</u> : Delayed/waitlist control—participants received training after experimental period.
O’Leary 2011	Intact: two hospitals (1 intervention, 81 members; 1 control, 66 members)	Preparation (planning), execution (communication)	1: general teamwork	<u>Experimental</u> : <i>Structured Interdisciplinary Rounds (SIDR)</i> with regular interdisciplinary meetings included daily goals of care forms. Meetings occurred each weekday for 30-40 minutes. <u>Control</u> : No training.
Shapiro 2004	Intact: emergency department personnel comprising four teams (2 intervention teams, 8 participants; 2 control teams, 8 participants)	Execution (communication, cooperation, coordination), reflection (feedback)	1: general teamwork	<u>Experimental</u> : One-day session consisted of an overview of crew resource management followed by three simulations of patient care (approximately 30 minutes each). Debriefs followed each simulation. <u>Control</u> : No training.
Thomas 2007	New: medical interns in pediatrics, internal medicine & pediatrics, family medicine, and obstetrics and gynecology (17 intervention participants; 15 control participants)	Preparation (planning), execution (communication, cooperation), reflection (performance monitoring, situational awareness)	1: general teamwork	<u>Experimental</u> : Participants received Neonatal Resuscitation Program and 2.5-hour team training program included lectures, role-play simulations, video clips, and question & answer period designed to illustrate effective teamwork behaviors. <u>Control</u> : Participants received usual Neonatal Resuscitation Program with no team training.
Weaver 2010	Intact: surgeons, nurse anesthetists, nurses, surgical technicians, anesthesiologists, and physician assistants from two hospitals (1 intervention, 29 members; 1 control, 26 members)	Preparation (mission analysis, goal setting, planning), execution (cooperation, communication), reflection (feedback, performance monitoring, situational awareness, problem solving, backing up), interpersonal dynamics (conflict management)	6: general preparation, planning, communication (2), situation monitoring, social support	<u>Experimental</u> : <i>TeamSTEPPS</i> program consisted of four-hour training session, including role-playing activities. <u>Control</u> : No training.
Weller 2014	Intact: 40 anesthetists from two hospitals, working with a nurse and anesthetic technician (i.e., 3 members per team) completed two	Preparation (planning), execution (communication), reflection (problem solving, situational awareness)	2: communication, general teamwork	<u>Experimental</u> : Anesthetists viewed a video demonstrating the use of an acronym within a simulation designed to improve team communication.

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	crisis interventions (one under experimental condition and one under control condition)			<u>Control</u> : Anesthetists viewed an attention control video (discussing a separate, irrelevant acronym).
LABORATORY EXPERIMENT				
Bjornberg 2014	New: undergraduate students comprising 47 virtual teams (80 experimental participants, 80 control participants); 3-4 members per team	Reflection (mutual performance monitoring)	6: performance (4), performance monitoring (2)	<u>Experimental</u> : 120-minute experimental session, included training on effective mutual team member performance monitoring. <u>Control</u> : Completed same 120-minute experimental session but did not receive training on performance monitoring.
Brown 2003	New: undergraduate business students comprising 42 teams (21 experimental teams, 92 members; 21 control teams, 92 members); ~4 members per team	Execution (communication), reflection (problem solving, intrateam coaching)	1: performance	<u>Experimental</u> : 75-minute training session consisting of a discussion of the importance of teams and teamwork in organizations, and the impact of self and others-statements on team performance. Participants were then trained to change dysfunctional/negative statements to functional/ positive ones that guide behavior. A 30-minute follow-up session reviewing principles of the training session occurred five weeks later. <u>Control</u> : 75-minute session wherein participants had a general discussion of the importance of teams and teamwork
Dibble 2010	New: undergraduate/graduate business students assigned to external adjustment intervention, placebo training, or no training control condition; ~5-6 members per team	Reflection (systems monitoring, problem solving, innovation)	2: performance, general reflection	<u>Experimental</u> : Discussion of various types of external challenges teams might possibly encounter in the experimental team task, a range of adjustment strategies that could be utilized, examples of each type of adjustment strategy, a review of the risks of over- and under-adjusting, and guidelines for selecting an appropriate adjustment strategy. <u>Control</u> : No training.
Ellis 2005	New: students from management course (31 intervention teams, 124 members; 34 control teams, 136 members); 4 members per team	Preparation (planning), execution (coordination, communication), reflection (problem solving)	3: planning, communication, problem solving	<u>Experimental</u> : 30-minute training session consisted of didactic lecture included nine case studies highlighting critical aspects of teamwork, reflection on each, and developing plans of action (with feedback from instructors on correct plans).

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
Haslam 2009 (study 1)	New: undergraduate students assigned to imposed goal setting condition (9 teams, 34 participants), participative goal setting condition (9 teams, 34 participants), or control condition (9 teams, 32 participants)	Preparation (action planning)	4: for both conditions: performance (2)	<u>Control</u> : No training. <u>Imposed goal setting</u> : participants given goal of improving performance by 20% in phase two and 40% in phase three of the experiment compared to their baseline performance. <u>Participative goal setting</u> : participants given same targets as participants in the imposed goal setting condition, but told to reflect on this target and set a goal themselves (in both phase two and phase three)
Haslam 2009 (study 2)	New: undergraduate students assigned to imposed-easy goal condition (12 teams, 41 participants), imposed-difficult goal condition (15 teams, 50 participants), participative-easy goal condition (13 teams, 38 participants), participative-difficult goal condition (15 teams, 47), or control condition (16 teams, 50 participants)	Preparation (action planning)	8: for each condition: performance (2)	<u>Control</u> : No goal setting; told to do their best <u>Imposed-easy goal setting</u> : participants given goal of improving performance by 20% in phase two and 40% in phase three of the experiment compared to their baseline performance. <u>Imposed-difficult goal setting</u> : participants given goal of improving performance by 40% in phase two and 80% in phase three of the experiment compared to their baseline performance. <u>Participative-easy goal setting</u> : participants given same targets as participants in the imposed-easy goal setting condition, but told to reflect on this target and set a goal themselves (in both phase two and phase three) <u>Participative-difficult goal setting</u> : participants given same targets as participants in the imposed-difficult goal setting condition, but told to reflect on this target and set a goal themselves (in both phase two and phase three)
Jarrett 2012	New: undergraduate psychology students assigned to local/subjective after-action review (AAR) intervention (20 teams, 80 participants), local/objective AAR intervention (20 teams, 80	Preparation (mission analysis, goal setting), reflection (feedback, performance monitoring, problem solving)	4: for both conditions: performance	<u>Control</u> : No goal setting; told to do their best <u>Subjective AAR</u> : Members participated in 10-minute review (monitored by experimenter) of performance on experimental team task, identify whether goal had been met, identify behaviors that affected the attainment of mission outcomes, and set outcome and

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	participants), local control condition (23 teams, 92 participants) distributed/subjective AAR intervention (20 teams, 80 participants), distributed/objective AAR intervention (20 teams, 80 participants), or distributed control condition (20 teams, 80 participants); 4 members per team			behavioral goals for subsequent experimental team tasks. For the distributed condition, members were in separate locations; for the local condition, members in the same location. <u>Objective AAR</u> : Members participated in same review as that described above but also had the ability to use the video simulator as they reviewed their previous performance. For the distributed condition, members were in separate locations; for the local condition, members in the same location. <u>Control</u> : Members completed a filler task that was unrelated to team task.
Kring 2005	New: undergraduate/graduate students assigned to local team communication training (TCT) intervention (16 participants), distributed TCT intervention (16 participants), local control condition (16 participants), or distributed control condition (16 participants); 2 members per team	Execution (communication), reflection (feedback, performance monitoring, problem solving)	10; for both conditions: performance	<u>Experimental</u> : 1-hour session, wherein participants read four short descriptions of communication dimensions (process, information exchange, feedback, and shared models) and then practiced the main parts of each while completing a collective task with the experimenter. <u>Control</u> : Participants completed a filler task unrelated to teamwork
Martinez-Moreno 2015	New: undergraduate psychology students assigned to intervention (28 teams, 112 members) or control condition (26 control teams, 104 members); 4 members per team	Reflection (performance monitoring, feedback), Interpersonal dynamics (conflict management)	7: backing up, conflict management (6)	<u>Experimental</u> : Team self-guided training: instructor-led review of team processes and outcomes on experimental task, and how team functioning could be improved in the second experimental task. <u>Control</u> : No training.
Prichard 2007	New: undergraduate students assigned to intervention (4 teams, 24 participants) or control condition (4 teams, 24 participants)	Planning (goal setting, action planning), execution, reflection (performance monitoring, problem solving, feedback), interpersonal dynamics (conflict management)	7: coordination, communication, planning, problem solving, situational monitoring, general teamwork (2)	<u>Experimental</u> : Members given 90-minute Chalybeate Team Development in Universities programme, wherein they are trained on various team skills (e.g., problem solving, action planning, interpersonal relations). <u>Control</u> : No training.
Schurig 2013	New: undergraduate psychology students assigned to subjective	Preparation (planning), reflection (performance	2; for both conditions: performance	<u>Subjective AAR</u> : Members participated in 10-minute review of performance on

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	after-action review (AAR) intervention (40 teams, 160 participants), objective AAR (40 teams, 160 participants), or control condition (43 teams, 172 participants); 4 members per team	monitoring, feedback)		experimental team task, identify whether goal had been met, identify behaviors that affected the attainment of mission outcomes, and set outcome and behavioral goals for subsequent experimental team tasks. <u>Objective AAR:</u> Members participated in same review as that described above but also had the ability to use the video simulator as they reviewed their previous performance. <u>Control:</u> Members completed a filler task that was unrelated to team task.
Smith-Jentsch (study three) 1996	New: undergraduate psychology students assigned to lecture-only intervention (15 participants), behavioral role-modeling intervention (15 participants), lecture-plus-demonstration intervention (15 participants), or control condition (15 participants); two members per team	Interpersonal dynamics (conflict management)	3; for all three conditions: communication	<u>Behavioral role-modeling:</u> 10-minute lecture about team performance-related assertiveness, persuasive arguments, and encouragement for using this strategy in team environments; participants then reviewed videos of role models demonstrating various responses to conflict as well as feedback from experimenter about the scenes. <u>Lecture-plus-demonstration:</u> Same 10-minute lecture and video scenes described above, with the addition of the experimenter reviewing relevant learning points from the lecture before and after each scene. <u>Lecture-only:</u> Expanded 1-hour lecture of the same lecture described above. <u>Control:</u> No training.
Villado 2013	New: undergraduate psychology students assigned to subjective after-action review (AAR) intervention (11 teams, 44 members), objective after-action review (12 teams, 48 members) intervention, or control condition (24 teams, 96 members); 4 members per team	Preparation (mission analysis, goal setting, planning), reflection (feedback, performance monitoring, problem solving)	2; for both conditions: performance	<u>Subjective AAR:</u> Team members received mission feedback and completed a 10-minute review of their performance on the experimental task, identify whether goal had been met, identify behaviors that affected the attainment of mission outcomes, and set outcome and behavioral goals for subsequent experimental team tasks. <u>Objective AAR:</u> Members received mission feedback participated in same review as that described above but also had the ability to use

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
				the video simulator as they reviewed their previous performance. <u>Control</u> : Members received mission feedback but no after-action review
Volpe 1996	New: undergraduate students assigned to cross-training intervention (20 teams, 40 participants) or control condition (20 teams, 40 participants); 2 members per team	General teamwork intervention	6: general teamwork, communication (5)	<u>Experimental</u> : Participants informed about the operationally relevant tasks pertaining to their own functional responsibilities as well as those of the other position. Training lasted 30-45 minutes. <u>Control</u> : Participants only informed about the tasks pertaining to their own responsibilities.
Wegge 2005	New: students assigned to directive group goal setting (30 teams, 120 participants), participative group goal setting (30 teams, 120 participants), participative group plus individual goal setting (30, 120 participants teams), or control condition (30 teams, 120 participants); 4 members per team	Preparation (goal setting)	3; for each condition: performance	<u>Directive group goal setting</u> : Members given a specific target to strive towards. <u>Participative group goal setting</u> : Members instructed to set challenging group goal. <u>Participative group plus individual goal setting</u> : Members instructed to set challenging group goal as well as their own individual goal. <u>Control</u> : Members instructed to do their best.
<u>ACADEMIA</u>				
Aaron 2014	New: 88 undergraduate students assigned to team charter intervention (28 students), team charter plus training, support, instruction intervention (29 students), or control condition (31 students)	Preparation (team charter), interpersonal dynamics (conflict management)	4: communication (2), social support (2)	<u>Team charter</u> : Students created a team charter which included a mission statement, team norms, team goals, and performance measurement. <u>Team charter plus training, support, instruction</u> : Same as above, but students also received training, support, and instruction on utilizing the charter from the course instructor. <u>Control</u> : No team charter or training given.
Beck-Jones 2004	New: business students assigned to roles plus cross-training intervention (54), roles only intervention (52), or control condition (55); 4 members per team	Execution (coordination, cooperation)	10; for both conditions: performance (2), goal setting, coordination, communication	<u>Roles only</u> : Students assigned roles and responsibilities to completing the assigned task. <u>Roles plus cross-training</u> : Students assigned roles and responsibilities and received information on the roles and responsibilities of the other team members. <u>Control</u> : No training.
Becker 2005	New: occupational therapy,	Execution (communication),	1: general teamwork	<u>Experimental</u> : Students received feedback on

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
	physical therapy, and respiratory care students enrolled in an online course (48 intervention students, 47 control students)	reflection (feedback, problem solving), interpersonal dynamics (social support)		team members' interactions; module coordinators also provided weekly feedback to faculty mentors on methods to improve student interaction. <u>Control</u> : No feedback given.
Beranek 2005	New: undergraduate computer architecture students comprising 23 virtual teams (12 intervention teams, 36 members; 11 control teams, 33 members); 3 members per team	Preparation (goal setting), execution (communication), interpersonal dynamics (conflict management)	1: general teamwork	<u>Experimental</u> : Students given training on effective teamwork, possible drawbacks to electronic communication, and common "abbreviations" to assist with virtual communication. <u>Control</u> : No training.
Bushe 1995	New: undergraduate students assigned to appreciative inquiry (32 members), team development (32 members), or control (32 members) condition; 4 members per team	Preparation (goal setting, action planning), reflection (performance monitoring, feedback)	6; for both conditions: performance, conflict management, problem solving	<u>Appreciative Inquiry</u> : Members each reflect on their best experience in a team, then come up with a list of what a highly effective team looks like. <u>Team Development</u> : Members reflect on the team's processes, and then develops goals and action plans <u>Control</u> : No training.
Fandt 1990	New: business course students (89 intervention students; 43 control students)	Preparation (goal setting, planning); execution (communication)	1: performance	<u>Experimental</u> : Participants given a lecture and assignment on goal setting for a team simulation task. Goals were taught to be moderately difficult, specific, concrete, and measurable. <u>Control</u> : No training.
Padmo Putri 2012	Intact: faculty members, instructional designer, and course manager from four departments of a university (32 intervention teams, 71 members; 33 control teams, 75 members); 3 members per team	Preparation (goal setting, planning), execution (communication)	7: performance (3), planning (2), communication (2)	<u>Experimental</u> : 1.5-hour training consisted of strategies for communication and planning during course development workshop. Participants viewed a presentation on developing a communication strategy plan, and practiced creating a plan. <u>Control</u> : Participants given a presentation unrelated to teamwork/communication training.
Rapp 2007	New: Students from two sections of a course assigned to experimental (26 students) or control (28 students) condition	Preparation (mission analysis, goal setting, action planning), execution (communication, coordination), reflection (feedback, problem solving),	2: performance, general teamwork	<u>Experimental</u> : Members given CD-based training program comprised of 13 modules related to managing teamwork (e.g., developing team charters, managing conflict, goal setting, communication)

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
		interpersonal dynamics (conflict management)		<u>Control</u> : No training.
Sikorski 2012	New: undergraduate meteorology students (29 intervention teams, 99 students; 30 control teams, 102 students)	Preparation (planning), execution (communication, coordination), reflection (innovation, problem solving)	3: performance	<u>Experimental</u> : Members rate team on team and task-related knowledge factors, and then identify two areas that can be improved and plans for how these areas can be improved. <u>Control</u> : Participants completed a newspaper reading task, unrelated teamwork.
<u>AVIATION</u>				
Brannick 2005	New: pilots assigned to intervention (24 teams, 48 members) or control condition (24 teams, 48 members); 2 members per team	Preparation (planning), execution (coordination, communication), reflection (feedback, performance monitoring, problem solving, intrateam coaching)	5: performance (3), coordination (2)	<u>Experimental</u> : <i>Crew Resource Management</i> training consisted of lecture on communication, assertiveness, and situation awareness. Participants then shown a short film of aircrews demonstrating these three skills during flight scenarios. Discussion of the lecture and film then occurred. Feedback from experimenter for the teams on their simulation performance also provided. <u>Control</u> : Participants completed problem-solving exercises and video games unrelated to teamwork.
Ikomi 1999	Intact: airline crews assigned to experimental (27 crews) or control condition (20 crews)	Execution (communication, coordination)	3: performance	<u>Experimental</u> : Crew resource management principles designed to enhance coordination and communication embedded within in-situ flight procedures. <u>Control</u> : No training.
Siegel 1973	Intact: helicopter pilots and navigators assigned to intervention (8 teams, 16 members) or control (8 teams, 16 members) condition; 2 members per team	Execution (communication)	1: performance	<u>Experimental</u> : Helicopter teams observed a team completing a flight simulation that incurred a flight problem and listened to the team's communication. After each problem, all teams would reconvene to discuss various questions. <u>Control</u> : No training.
Stout 1997	New: aviators assigned to intervention (20 participants) or control condition (22 participants)	Preparation (planning), Execution (communication, coordination), reflection (situational awareness, problem solving), interpersonal dynamics	3: performance	<u>Experimental</u> : Over two days, participants were educated on communication, assertiveness, and situational awareness via lectures, demonstrations (videotapes and case study analyses) of teamwork concepts, and practice

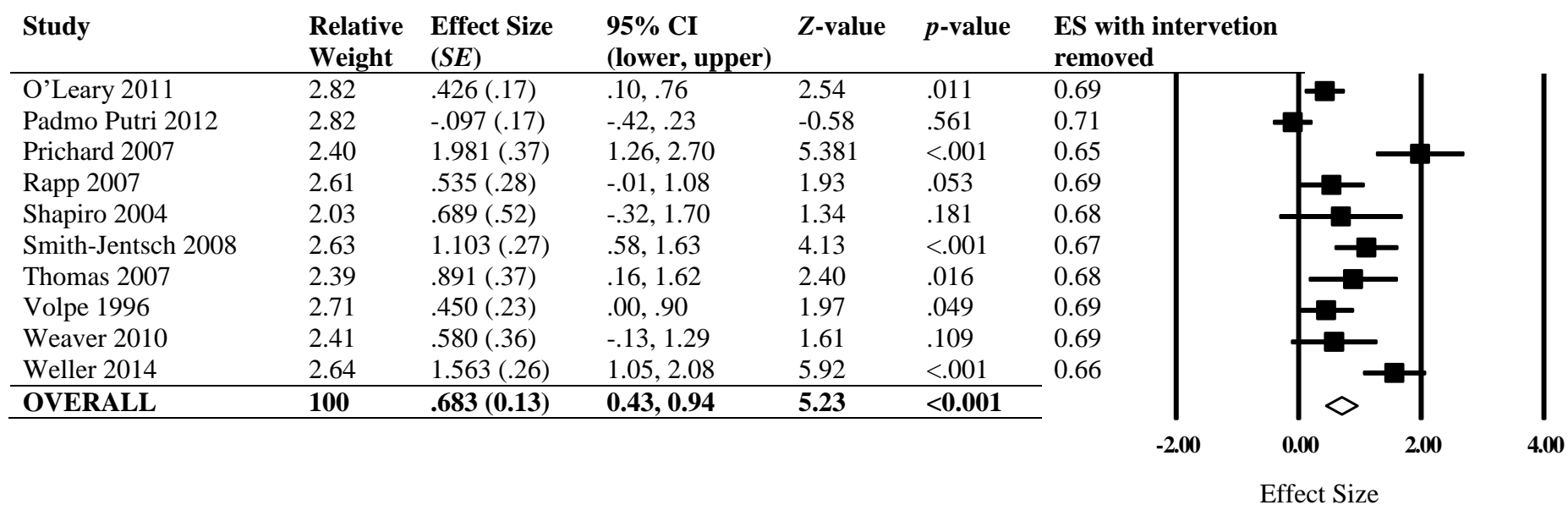
Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
		(conflict management)		and feedback administered by means of role-plays and simulator exercise (which focused on the three teamwork skills). <u>Control</u> : Delayed/waitlist control—participants received training after experimental period.
<u>MILITARY</u>				
Cannon-Bowers 1998	New: Navy recruits assigned to experimental (20 teams, 60 participants) or control (20 teams, 60 participants) condition; 3 members per team	Execution (coordination, communication, cooperation)	3: performance	<u>Experimental</u> : Members instructed on their job duties/roles as well as those of their teammates. <u>Control</u> : Members only instructed on their own responsibilities.
Dalenberg 2009	New: cadets assigned to intervention (22 teams, 88 members) or control condition (19 teams, 76 members); 4 members per team	Preparation (goal setting, planning), execution (cooperation, coordination, communication)	3: performance, coordination, general teamwork	<u>Experimental</u> : Participants instructed to develop plans with consideration for the following: setting team goals, prioritizing, defining roles, passing information, coordination of action, cooperation, and assistance. Discussions took up to ten minutes. <u>Control</u> : No discussion time given.
Eden 1986	Intact: military company members assigned to experimental (7 companies, 220 members) or control (9 companies, 280 members) condition	General teamwork intervention	2: general teamwork, conflict management	<u>Experimental</u> : Three-day workshop on teamwork development. <u>Control</u> : No training.
Entin 1999	New: naval officers assigned to team adaptation and coordination training (TACT) intervention (2 teams, 10 members), TACT+ intervention (2 teams, 10 members), or control condition (2 teams, 10 members); 5 members per team	Preparation (planning), execution (coordination, communication), reflection (feedback, performance monitoring, systems monitoring, situational awareness, backing up), interpersonal dynamics (social support)	2: performance, coordination	<u>TACT</u> : Teaches teams coordination and communication strategies, including: (1) how to identify signs and symptoms of stress in the external environment, in the team, and in individual members; (2) instructions on, and videos of, five adaptive strategies that can be used to cope with increased workload and stress; and (3) practicing strategies in two 12-minute training scenarios, with feedback on teamwork behaviors. <u>TACT+</u> : Same as above, plus tactical action officer of the team was given specific instructions and practice on how to give brief (~30 second) situation-assessment updates (current priorities, targets of interest, and

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
				situation perception) to the rest of the team (approximately once every 3 minutes). <u>Control</u> : members told they were being trained to appreciate the “big picture” and how their team’s performance affected other teams on their platform and in the battle group
Green 1994	New: tactical adaptation and coordination (10), (10), control (10) condition	Execution (coordination) for TACT; Execution (coordination), reflection (situational monitoring) for TACT+	4; for both conditions: performance, general teamwork	<u>TACT</u> : Teams taught teamwork strategies (focused on coordination) in adapting to stressful military situations <u>TACT+</u> : Same training as above, and also prompted to provide situation reports every three minutes <u>Control</u> : No training.
Smith-Jentsch 2008	Intact: navy teams assigned to intervention (7 teams, 35 members) or control condition (6 teams, 30 members); 5 members per team	Preparation (mission analysis), reflection (problem solving, performance monitoring, feedback)	4: performance, communication, cooperation, general teamwork	<u>Experimental</u> : Team leaders given training for two hours on how to facilitate guided team self-correction. Then, after team task simulations, leader had team identify positive and negative instances of teamwork behaviors. Leader then asked the team to generate four specific goals for improvement on the next team task. <u>Control</u> : Team leaders received taskwork-related training.
INDUSTRY				
Buller 1986	Intact: hard rock miner teams assigned to teambuilding (6 teams, 18 members), goal setting (4 teams, 8 members), teambuilding plus goal setting (6 teams, 18 members), or control (4 teams, 9 members) condition	Reflection (feedback, performance monitoring) for teambuilding condition; Preparation (goal setting, action planning), reflection (feedback, performance monitoring) for goal setting condition, and teambuilding plus goal setting condition	9: for each condition, performance (3)	<u>Teambuilding</u> : Teams reflect on team processes, guided by three questions: ‘how can we do our job better?’, ‘how can we make this a better place to work?’, and ‘how can we make this a safer place to work?’. <u>Goal setting</u> : Teams received feedback on their current performance and then set specific, challenging performance goals for the following three months. Feedback on progression to goal attainment were then given each week for the next three months <u>Teambuilding plus goal setting</u> : Combination of the above two conditions. <u>Control</u> : No training
Friedlander	Intact: employees from a research	Preparation (action planning),	1: general teamwork	<u>Experimental</u> : Team members identify

Study (First author)	Team Type & Participants	Targeted Teamwork Dimension(s)	Effect Sizes and Criterion Measures	Description of Intervention
1967	and development organization assigned to intervention (4 teams, 31 members) or control (8 teams, 60 members)	reflection (problem solving)		problems facing the team, brainstorm possible solutions to these problems, and plan how these solutions can be implemented. <u>Control</u> : No training.
Longenecker 1994	Intact: manufacturing teams assigned to intervention (26 members) or control (26 members) condition	Preparation (goal setting), reflection (feedback, problem solving)	1: performance	<u>Experimental</u> : Teams set specific, challenging performance goals. Performance was monitored for each shift, and reviewed/revised as necessary <u>Control</u> : No training.

Table 5.2. Summary results of controlled studies assessing the effects of teamwork interventions on teamwork.

Study	Relative Weight	Effect Size (SE)	95% CI (lower, upper)	Z-value	p-value	ES with intervention removed	
Aaron 2014 a	2.43	1.432 (.35)	.74, 2.13	4.04	<.001	0.67	
b	2.48	.869 (.33)	.22, 1.52	2.61	.009	0.68	
Becker 2005	2.75	.635 (.21)	.22, 1.05	3.02	.003	0.69	
Beck-Jones 2004 a	2.70	-.030 (.24)	-.50, .44	-0.13	.898	0.70	
b	2.69	-.003 (.24)	-.47, .47	-0.01	.990	0.70	
Beranek 2005	2.67	.649 (.25)	.16, 1.13	2.62	.009	0.68	
Bjornberg 2014	2.83	.080 (.16)	-.23, .39	0.50	.615	0.69	
Brannick 2005	2.72	1.229 (.23)	.79, 1.67	5.47	<.001	0.69	
Bushe 1995 a	2.53	.405 (.31)	-.20, 1.01	1.31	.192	0.69	
b	2.53	.534 (.31)	-.08, 1.14	1.71	.086	0.69	
Cheater 2005	2.82	.336 (.17)	.00, .67	1.97	.049	0.69	
Clay-Willaims 2013 a	2.04	.531 (.51)	-.46, 1.53	1.05	.296	0.69	
b	2.06	-.213 (.50)	-1.20, .77	-0.43	.671	0.70	
c	2.12	0.000 (.48)	-.94, .94	0.00	1.00	0.70	
Dalenberg 2009	2.82	1.001 (.17)	.68, 1.33	6.02	<.001	0.67	
Deneckere 2013	2.92	.129 (.09)	-.04, .29	1.52	.129	0.70	
Dibble 2010	2.92	-.242 (.09)	-.42, -.07	-2.72	.007	0.71	
Eden 1986	2.92	.427 (.09)	.07, .42	2.73	.006	0.70	
Ellis 2005	2.88	.792 (.13)	.54, 1.05	6.14	<.001	0.68	
Emmert 2011	2.54	.763 (.31)	.16, 1.36	2.48	.013	0.68	
Entin 1999	2.32	.771 (.40)	-.01, 1.55	1.93	.054	0.68	
Friedlander 1967	2.72	.495 (.22)	.06, .94	2.21	.027	0.69	
Green 1994 a	1.91	.665 (.56)	-.44, 1.76	1.19	.236	0.68	
b	1.87	1.058 (.58)	-.08, 2.20	1.82	.069	0.68	
Jankouskas 2010	2.22	.778 (.44)	-.08, 1.64	1.77	.077	0.68	
Kim 2014	2.65	.062 (.26)	-.45, .57	0.24	.813	0.70	
Marshall 2009*	2.70	3.277 (.33)	2.65, 3.95	9.90	<.001	0.61	
Martinez-Moreno 2015	2.86	.503 (.14)	.23, .78	3.63	<.001	0.69	
Morey 2002*	2.93	1.896 (.08)	1.75, 2.05	24.83	<.001	0.64	



Note: a, b, c = intervention groups within study; *SE* = standard error; CI = confidence interval; ES = effect size. * = Study identified as an outlier and removed from subsequent moderator analyses. The final column marked 'ES with study removed' indicates the results of the sensitivity analysis for each respective intervention.

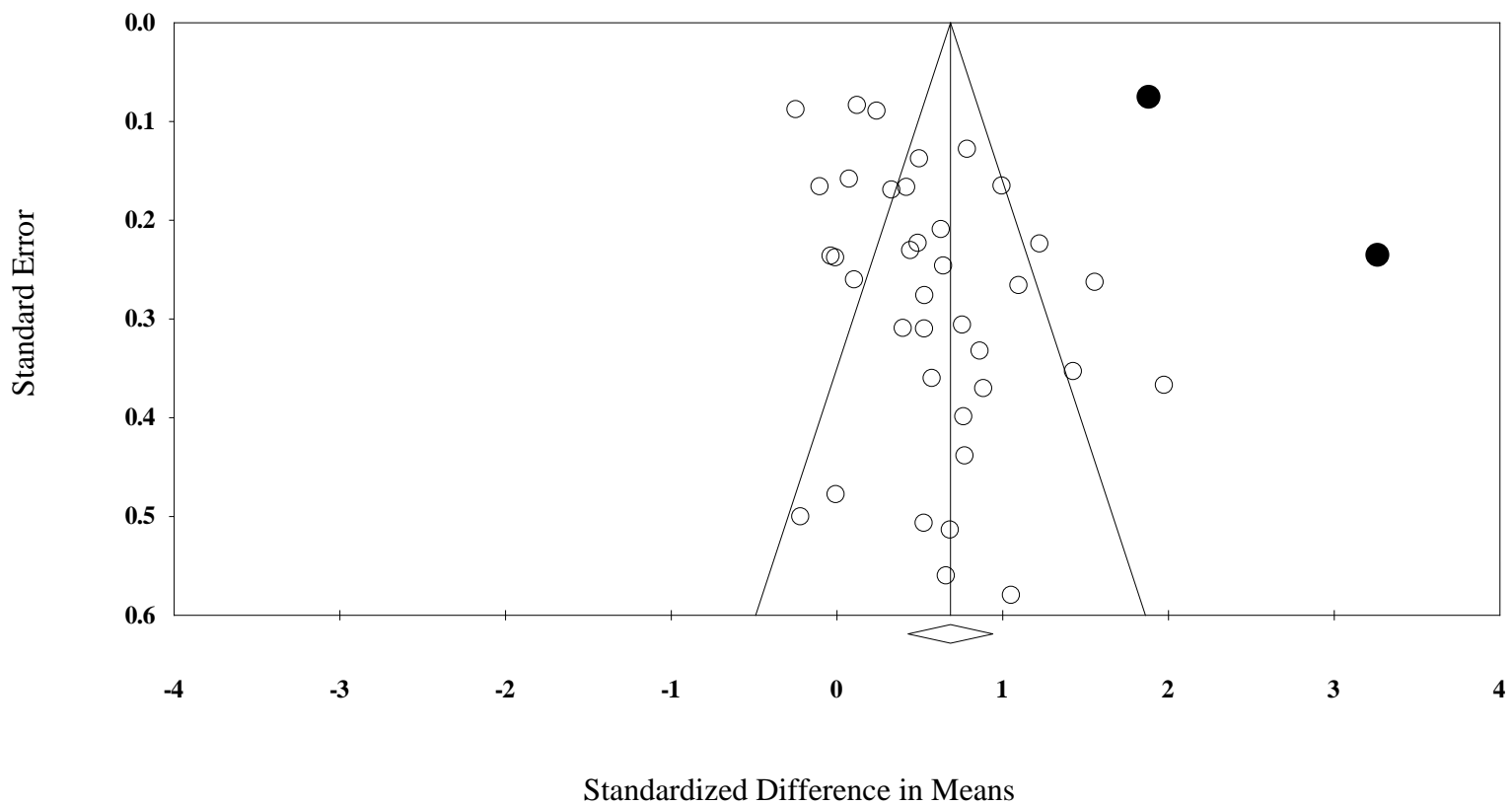


Figure 5.2. Funnel plot for studies assessing the effects of teamwork training on teamwork. Circles filled with black indicate outlier studies.

Marshall et al. (2009). The resulting effect size when these studies were excluded was $d (SE) = 0.550 (0.08)$, 95% CI = 0.39 – 0.71, $Z = 6.73$, $p < 0.001$; $Q (df) = 187.53 (36)$, $I^2 = 80.8$. Subsequent moderator analyses were conducted with these two outlier studies being omitted.

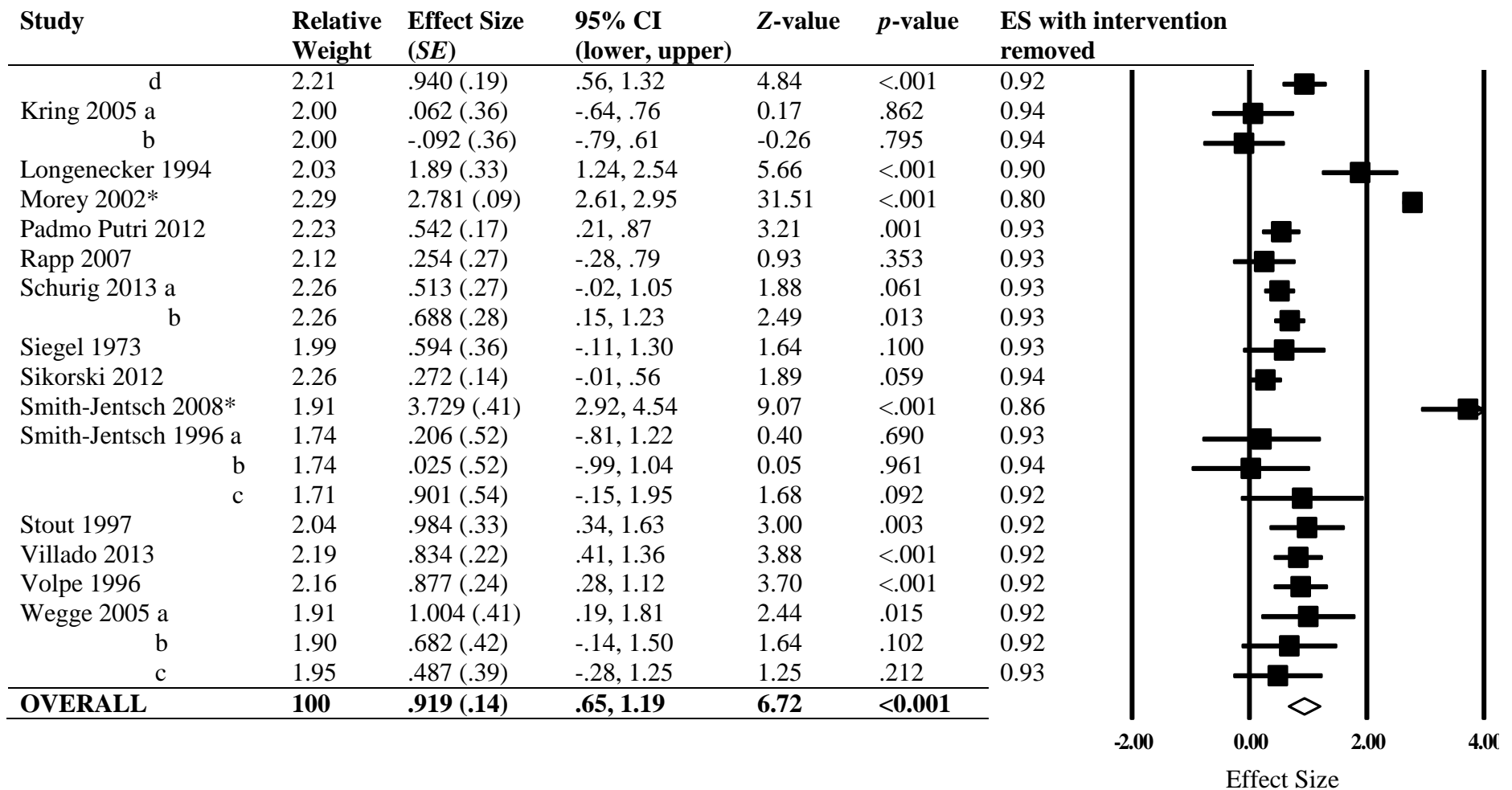
Results of the overall effect of teamwork interventions on team performance as well as summary statistics, sensitivity analyses (i.e., the final column marked ‘ES with intervention removed’), and forest plots for this pool of studies are presented in Table 5.3. This pool of studies included a total of 50 interventions from 32 studies. It was shown that teamwork interventions had a significant, large effect on team performance— $d (SE) = 0.919 (0.14)$, 95% CI = 0.65 – 1.19, $Z = 6.72$, $p < 0.001$; $Q (df) = 851.3 (49)$, $I^2 = 94.2$. The fail-safe N was 6692, which is sufficiently large, as it exceeds the critical value of 260 ($5*50+10$). The funnel plot for this pool of studies is shown in Figure 5.3. Egger’s value for this funnel plot was not significant ($B = 0.131$, $SE = 1.19$, 95% CI = -2.26 – 2.54, $t = 0.11$, $p = 0.91$), which also implies that bias was not present. There were five outlier interventions (from four studies) in this pool of studies that assessed team performance: Morey et al. (2002), Smith-Jentsch et al. (2008), one of the interventions from Buller and Bell (1986); team building condition), and both interventions from Bushe and Coetzer (2009). When these outliers were removed, the resulting effect size was $d (SE) = 0.582 (0.06)$, 95% CI = 0.47 – 0.69, $Z = 10.30$, $p < 0.001$; $Q (df) = 101.1 (44)$, $I^2 = 56.5$. Subsequent moderator analyses were conducted with these five interventions omitted.

Moderator Analyses

The results of the moderator analyses are shown in Table 5.4 (for teamwork behaviours) and Table 5.5 (for team performance). With respect to sample characteristics, significant positive effects of teamwork interventions were found for enhancing teamwork across all contexts ($ds = 0.46$ - 1.23) except for the single effect size from an industry setting ($d = 0.50$). In terms of team

Table 5.3. Summary results of controlled studies assessing the effects of teamwork training interventions on team performance.

Study	Relative Weight	Effect Size (SE)	95% CI (lower, upper)	Z-value	p-value	ES with intervention removed	
Beck-Jones 2004 a	2.16	.502 (.18)	.35, 1.04	3.91	<.001	0.93	
b	2.15	.902 (.18)	.33, 1.30	3.83	<.001	0.92	
Bjornberg 2014	2.24	.466 (.16)	.15, .78	2.91	.004	0.93	
Brannick 2005	2.20	.237 (.21)	-.17, .64	1.15	.249	0.94	
Brown 2003	2.25	.267 (.15)	-.02, .56	1.80	.072	0.94	
Buller 1986 a	1.33	1.435 (.77)	-0.08, 2.95	1.86	.063	0.91	
b*	1.11	3.72 (.94)	1.88, 5.56	3.96	<.001	0.89	
c	1.46	1.58 (.69)	.23, 2.94	2.30	.022	0.91	
Bushe 1995 a*	1.67	4.57 (.56)	3.47, 5.66	8.19	<.001	0.86	
b*	1.47	5.96 (.68)	4.63, 7.29	8.75	<.001	0.84	
Cannon-Bowers 1998	2.22	.46 (.19)	.09, .82	2.45	.014	0.93	
Chang 2008	2.04	1.344 (.33)	.70, 1.99	4.09	<.001	0.91	
Dalenberg 2009	2.24	.653 (.16)	.34, .97	4.06	<.001	0.93	
Dibble 2010	2.29	.181 (.09)	.01, .36	2.04	.042	0.94	
Entin 1999	1.92	.927 (.41)	.13, 1.72	2.88	.022	0.92	
Fandt 1990	2.25	.095 (.15)	-.19, .38	0.65	.518	0.94	
Green 1994 a	1.67	.655 (.56)	-.44, 1.75	1.17	.243	0.92	
b	1.62	1.212 (.59)	.05, 2.37	2.05	.040	0.91	
Haslam 2009-1 a	2.08	.223 (.30)	-.37, .82	0.73	.464	0.93	
b	2.06	.690 (.31)	.07, 1.31	2.20	.028	0.92	
Haslam 2009-2 a	2.02	.941 (.34)	.27, 1.61	2.76	.006	0.92	
b	2.04	.610 (.33)	-.03, 1.25	1.87	.062	0.93	
c	2.02	.957 (.35)	.28, 1.63	2.78	.005	0.92	
d	2.03	.963 (.34)	.31, 1.62	2.87	.004	0.92	
Ikomi 1999	2.06	1.008 (.32)	.39, 1.63	3.18	.001	0.92	
Jankouskas 2010	1.86	-.173 (.44)	-1.04, .70	-0.39	.696	0.94	
Jarrett 2012 a	2.22	.243 (.19)	-.12, .61	1.31	.191	0.94	
b	2.21	.834 (.19)	.46, 1.21	4.34	<.001	0.92	
c	2.22	.358 (.19)	-.01, .72	1.92	.055	0.93	



Note: a, b, c, d = intervention groups within study; *SE* = standard error; CI = confidence interval; ES = effect size. * = Study identified as an outlier and removed from subsequent moderator analyses. The final column marked ‘ES with study removed’ indicates the results of the sensitivity analysis for each respective intervention.

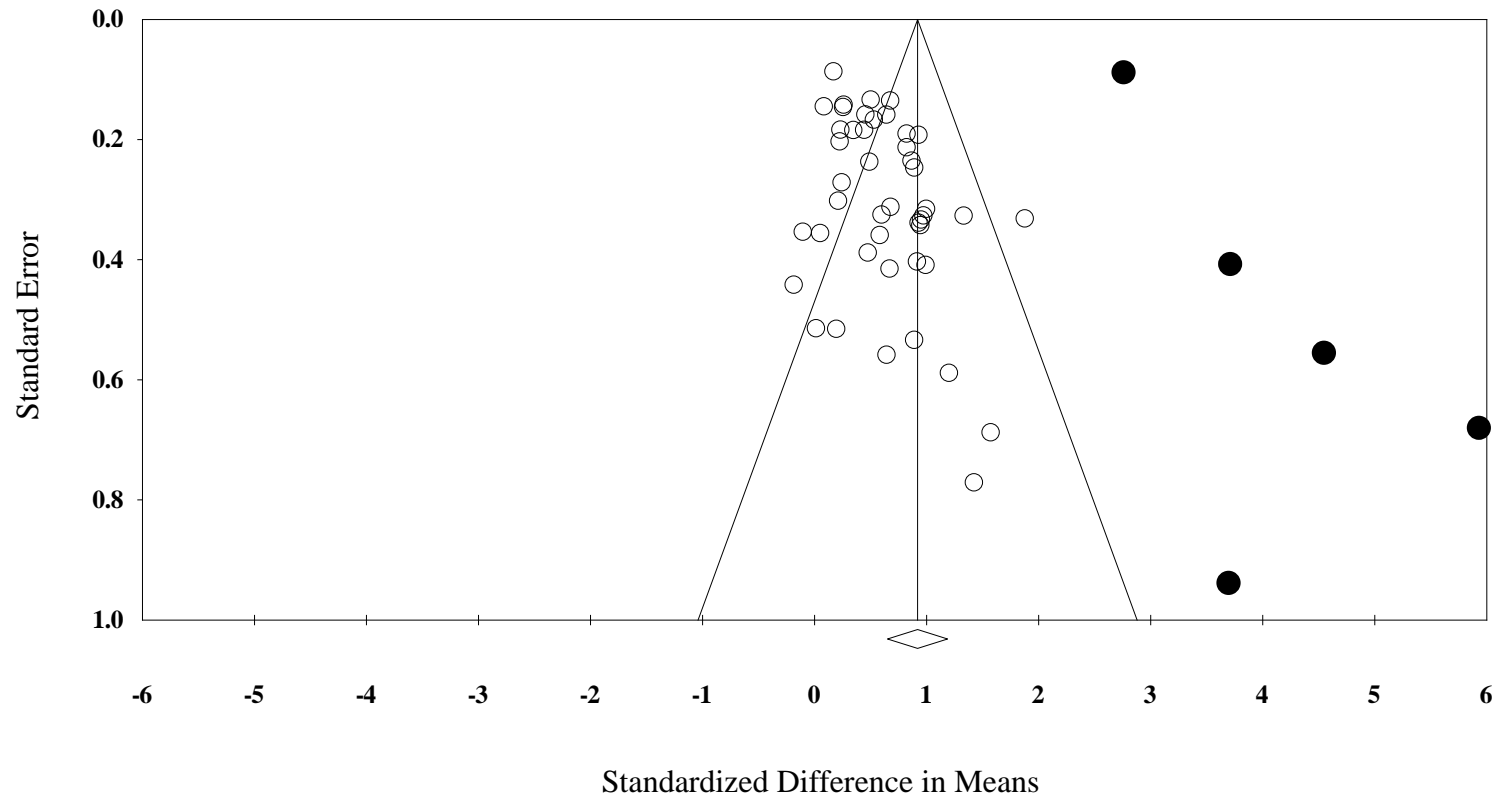


Figure 5.3. Funnel plot for studies assessing the effects of teamwork training on team performance. Circles filled with black indicate outlier studies.

Table 5.4. Moderator results for interventions assessing teamwork as the outcome variable.

Moderator	K	Effect size (SE)	95% CI	Z-value	p value	Q value (df), p value
Sample Characteristics						
Context						3.272(5), $p=0.658$
Health care	13	0.51 (0.15)	0.20, 0.81	3.30	0.001	
Academia	10	0.46 (0.17)	0.14, 0.78	2.78	0.005	
Laboratory experiment	6	0.51 (0.20)	0.12, 0.89	2.55	0.011	
Military	6	0.77 (0.23)	0.33, 1.22	3.42	0.001	
Aviation	1	1.23 (0.47)	0.25, 2.21	2.46	0.014	
Industry	1	0.50 (0.50)	-0.48, 1.47	0.99	0.321	
Team type						4.04(1), $p=0.004$
Intact	13	0.33 (0.14)	0.05, 0.60	2.35	0.019	
New	24	0.67 (0.10)	0.47, 0.87	6.58	<0.001	
Intervention Characteristics						
Method of intervention						6.17(3), $p=0.10$
Didactic education	4	0.19 (0.19)	-0.20, 0.57	0.95	0.341	
Workshop	18	0.50 (0.10)	0.31, 0.70	4.96	<0.001	
Simulation	11	0.78 (0.16)	0.48, 1.09	5.05	<0.001	
Team reviews	4	0.64 (0.19)	0.26, 1.01	3.34	0.001	
Teamwork dimensions targeted ^a						
Preparation	20	0.75 (0.11)	0.54, 0.95	7.09	<0.001	
Execution	21	0.64 (0.11)	0.42, 0.86	5.70	<0.001	
Reflection	22	0.65 (0.11)	0.43, 0.86	5.80	<0.001	
Interpersonal dynamics	11	0.69 (0.16)	0.38, 1.00	4.33	<0.001	
Number of dimensions targeted ^b						19.73(4), $p=0.001$
One	6	0.05 (0.16)	-0.26, 0.35	0.29	0.775	
Two	11	0.65 (0.12)	0.42, 0.89	5.39	<0.001	
Three	6	0.98 (0.16)	0.66, 1.30	6.04	<0.001	
Four	7	0.57 (0.15)	0.27, 0.87	3.70	<0.001	
Measurement Characteristics						
Type of teamwork measure ^c						16.86(1), $p<0.001$

Moderator	K	Effect size (SE)	95% CI	Z-value	p value	Q value (df), p value
Third party	45	0.80 (0.07)	0.66, 0.94	10.92	<0.001	
Self-report	46	0.38 (0.07)	0.25, 0.52	5.47	<0.001	
Teamwork dimension measured ^c						2.98(1), p=0.56
General	27	0.71 (0.11)	0.49, 0.93	6.36	<0.001	
Preparation	8	0.53 (0.19)	0.16, 0.89	2.80	0.005	
Execution	31	0.55 (0.10)	0.35, 0.74	5.57	<0.001	
Reflection	12	0.70 (0.16)	0.40, 1.01	4.50	<0.001	
Interpersonal dynamics	13	0.45 (0.14)	0.17, 0.73	3.12	0.002	

Note: The *df* of the Q-value represents the total number of combinations of the targeted dimensions minus 1. ^a: The total k of this moderator is greater than 37 as many interventions targeted more than one dimension of teamwork. Because of this, each category within this moderator was analyzed independently (i.e., whether each teamwork dimension was targeted or not targeted in the intervention); as a result, it was not possible to calculate a Q value for this moderator. ^b: The total k of this moderator is less than 37 as seven interventions were unclear in terms of the exact teamwork dimensions targeted. ^c: The total k of this moderator is greater than 37 as many studies used more than one type of criterion measure of teamwork. Because of this, each category within this moderator was analyzed independently.

Table 5.5. Moderator results for interventions assessing team performance as the outcome variable.

Moderator	K	Effect size (SE)	95% CI	Z-value	p value	Q value (df), p value
Sample Characteristics						
Context						16.94(5), $p=0.01$
Health care	2	0.76 (0.31)	0.15, 1.36	2.46	0.014	
Laboratory experiment	25	0.54 (0.07)	0.41, 0.67	8.08	<0.001	
Aviation	4	0.64 (0.18)	0.28, 0.99	3.51	<0.001	
Military	5	0.66 (0.17)	0.34, 0.99	3.99	<0.001	
Industry	3	1.76 (.32)	1.13, 2.38	5.52	<0.001	
Academia	6	0.40 (0.12)	0.17, 0.63	3.35	0.001	
Team type						6.04(1), $p=0.02$
Intact	6	0.99 (0.18)	0.64, 1.33	5.63	<0.001	
New	39	0.54 (0.06)	0.42, 0.65	9.32	<0.001	
Intervention Characteristics						
Method of intervention						2.44(3), $p=0.49$
Didactic education	4	0.41 (0.16)	0.09, 0.74	2.52	0.012	
Workshop	24	0.55 (0.08)	0.39, 0.71	6.87	<0.001	
Simulation	7	0.57 (0.17)	0.23, 0.90	3.30	0.001	
Team reviews	10	0.69 (0.10)	0.50, 0.89	6.88	<0.001	
Teamwork dimensions targeted ^a						
Preparation	15	0.60 (0.07)	0.46, 0.73	8.69	<0.001	
Execution	26	0.52 (0.08)	0.37, 0.66	6.87	<0.001	
Reflection	22	0.55 (0.08)	0.40, 0.70	7.17	<0.001	
Interpersonal dynamics	6	0.57 (0.18)	0.18, 0.95	2.88	0.004	
Number of dimensions targeted ^b						3.98(4), $p=0.67$
One	20	0.61 (0.09)	0.44, 0.79	6.85	<0.001	
Two	12	0.63 (0.12)	0.40, 0.86	5.31	<0.001	
Three	9	0.46 (0.11)	0.24, 0.67	4.08	<0.001	
Four	3	0.67 (0.25)	0.19, 1.15	2.74	0.006	
Measurement Characteristics						
Type of team performance measure ^c						2.03(1), $p=0.15$

Moderator	K	Effect size (SE)	95% CI	Z-value	p value	Q value (df), p value
Third party	31	0.56 (0.08)	0.40, 0.72	6.79	<0.001	
Objective	62	0.61 (0.06)	0.48, 0.73	9.70	<0.001	

Note: The *df* of the *Q*-value represents the total number of combinations of the targeted dimensions minus 1. ^a: The total *k* of this moderator is greater than 45 as many interventions targeted more than one dimension of teamwork. Because of this, each category within this moderator was analyzed independently (i.e., whether each teamwork dimension was targeted or not targeted in the intervention); as a result, it was not possible to calculate a *Q* value for this moderator. ^b: The total *k* of this moderator is less than 45 as one intervention was unclear in terms of the exact teamwork dimensions targeted. ^c: The total *k* of this moderator is greater than 45 as many studies used more than one type of criterion measure of team performance. Because of this, each category within this moderator was analyzed independently.

performance, significant effects were evident across all settings ($ds = 0.40-1.76$). In addition, interventions were effective for enhancing teamwork with intact teams ($d = 0.33$) and newly-formed teams ($d = 0.67$), with the effect size for new teams being significantly larger ($Q = 4.04$, $p = 0.004$) than that for existing teams. Teamwork training was also effective at fostering team performance for both team types; however, in contrast to the findings on teamwork, the effect size for intact teams ($d = 0.99$) was significantly larger ($Q = 6.04$, $p = 0.02$) than that for new teams ($d = 0.54$).

Three intervention characteristics were analyzed as potential moderators. First, with regard to the intervention method utilized, significant effects on teamwork were found for workshop training ($d = 0.50$), simulation-based teamwork training ($d = 0.78$), and team reviews ($d = 0.64$) but not for didactic education ($d = 0.19$). All training methods were effective for enhancing team performance ($ds = 0.41-0.69$). Second, significant effects of training on teamwork were evident when two or more dimensions of teamwork were targeted ($ds = 0.65-0.98$) but not when only one dimension was targeted ($d = 0.05$). Team performance, however, improved significantly as a result of teamwork training regardless of the number of teamwork dimensions that were targeted ($ds = 0.46-0.67$). Third, significant effects were shown regardless of which dimension (i.e., preparation, execution, reflection, interpersonal dynamics) was targeted for both teamwork ($ds = 0.64-0.75$) and team performance ($ds = 0.52-0.60$).

Finally, with regard to measurement characteristics, significant improvements on teamwork emerged when either third-party ($d = 0.80$) or self-report ($d = 0.38$) measures of teamwork were utilized; the effect size for third-party measures was significantly larger ($Q = 6.02$, $p = 0.014$) than the effect size for self-report measures. For team performance outcomes, significant effects were shown for both objective ($d = 0.61$) and third-party measures ($d = 0.56$).

Finally, significant effects on teamwork were found when general/omnibus measures of teamwork were taken ($d = 0.71$), as well as when a specific dimension of teamwork was measured ($ds = 0.45-0.70$).

Discussion

The purpose of this systematic review and meta-analysis was to quantify the effects of the extant controlled experimental research of teamwork training interventions on teamwork and team performance. It was shown that these interventions had (positive and significant) medium-to-large sized effects on teamwork and large effects on team performance. When outlier studies were removed, medium-sized effects were found for both criteria. Additional subgroup/moderator analyses also revealed several notable findings, each of which will be discussed in turn. The chapter concludes with a discussion of the limitations associated with this meta-analysis as well as considerations for future teamwork training research.

Who Can Benefit From Teamwork Training?

With regard to sample characteristics, teamwork interventions were shown to be effective at enhancing both teamwork and team performance across a variety of team contexts, including laboratory settings as well as real-world contexts of health care, aviation, military, and academia. This highlights the efficacy of teamwork training as a means of improving teams; this is an important finding as effective teams (i.e., those that work well together and perform at a high level) are vital in many of the aforementioned contexts. For example, it has been estimated that approximately 70% of adverse events in medical settings are not due to individuals' technical errors but, rather, as a result of breakdowns in teamwork (Becker & Godwin, 2005). Thus, there is a critical need to ensure that teams are effective across these settings, as these teams greatly impact (among other things) the welfare of others. The results of this meta-analysis suggest that

teamwork training can indeed be a useful way of enhancing team effectiveness within these contexts.

We also examined whether there were differential effects of teamwork training for new teams compared to intact teams. It was shown that these interventions were effective for both team types. The effects of teamwork training on teamwork outcomes were significantly larger for new teams (who showed a medium-to-large effect size) compared to existing teams (who had a small-to-medium effect size). Interestingly, when we examined team performance as the criterion variable, the training effects were significantly larger for intact teams (who showed a large effect size) compared to newly-formed teams (who again showed a medium-to-large effect size). It should be noted that there were many more studies conducted with new teams compared to intact teams—thus, caution should be exercised in directly comparing these findings. Nonetheless, at this point, the existing research seems to suggest that teamwork interventions work particularly well at enhancing teamwork processes for newly established teams as well for existing teams (but to a lesser extent). It is possible that teamwork processes might be more malleable and display greater potential for improvement with new teams compared to more established teams whose teamwork processes may be more entrenched. On the other hand, it is notable that the effects of teamwork training on team performance were stronger for established teams. In line with this, it is plausible that, while intact teams may show less pronounced changes in teamwork (compared to new teams), they might be better able to translate their teamwork training into improved team performance outcomes.

What Type of Training Works?

Three moderator variables were assessed with regard to intervention characteristics. First, with regard to the training method utilized, it was shown that all four training methods were

effective for enhancing team performance. These included the provision of didactic lectures/presentations, workshops, simulation training, and review-type activities conducted in situ. Although significant effects were shown for the latter three training methods for teamwork outcomes, those interventions that targeted didactic instruction did not result in significant improvements in teamwork itself. This suggests that simply providing educational lectures wherein team members passively learn about teamwork is not an effective way of improving teamwork. When taken together these findings suggest that teamwork training should incorporate experiential activities that provide participants with more active ways of learning and practising teamwork. These may include various workshop-style exercises that involve all team members, such as working through case studies of how teams can improve teamwork, watching and critiquing video vignettes of teams displaying optimal versus suboptimal teamwork, discussing and setting teamwork-related goals and action plans, or other activities that help stimulate critical thinking and active learning of effective teamwork. Teams may also find it useful to conduct simulations of specific team tasks that the group is likely to encounter in-situ, such as aviation teams using an airplane simulator, surgical teams conducting mock-surgeries on medical manikins, military teams practising various field missions, and so on. Teamwork can be also fostered by having team members participate in team reviews/briefings before, during, and/or after the execution of team tasks that occur in-situ. In summary, simply lecturing about the importance of teamwork is not sufficient to create meaningful improvements in teamwork; rather, substantive positive effects can be derived by having team members engage in activities that require them to *actively learn about* and *practise* teamwork.

We also sought to assess how comprehensive an intervention should be—specifically, the number of teamwork dimensions that need to be targeted—in order to be effective. With regard

to improving team performance, there were significant effects when one or more dimensions were targeted. However, in terms of improving teamwork behaviours, significant effects only emerged when two or more dimensions were targeted. From an applied perspective, individuals concerned with intervention (e.g., team consultants, coaches, managers, team leaders) can utilize these findings by targeting more than one dimension of teamwork within their training protocol. For instance, if the purpose of an intervention is to improve a health care team's communication, greater effects may be derived by not merely targeting communication during the execution phase alone (e.g., with a structured communication tool), but by also incorporating strategies that target other dimensions of teamwork, such as setting goals and action plans for how communication will be improved (i.e., the preparation dimension of teamwork) as well as monitoring progress towards those goals, resolving any communication-related problems that arise, and making adjustments to action plans as necessary (i.e., the reflection dimension).

Relatedly, we sought to address whether there were differential effects of teamwork interventions on teamwork and team performance based on the dimensions of teamwork that were targeted. It was found that interventions had a significant effect on both teamwork behaviours and team performance when any dimension of teamwork was targeted. This is important as it means that if those concerned with intervention target any one of the four dimensions of teamwork, this will likely result in improvements in team functioning. While the preparation (i.e., behaviours occurring before team task performance such as setting goals and action plans), execution (i.e., intra-task behaviours such as communication and coordination), and reflection (i.e., behaviours occurring following task performance such as performance monitoring and problem solving) dimensions have each been theorized to be implicated in fostering team performance (cf. Rousseau et al., 2006; Beck-Jones, 2004), is particularly

noteworthy that interventions targeting the interpersonal dynamics of a team (i.e., managing interpersonal conflict and the provision of social support between members) also displayed significant effects in relation to team performance. Specifically, efforts to enhance interpersonal processes have generally been theorized to be related to supporting team maintenance more so than supporting team performance (Rousseau et al., 2006; Beck-Jones, 2004). However, the results from the current review provide evidence that training teams with regard to social support and interpersonal conflict management processes may actually be a useful way to enhance team performance. While the exact reason for this effect is not immediately clear from this review, it may be that improving interpersonal dynamics has an indirect relationship with team performance. That is, teamwork training focused on improving social support and conflict management may improve the functioning of a team, which, in turn, improves the team's performance. As Marks et al. (2001) contend, these interpersonal processes "lay the foundation for the effectiveness of other processes" (p. 368). Relatedly, Rousseau et al. (2006) suggest that problems related to social support and conflict management "may prevent team members from fully contributing to task accomplishment or from effectively regulating team performance" (p. 557). Further research examining this potential relationship is required as this would have implications in both research and applied teamwork settings.

Does It Matter How Criterion Variables Are Measured?

Two measurement characteristics were examined as moderators within this meta-analysis. First, significant, large- and small-to-medium sized effects were found for third party and self-report measures of teamwork, respectively. Significant medium effects were also evident for third party and objective measures of team performance. It is worth noting that significantly larger effect sizes emerged for third party assessments of teamwork compared to

self-report measures. Taken together, these findings suggest that the positive effects that were found for teamwork interventions are not merely perceptive and/or due to individuals' self-report biases (i.e., social desirability). Rather, these results indicate that the effects of these interventions on both teamwork and team performance are clearly observable with measures beyond self-report indices.

Finally, we sought to assess whether the effects of teamwork training varied based on which teamwork dimension(s) were measured. Medium-to-large effects emerged when general/omnibus measures of teamwork—that is, those that provided an overall score of teamwork as opposed to examining individual dimensions of teamwork—were taken. Measures that tapped into the specific dimensions of teamwork (e.g., those that provided individual scores on preparation, execution, reflection, and interpersonal dynamics) also yielded comparable effect sizes. Hence, teamwork interventions appear to have a somewhat similar effect on each of the components of teamwork. In summary, the results of the above two moderators (i.e., type of measure and dimension of teamwork examined) suggest that teamwork training has a positive impact on teamwork and team performance regardless of the way in which these variables are assessed.

Despite the contributions of this meta-analysis to the team psychology literature, it is not without limitations. First, there were additional variables that we had planned to analyze as moderators *a priori* including team size and length of/contact time within the intervention. However, there was an insufficient amount of reliable data across the studies on these variables to conduct these subgroup analyses appropriately. For instance, although many studies noted the total number of participants within an organization (e.g., a hospital) that took part in an intervention, information on the size of the teams within the organization (e.g., various units

within the hospital) was often missing. Team composition variables such as this have been noted as important factors to take into account when examining teams (e.g., Salas et al., 2008, Beranek & Martz, 2005). Similarly, although some studies were explicit about the total length of the intervention and the contact time between interventionists and participating teams, this information was not provided consistently. This too would have been a valuable feature to analyze in order to provide more specific recommendations about how teamwork training programs should be designed—that is, how long an intervention should last? Unfortunately, due to the paucity of information available in the included manuscripts, we were unable to determine whether these variables moderated the observed effects of teamwork training on teamwork and team performance in the current meta-analysis.

Furthermore, there was a considerable amount of variability within some of the moderator categories that were coded. For instance, with regard to intervention methods, ‘workshops’ consisted of many different types of activities including team charter sessions, strategy planning meetings, case study activities, and so on. Combining these activities into one category was done for the sake of being adequately powered to conduct moderator analyses (i.e., include a sufficient number of studies within each of the resulting categories). However, while the above examples are indeed activities that teams do together, they are of course each different in their own ways. Hence, although it is evident that workshop-type activities are effective overall, it is unclear if specific workshop activities are more effective than others. This example underscores the difficulty that can occur when trying to balance statistical power with accuracy for each moderator category when conducting subgroup analyses in a meta-analysis.

Relatedly, effect sizes were only computed with the statistics that were provided from baseline and post-intervention, even if studies provided additional data on teamwork and/or

performance at some other point in between or at a follow-up point in time (although it is worth noting that relatively few studies actually did this). This was done in order to minimize heterogeneity within the meta-analysis and improve the interpretability of the results (i.e., determining the effects of teamwork training from pre- to post-intervention). However, by not taking these measurement time-points into consideration, two questions in particular are raised. First, do certain dimensions of teamwork and team performance evolve differently over time and, if so, how? For instance, do improvements in teamwork occur immediately in response to training and then plateau; or do they improve in a slower, more linear fashion from the onset of training? Second, what are the long-term implications of teamwork training? That is, does teamwork training result in sustained improvements in teamwork and team performance beyond the intervention period or do these effects eventually wane? Answers to these types of research questions would certainly be of interest to teamwork researchers and applied practitioners.

In addition to summarizing the previous research on teamwork interventions for improving teamwork and team performance, the findings from this systematic review also highlight several potential avenues of future research. First, with regard to sample characteristics, the majority of studies that examined the effects of teamwork interventions on team performance were conducted within laboratory settings, with relatively fewer controlled studies conducted in real-world settings. Thus, although significant effects on team performance (and teamwork) were found in health care, aviation, military, and academic settings, the extant literature would be strengthened by conducting further controlled intervention research within these contexts. It was also shown that teamwork training was less effective for improving teamwork for intact teams compared to new teams. Since many teams seeking teamwork training are likely to be intact, it is important that future research continue to test various training strategies that can be utilized with

these types of teams. In addition, there are other contexts in which controlled interventions have not yet been conducted such as with police squads, firefighting crews, sports teams, political parties, and so on. Research in these areas is clearly ripe for future inquiry.

Further research on the ideal *combination* of teamwork dimensions (i.e., preparation and/or execution and/or reflection and/or interpersonal dynamics) targeted in an intervention would also enhance our current knowledge in terms of how to train teamwork most effectively and efficiently. We had originally planned to further assess this moderator by conducting a method co-occurrence analysis (cf. Peters, Bruin, & Crutzen, 2015). Specifically, since there would likely be a variety of combinations of dimensions that were targeted in the teamwork interventions (e.g., preparation only; preparation and execution; preparation, execution, reflection, and interpersonal dynamics; etc), we had hoped to examine if there would be differential effects of these combinations with regard to intervention effectiveness.

Unfortunately, since there were such a large number of combinations of dimensions targeted in the included studies, there was an insufficient number of interventions that fell into each category. We were, therefore, unable to pursue this method co-occurrence analysis of the various combinations of dimensions. Thus, although our findings suggest that interventions are more effective when two or more dimensions are targeted, further research that examines the effects of the ideal *combinations* of these dimensions would certainly enhance our current knowledge of teamwork training. For example, if the objective of teamwork training is to improve the coordination and cooperation of the team, should the training also target (in addition to targeting these execution behaviours) *both* the preparation and reflection dimensions of training (or simply one or the other)? Answering such complex questions will help to advance our understanding of what makes for an effective teamwork training program.

Balanced against the contributions and insights provided by the various moderator analyses conducted in this study, the overall take-home message is that teamwork training is an effective way to foster teamwork and team performance. These effects appear to be evident across a range of samples, utilizing numerous intervention methods, and when considering various measurement characteristics. Interventions appear to be particularly effective when they target multiple dimensions of teamwork and include experiential activities for team members to actively learn about, practise, and continually develop teamwork.

Chapter 6: The Development and Efficacy of a Teamwork Training in Sports Program (TTSP)

Team building has been described as “a method of helping the group to (a) increase effectiveness, (b) satisfy the needs of its members, or (c) improve work conditions” (Brawley & Paskevich, 1997, p. 13). As an umbrella term (Martin et al., 2009), sport teams can be “built” (or enhanced or improved; Brawley & Paskevich, 1997) in a variety of ways such as by targeting group processes (e.g., communication), emergent states (e.g., cohesion), coach-athlete relationships, leadership behaviours, and so on. Within the context of sport, the majority of the past research on team building has focused on developing team cohesion (Bruner et al., 2013; Martin et al., 2009). However, recent research suggests that additional group variables should be targeted in order to enhance team effectiveness (Beauchamp et al., 2017; Bruner et al., 2013; Collins & Durand-Bush, 2015). For example, a meta-analysis by Martin et al. (2009) found mixed evidence regarding the efficacy of team building interventions in sport. Specifically, they found non-significant effects for *omnibus* interventions (i.e., those targeting multiple constructs) as well as those focused on improving the *interpersonal relations* within a team, significant medium-sized effects for *adventure* programs, and significant medium-to-large effects for *goal setting* interventions. In other words, team building interventions that involved setting team goals—a type of *teamwork* behaviour (cf. McEwan & Beauchamp, 2014; Rousseau et al., 2006)—demonstrated the strongest effects for enhancing team effectiveness. Furthermore, interventions with teams in contexts outside of sport (e.g., health care, academia, military) that target other dimensions of teamwork (e.g., coordination, backing up, integrative conflict management) have also been shown to enhance teamwork and performance (McEwan, Ruissen, Eys, Zumbo, & Beauchamp, 2017; chapter 5).

In light of this evidence, the broad objectives of this study were twofold. First, we describe the development of an evidence-informed and theoretically-driven team building intervention that targets teamwork in sport. Specifically, we detail seven strategies that have been shown to be effective for enhancing teamwork; these were informed by the meta-analysis from chapter 5 (McEwan et al., 2017) as well as a scoping review on teamwork training (McEwan et al., under review). Throughout this section, we also note the manner in which these strategies could be implemented within sport by considering (a) previous team building research that has been conducted in sport, and (b) the array of existing research on teamwork training across other areas of team psychology (McEwan et al., under review). Thereafter, we describe how a teamwork training program that encompasses those strategies was implemented and tested in a pilot controlled intervention study.

Teamwork Training in Sport

Teamwork in sport has been described as a dynamic process wherein team members collaboratively execute the independent and interdependent behaviours that are required in order for that team to achieve its purposes (McEwan & Beauchamp, 2014). There are 14 behavioural dimensions of teamwork; 12 of these dimensions focus on the performance of a team (i.e., the regulation of team performance), while the other two are concerned with its interpersonal dynamics (i.e., the management of team maintenance; see chapter 2 for detailed overview). Hence, effective teamwork is not merely a matter of team members working well together *during* a team competition (by coordinating, cooperating, and communicating well; i.e., execution), but also *before* a competition (by specifying a team mission, team goals, and action plans; i.e., preparation), *after* a competition (by monitoring performance and various conditions affecting that performance; i.e., evaluation), and any other points between competitions (by problem

solving, providing verbal feedback to one another, helping teammates improve their performance, and creating innovative tactics to enhance performance; i.e., adjustments). Moreover, teams need to manage interpersonal conflicts effectively and provide interpersonal support (i.e., management of team maintenance) throughout their time together (e.g., over the course of a competitive season).

As shown in Figure 6.1, a sport team's tenure involves a series of recurring episodes (Marks et al., 2001). These episodes have been described as "distinguishable periods of time over which performance accrues and feedback is available" (Marks et al., 2001, p. 359). In general, episodes can be categorized into (a) *action episodes*, where teams actively engage in tasks that determine goal accomplishment (e.g., sporting games or tournaments), and (b) *transition episodes*, where teams focus on preparing for, and reflecting on, their performance in order to progress towards the attainment of team objectives (Marks et al., 2001). These episodes vary in duration and may overlap with each other. In sports, for instance, teams might set broad objectives for their entire season, which they revisit and evaluate throughout the season. They may also set shorter-term goals, such as those for the first quarter of the season or in preparation for an upcoming match versus a certain opponent; even within those matches, teams can plan for specific situations and then make adjustments to their strategies when there are breaks in action (e.g., during timeouts, or between periods, innings, halves, etc.).

Since teamwork behaviours are enacted over a series of action and transition phases (Marks et al., 2001), it would appear necessary that a teamwork training in sport program include multiple strategies so that any of these dimensions are able to be targeted as necessary (i.e., if a team appears to have any deficient areas of teamwork). Past research (including both primary studies and review papers) indicate that seven such strategies can be implemented to enhance

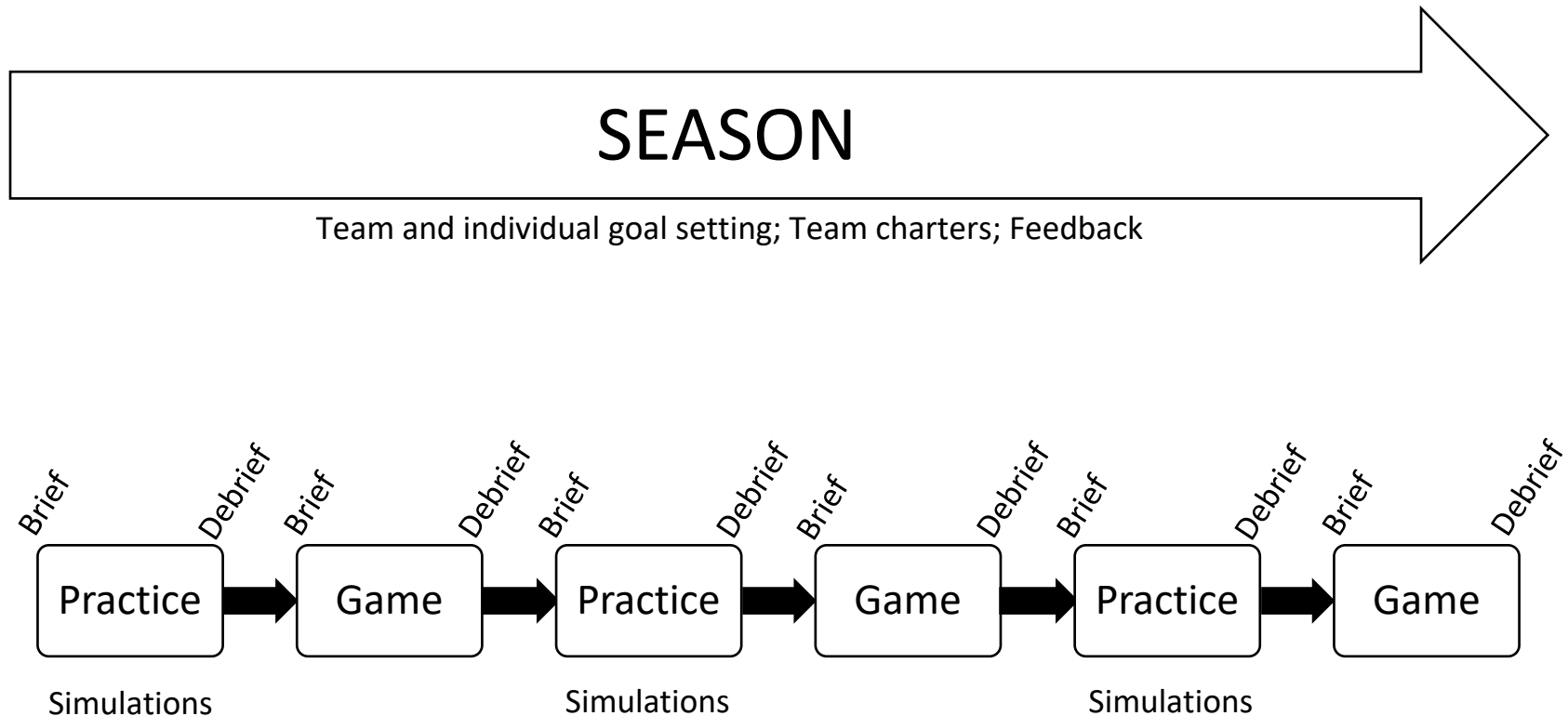


Figure 6.1. Conceptual framework of teamwork training in sport settings. Note that although (for ease of reading) team briefs and debriefs are shown to occur before and after practices/games, these strategies can be implemented during these episodes as well, such as during timeouts or other breaks in action.

the various aspects of teamwork (e.g., McEwan et al., 2017; McEwan, et al., under review). Each of these strategies are detailed in turn (a summary of these strategies—including the dimensions of teamwork that they target—is also provided in Table 6.1).

Feedback. Providing feedback is one of the simplest intervention strategies that can be implemented when working with teams. This strategy involves first collecting data of relevant behaviours or performance indices of a team, and then providing team members with the results of those data (Ward, 1997). As such, this strategy can be used to target any/all aspect(s) of teamwork (as noted in Table 6.1). Feedback allows a team to see “where it is” which can then help guide conversations regarding “where it wants to go” (Ward, 1997). Specifically, this technique can help highlight both areas of strength as well as areas that require improvement—this may confirm participants’ (i.e., coaches and players) previously-held beliefs about the team or (perhaps more importantly) raise awareness about discrepancies between these prior beliefs and actual levels (Ward, 1997). For example, a coach may believe that team members are all in agreement with regard to the team’s broad objectives, specific goals, and action plans for a season (i.e., teamwork-preparation behaviours); as such, they may devote little attention to these behaviours. However, if, after having completed a measure of these behaviours, the results indicate that team members’ ratings of these facets are actually lower than the coach supposed, this discrepancy would suggest that the team needs to attend to these behaviours.

A range of approaches have been used to provide feedback to teams on their teamwork. These have included team members receiving verbal feedback from experts on a certain team task (e.g., Chang, Waid, Martinec, Zheng, & Swanstrom, 2008), observing videos of their performance (Jarrett, 2012), and engaging in open discussions among each other regarding their teamwork (Martinez-Moreno, Zornoza, Orengo, & Thompson 2015)—each of these approaches

Table 6.1. Teamwork dimensions directly targeted by each training strategy.

	Feedback	Team Goal Setting	Individual Goal Setting	Team Charters	Simulation	Briefs	Debriefs
Mission Analysis	✓	✓		✓			
Goal Specification	✓	✓	✓			✓	
Planning	✓	✓	✓			✓	
Coordination	✓				✓		
Cooperation	✓				✓		
Communication	✓				✓		
Performance Monitoring	✓	✓					✓
Systems Monitoring	✓	✓					✓
Problem Solving	✓	✓					✓
Innovation	✓	✓					✓
Intrateam Coaching	✓		✓				
Backing Up	✓		✓				
Psychological Support	✓			✓			
Conflict Management	✓			✓			

have demonstrated positive effects on subsequent teamwork and team performance (McEwan et al., 2017; McEwan et al., under review). In the context of sport, providing feedback on team variables has been utilized in previous studies using a technique known as ‘performance profiling’ (Dale & Wrisberg, 1996). Briefly, this approach involves team members noting the characteristics that they perceive to be indicative of a successful team and then rating their own team with respect to each characteristic on a scale of 1 to 10. Thereafter, teams are presented with a visual illustration of their results as a means of providing feedback. It should be noted that there does not appear to be any empirical support for the utility/validity of this measurement approach—that is, using the 10-point scale to rate various attributes that teams select as being important. Nonetheless, teams have described the feedback provided through performance profiling as a helpful way to have members “get on the same page” (Dale & Wrisberg, 1996, p. 263). As such, it may be beneficial to infuse the *Multidimensional Assessment of Teamwork in Sport (MATs)* (chapter 5) within the performance profiling technique; that is, measuring each aspect of teamwork and then providing feedback to teams on their scores. This would combine a strategy that has been rated positively by team sport athletes (i.e., performance profiling) with a measure that has been shown to be conceptually and psychometrically sound (i.e., the MATs). Furthermore, this approach would (a) provide a comprehensive indication of a team’s current levels of the various aspects of teamwork, and (b) guide the selection of additional strategies that could be implemented to target any deficient areas that are in particular need for improvement.

Team goal setting. One teamwork training strategy that has been subject to research in sport is team goal setting, which involves team members deciding upon their collective objectives, specific goals, and/or plans of action for achieving those goals. This strategy has been found to enhance team effectiveness in sport (Martin et al., 2009) and foster teamwork in other

team contexts (McEwan et al., 2017). Eys et al. (2006) suggested that four conditions are necessary to maximize the effectiveness of team goal setting in sport: (1) athletes should all provide input into the type and magnitude of the goals set; (2) goals should note specific behaviours (and avoid clichés or general terms); (3) both short- and long-term goals should be set with clear links between them; and (4) coaches should provide input and support.

Eys et al. (2006) proposed a three-stage approach to team goal setting. The first stage is conducted in a session near the start of the team's season or tenure, while stages two and three are done on an ongoing basis over the course of the team's season/tenure. Specifically, stage one involves introducing the program and having members collectively define long-term objectives (e.g., the team's position in league standings by season's end) and short-team outcome goals (e.g., winning a certain number of games/competitions within the next month). Thereafter, members are asked what, specifically, the team needs to do well on a game-to-game basis in order to maximize its chances of reaching these goals. Members then make a list (independently) of several performance indices that are most important to *team* success (e.g., in basketball, the points scored, points allowed, or fouls committed per game). The athletes are then assigned to subgroups of approximately five members (to help ensure that every member's opinion is considered) to discuss their lists and come to a consensus of the performance indices. Each subgroup's list is then presented to the entire team. Once the team's final list of indices is created, members then establish the specific levels of performance that need to be reached for each index (e.g., a minimum 60 points scored and maximum of 50 points allowed and 12 fouls committed per game) using the same approach outlined above (i.e., independently, in subgroups, then as an entire group).

The second stage involves monitoring the team's progression towards those previously-set goals. Ideally, a visual representation of the goals is placed in a conspicuous area for the athletes to see, such as the team's locker room or in an athlete workbook. Prioritized goals can also be highlighted to denote those goals that require the team's most immediate attention. Finally, the third stage involves providing summary feedback to the team with regard to progression towards its goals. From there, a goal can be modified or replaced/disregarded if the team decides that it is no longer essential to team success. In line with Goal Setting Theory (Latham & Locke, 1991), data about the team's performance and progress towards achieving the goal (i.e., 'goal monitoring') can enhance the likelihood of attaining those goals. Hence, the second and third stages underscore the point that team goal setting should not merely consist of a single exercise at one time-point. Rather, it should be incorporated as an ongoing strategy that is revisited at several points over the course of a team's time together.

With regard to teamwork, stage 1 of the team goal setting protocol highlighted above (Eys et al., 2006) primarily targets two preparation dimensions, *mission analysis* and *goal specification*. A third preparation dimension, *planning*, involves teams creating action plans (i.e., strategy formulation) that outline *how* a team will achieve their outcome goals and, in turn, their broader objectives. According to Goal Setting Theory (Latham & Locke, 1991), strategy planning can help facilitate goal-related performance. Indeed, teams that develop specific action plans as part of setting goals show higher levels of teamwork and, in turn, team performance compared to teams who set goals without formulating strategies (LePine et al., 2008; Mathieu & Rapp, 2009). Thus, it would appear that the integration of action planning within the team goal setting approach outlined by Eys et al. (2006) would be a useful strategy in a teamwork training protocol. Stage 2 of team goal setting primarily targets the evaluation dimensions of *performance*

monitoring and *systems monitoring* dimensions of teamwork. Finally, stage 3 of the goal setting process primarily targets the *problem solving* dimension—by allowing teams to identify why they have been unsuccessful and how they can improve—as well as the *innovation* dimension—by providing teams with opportunities to modify team action plans using novel approaches to task accomplishment (see Figure 6.1).

Individual goal setting. A variant of team goal setting involves team members specifying their own individual performance goals. Individual goal setting is a commonly-utilized mental skill in sports (Burton & Weiss, 2008) and has been shown to enhance athlete performance (Kyllo & Landers, 1995; Locke & Latham, 2002). However, individual goal setting may also be an effective way to foster teamwork if team members' individual goals fit within, and contribute to, the group's collective goals (Mathieu & Rapp, 2009; Rousseau et al., 2006). Indeed, part of developing high-quality teamwork involves a consideration of each team member's individual strengths, roles, and areas for improvement (Mathieu & Rapp, 2009; Smith, Locke, & Berry, 1990). Moreover, it has been shown that support and feedback from other members and coaches are key components of this process (Aaron et al., 2014). Thus, rather than having team members set their own personal goals in a completely independent manner, individual goal setting within a team context might be an effective way of fostering teamwork if members (a) consider the team's collective goals and how they can help contribute to the attainment of those goals, and (b) receive support from other members in setting and attaining their goals.

Thus, once team objectives/goals have been set, team members could identify salient personal performance-related goals that take into consideration the team's goals, their own strengths as an individual athlete, and their role within the team. While athletes might be tempted

to simply set independent task goals (e.g., a football quarterback improving his throwing), they should also be encouraged to set goals related to interdependent teamwork skills that can be practised with other team members during devoted times in practice (e.g., the quarterback working to improve coordination with his receivers on various passing plays). Practising these skills together will not only help players improve the technical components of the skill but also provides a means of fostering teamwork. In particular, this modified goal setting approach is designed to facilitate *intrateam coaching* and *backing up*; these are two dimensions that typically do not appear to be directly targeted in teamwork training interventions (McEwan et al., under review). By encouraging coaches to allow time during practices/training sessions for team members to work on these behaviours, athletes are given opportunities to provide performance-related advice to each other (e.g., “when you run your route, try to do this....”) and/or help each other improve by other, non-verbal means (e.g., filling in for teammates, observing the performance of other team members). As with team goals, these individual goals should also be revisited at later points in the season to determine goal progress.

Team charters. A strategy that is similar to team and individual goal setting involves the development of team charters. Team charters provide teams with an opportunity to discuss and, ultimately, agree on members’ expectations related to the management of team maintenance behaviours (Aaron et al., 2014; Barron, 2000). The content of these charters will likely vary across teams but could include a discussion of the team’s overall purposes/objectives (i.e., *mission analysis*) as well as the behavioural norms associated with the *interpersonal/psychological support* and *integrative conflict management* dimensions of teamwork. Team members tend to view activities related to the management of team maintenance behaviours as lower in priority compared to activities focused on task performance; as a result, many teams

tend to fixate on task performance without considering these interpersonal behaviours (Mathieu & Rapp, 2009). However, in light of evidence that both psychological support and conflict management can influence team effectiveness (De Dreu & Weingart, 2003; Freeman & Rees, 2009; McEwan et al., 2017), it is important that team members are able to manage these types of behaviours effectively as they arise.

Creating a team charter is a proactive strategy that provides a means of preventing dysfunctional interpersonal behaviours or, at the very least, minimizing the negative impact that may result if these breakdowns in team maintenance occur (Marks et al., 2001; Mathieu & Rapp, 2009). For example, if intrateam conflicts occur over the course of a season (as is common when a variety of individuals are brought together in a group), a team charter can enable the team to more effectively manage these conflicts, as opposed to dealing with them in a purely reactive manner (Rousseau et al., 2008). Indeed, in previous qualitative studies, athletes have mentioned that while team building activities focused on interpersonal dynamics (that are somewhat similar to team charters) may not necessarily *prevent* conflict altogether, they can help teammates “build trust and open channels of communication to help them more effectively resolve conflict that may arise” (Holt et al., 2012, p. 144). Hence, team charters can help teammates develop a shared understanding of how they will support each other (*psychological support*) and resolve conflicts (*integrative conflict management*). It is thought that this proactive attention to supportive behaviours leads to enhanced team maintenance, which, in turn, can maintain or even improve team performance (Aaron et al., 2014; Freeman & Rees, 2009). As noted by Mathieu and Rapp (2009), “teams with high-quality charters are more likely to have thoroughly outlined member roles and interaction processes early on, so members can better concentrate on taskwork without

pausing to debate issues already addressed in the team charter and can thereby perform better” (p. 92).

At this point, it does not appear that the process and resulting effects of team charters have been empirically tested in the context of sport. Anecdotally, however, this type of activity seems to be used by many teams in elite sport. One example comes from the British and Irish Lions rugby union squad. Every four years, top rugby players from the usually-rival nations of England, Ireland, Scotland, and Wales are brought together to form a team and compete against other top teams around the world. As part of the initial team building process, the players on their successful 1997 tour to South Africa created ‘The Lions Laws’, which laid out a “code of conduct”—that is, the standards by which the players were to uphold (Humphrey & Rees, 1999). Creating this charter was meant to ensure clarity of the team’s behavioural norms and also create accountability among players to each other. Ostensibly, this activity enabled former-rival team members to come together as a group and reduce the potential for intrateam conflict. The team manager for that tour, Fran Cotton, noted this activity as “the most important session of [training camp]—and that includes the rugby” (Humphrey & Rees, 1999).

The process by which this strategy could be carried out is similar to that of the team goal setting sessions, wherein players discuss their responses to various questions/scenarios in subgroups and then with the team as a whole (Humphrey & Rees, 1999). As implied above however, the content of these discussions does not primarily concern team performance strategies (e.g., task performance-related goal setting, formulations of team strategies); rather, specific focus is given to the management of team maintenance behaviours. To guide these sessions, those concerned with leading the intervention (e.g., coaches, sport psychology consultant) could have players discuss general questions such as how the players should conduct

themselves in various situations (e.g., at team meetings, away from the competitive venue) as well as more specific questions (in terms of the MTM-related behaviours) including how teammates can support each other or how they can resolve conflicts effectively. As with team goal setting, finalized team charters could be placed in a conspicuous area (e.g., poster in the team locker room; insertion in a team handbooks) for players to see as a reminder throughout their time together; this also allows teams to revisit these charters later on in the season to ensure that team members follow through with their commitments (Aaron et al., 2014).

Team briefs and debriefs. The feedback and goal setting activities highlighted above imply that a key component of teamwork training lies in preparing for team tasks, as well as monitoring performances, and making adjustments if/when necessary during transition episodes. These exercises should not only be utilized on a “broad” level; that is, in preparing for and reflecting on the team’s season as a whole (i.e., the top half of Figure 6.1). Rather, team preparations and reflections should also be conducted during any transition episode, such as before and after a competition or even during breaks within competition (Rousseau et al., 2008). For instance, a soccer team might engage in preparation, evaluation, and adjustments exercises with regard to their season as a whole. In addition, the team could utilize similar exercises over a shorter term, such as before and after tournaments and games, as well as during half-time breaks and on-field stoppages. An effective strategy for accomplishing these purposes involves team briefing before a task (which targets the *goal specification* and *planning* dimensions of teamwork), as well as team debriefing (or after-event reviews) following task completion (which targets *performance monitoring*, *systems monitoring*, *problem solving*, and *innovation*; Villado & Arthur, 2014).

In order for teams to be “on the same page” and function effectively *during task execution*, members must have a shared understanding of the situation at hand, the team’s goals, and what needs to be done to achieve those goals (Dalenberg, Vogelaar, & Beersma, 2009). The specific content of these briefs and debriefs will vary from team to team. In general, though, team briefs consist of a discussion among members related to the goals for the upcoming task and action plans/strategies for how they will obtain those goals (Dalenberg et al., 2009). A key component of these briefs involves a discussion of the three teamwork execution behaviours—coordination, cooperation, and communication—that are required for the team to be successful (Dalenberg et al., 2009). As noted by Dalenberg et al. (2009), “When the team members agree what the team aims for and when they know [beforehand] their own role and all other team members’ roles in that process, they are better able to synchronize their actions” (p. 34). Some points that can guide the conversations in these briefs could include: reinforcing the team’s strengths; noting the strengths, tendencies, and weaknesses of the opposing team; identifying how the team could use these points of information to their advantage; reiterating the importance of coordinating, cooperating, and communicating effectively; and so on.

Team debriefs involve a systematic analysis of a team’s recent performance on a task (Villado & Arthur, 2015). The purpose of these debriefs is to turn a recent event into a learning opportunity for the team through a structured and focused review and discussion (Ellis, Mendel, & Nir, 2006; Villado & Arthur, 2015). The content of these debriefs should relate back to the discussions that took place during team briefs prior to the task. Thus, these activities typically involve identifying: (1) whether the team’s goals were met; (2) the reasons why the team was or was not successful in achieving each goal; (3) the quality of execution of teamwork behaviours and how these affected the team’s performance; and (4) goals and action plans for subsequent

team tasks (e.g., Ellis et al., 2006; Jarrett, 2012; Martinez-Moreno et al., 2015; Villado & Arthur, 2015). Some example items for discussion that teams could ask themselves include: “Did we stick to our gameplan?”; “How well did we communicate?”; “Did we support each other?”; “Did we all perform our roles effectively?”; “When we were unsuccessful in situation *x*, what caused this?”; and so forth. Identifying both successes and failures in a team’s execution of a task can enhance subsequent team performance, as both serve as important lessons for team members (Ellis et al., 2006). This is an essential point in the context of sports as teams may be tempted to (a) simply celebrate after winning a match without reflecting on any situations of sub-optimal teamwork execution, or (b) view lost matches as complete failures without noting points of success. Of particular note, research has shown that the times after a team has been generally successful (e.g., after winning a match) is actually a particularly important time to identify any breakdowns in team functioning that occurred at certain points during the task in order to prepare for ensuing tasks that may include similar situations (e.g., in the team’s next match; Ellis et al., 2006). This approach forces teams to focus on specific behavioural *processes* that will likely facilitate subsequent task execution, rather than simply focusing on the *outcome* of the task in terms of wins versus losses (which is less likely to be helpful to subsequent task performance).

Pre- and post-game team meetings are common in sports. Thus, incorporating structured briefs and debriefs likely represents a highly feasible teamwork strategy in this context. With this idea of feasibility in mind, rather than completely overhauling a team’s meetings before and after a game, it would likely be more appropriate to provide guidance on how the team’s current meetings can be modified (even slightly) in order to facilitate teamwork. In line with previous research on team briefing and debriefing, such modifications should involve all team members in the discussion. Specifically, rather than having select individuals (such as coaches and team

captains) dictate the conversation, all team members should be encouraged to contribute to identifying the various teamwork behaviours required during the task in relation to coordination, cooperation, and communication.

Simulations. Each of the above-noted techniques focus on reviewing the team's performance and teamwork behaviours over the course of a season, as well as before and after a team task. Although these techniques can enhance teamwork (and, in turn, team performance), it should be noted that these strategies are enacted during transition episodes (e.g., between competitions). Therein, they primarily target the preparation, evaluation, adjustments, and management of team maintenance aspects of teamwork, but not the execution phase (although indirect benefits from these techniques on execution behaviours can occur; McEwan et al., 2017). Hence, a question arises regarding how teams can *directly* target/train the behaviours that are enacted during action episodes (e.g., during competition)—that is, the *communication*, *coordination*, and *cooperation* dimensions of teamwork.

One training strategy that has been utilized to enhance teamwork execution behaviours in various team contexts is known as *simulation-based training (SBT)*. SBT involves replicating real-world environments and having members learn, practise, and receive feedback on their performance while they are executing a team task (Weaver et al., 2010). This in-situ engagement allows teams to move from a notional/abstract view of team functioning and closer to a real-world event. In other words, simulations force teams to take what has been learned in a team meeting and apply/practise these skills in an environment that closely mimics situations that have arisen or may occur in the future (Hunt, Shilkofski, Stavroudis, & Nelson, 2007). SBT is often used to train taskwork skills; that is, to teach team members how to perform a technical skill in a simulated environment (e.g., executing chest compressions while performing cardiopulmonary

resuscitation (CPR) on a medical mannequin; flying a certain aircraft using an airplane simulator). However, studies have also found that this strategy is effective for enhancing teamwork execution behaviours when these processes are targeted (e.g., team members learning how to best coordinate their skills when performing CPR; a pilot and crew members practising effective communication; McEwan et al., 2017).

Although the effects of SBT on teamwork in sport have not yet been formally assessed, it is likely that most athletes and coaches have utilize some form of simulation to a certain extent. For instance, a basketball team does not simply learn how to perform a technical skill or execute an offensive play by listening to the coach's description of it in a classroom or locker room; rather, teams will actively engage in learning and practising these skills on the basketball court. As another example, many professional gridiron football teams will prepare for an upcoming opponent by having team members (typically backup/reserve players) form "scout" teams in practice. These scout teams are instructed to study, and then perform in a similar manner to, the team's upcoming opponent. Team starters will then play against this simulated opponent during practices (in North America, these are often referred to as "scrimmages"). Some teams will even practise at the venue of an upcoming competition and simulate crowd noise through speakers as an additional means of simulation (Barnard, Hambrick, & Porter, 2010).

Since it is probable that many teams already utilize simulations in some form (e.g., simulated games versus scout teams), *simulation-based teamwork training (SBTT)* might simply involve adapting these simulations to ensure that coaches and players not only focus on the technical skills of athletes but also on members' teamwork in preparation for an upcoming competition. Thus, incorporating SBTT is likely to be a highly feasible training technique within

sports teams, and provides a way for team members to actively learn about and practise *communicating, coordinating, and cooperating* during team tasks.

The Current Study

The purpose of the current study was to test a novel team building program that specifically targets teamwork in sport. This program utilized the seven strategies described above that have been shown to enhance team effectiveness in other contexts (cf. McEwan et al., 2017). Specifically, this pilot intervention study examined the efficacy of these strategies to enhance teamwork behaviours with a sample of sports teams over a 10-week period. The implementation approach of the *Teamwork Training in Sport Program (TTSP)* sought to apply the *content* of teamwork training developed in other team settings within the *context* of sport. Specifically, teams completed a measure of teamwork at the start (week 1), midway point (week 5), and end (week 10) of the study. Experimental condition teams received teamwork training at week 2 and week 6, while control condition teams did not receive any training. It was hypothesized that participants in the experimental condition would show significantly greater improvements in teamwork when compared to control condition participants from both baseline to the midway point of the intervention and from mid-intervention to post-intervention.

Methods

Participants

Following institutional ethics approval, participants were recruited by emailing coaches and team managers across the lower mainland of British Columbia via publicly available contact information. Within this email, we attached the letter of information that provided details about the study (see Appendix N). Coaches/managers who were interested in having their team participate in the study were asked to email the first author in order to set up a meeting time for

the first session. Ultimately, twelve interdependent sports teams consisting of 187 athletes (mean age: 16.9 years; 50% female) agreed to participate in the Teamwork Training in Sport Program (TTSP). Information on each team is provided in Table 6.2. Six teams were assigned to the experimental (training) condition while the other six were assigned to the no-training control condition. Three basketball teams, two water polo teams, and two soccer teams were from the same organizations. As such, full randomization was not possible as these three sets of teams had the same team managers/coaches and, thus, needed to be clustered and assigned to the same experimental condition (in order to avoid contamination between conditions). Hence, the study followed a 10-week non-randomized controlled intervention design. Teamwork was assessed at three time-points of the study: week 1, week 5, and week 10. Two teams from the experimental condition (teams 1 and 2) and one team from the control condition (team 7) were only able to participate in the first two measurement time-points of the study, as they had less than ten weeks remaining in their season at the time in which they wanted/agreed to participate. For all other teams in the study, baseline assessments were conducted approximately one month after the beginning of their respective seasons.

Materials

Teamwork was assessed with the *Multidimensional Assessment of Teamwork in Sport (MATS)*. The MATS is a 70-item questionnaire that examines 14 dimensions of teamwork. Each item is scored on a 7-point Likert-type scale from 1 (strongly disagree) to 7 (strongly agree). Previous research has provided evidence of good model-data fit and reliability of subscales corresponding to five measurement models in relation to the *preparation, execution, evaluation, adjustments, and management of team maintenance (MTM)* aspects of teamwork (see chapter 3). The preparation subscale consists of the ‘mission analysis’ (5 items), ‘goal specification’ (6

Table 6.2. Descriptions of each team participating in the teamwork training study.

Team	Condition	Sport	Sex	<i>N</i> players	Mean age	Competitive level
1	Experimental	Basketball	M	15	16.6	Local elite
2	Experimental	Hockey	M	19	18.6	Local elite
3	Experimental	Rugby	F	24	26.1	Local elite
4	Experimental	Basketball	F	12	16	Local elite
5	Experimental	Basketball	F	13	15.5	Local elite
6	Experimental	Basketball	F	11	14.8	Local elite
7	Control	Volleyball	M	16	19.8	University
8	Control	Water Polo	M/F	19	14.8	Local elite
9	Control	Water Polo	M/F	15	13	Local elite
10	Control	Basketball	F	8	13.1	Local elite
11	Control	Soccer	M	18	14.5	Local elite
12	Control	Soccer	F	17	13.3	Local elite

Note. All ‘local elite’ teams were rep teams competing against other teams in the lower mainland of British Columbia.

items), and ‘planning’ (7 items) dimensions. The execution subscale consists of the ‘coordination’ (4 items), ‘cooperation’ (5 items), and ‘communication’ (5 items) dimensions. The evaluation subscale consists of the ‘performance monitoring’ (6 items) and ‘systems monitoring’ (4 items) dimensions. The adjustments subscale consists of the ‘problem solving’ (5 items), ‘innovation’ (4 items), ‘intrateam coaching’ (4 items), and ‘backing up’ (5 items) dimensions. Finally, the MTM subscale consists of the ‘integrative conflict management’ (5 items) and ‘psychological support’ (5 items) dimensions. In this study, participants’ perceived level of teamwork was estimated by calculating their mean scores on each of the dimensions within the subscale (from 1 to 7); a subscale score was then calculated based on a team’s mean score on those dimensions (e.g., a score for preparation was provided by calculating participants’ mean scores for coordination, cooperation, and communication).

Procedure

The layout of this study for the experimental condition is noted below. Teams in the control condition also completed the MATS at weeks 1, 5, and 10, but did not partake in any training sessions.

Week 1: Introduction: Time 1 completion of the MATS (approximately 30 minutes)

Week 2: Training session 1: Teams received feedback on each dimension of teamwork and a supplemental training strategy (up to 60 minutes)

Week 3-4: Period designed for teams to continue implementing strategies; open for email support between the coach and interventionist

Week 5: Time 2 completion of the MATS

Week 6: Follow-up training/booster session: Teams received feedback on each dimension of teamwork and a supplemental training strategy (up to 60 minutes)

Weeks 7-9: Period designed for teams to continue implementing strategies; open for email support between the coach and interventionist

Week 10: Time 3 completion of the MATS

Summary of Training Sessions

Training sessions were carried out by the first author. To begin the training, all coaches and players of teams in the experimental condition received a printed workbook containing relevant information related to teamwork that they worked through over the course of the intervention (for a sample workbook, see Appendix R). Team members were encouraged to keep their workbook in a conspicuous area, such as their locker room stall or equipment bag. This provided a means of tracking the team's progress in improving their teamwork and also served as reminders related to the information covered during training.

The core component of the TTSP involved obtaining data from athletes on their perceived teamwork (as measured by the MATS) and then providing feedback to teams based on those ratings. Providing feedback represents one training strategy that targets all 14 dimensions of teamwork (see Table 6.1) and, therefore, was the *primary intervention technique* used in this study. All intervention teams received feedback on their teamwork scores to begin the two training sessions (at weeks 2 and 6). These sessions involved both the players and coaches to ensure that they were all 'on the same page' (cf. Dale & Wrisberg, 1996) with regard to their current levels of teamwork, as well as the secondary strategies that were to be implemented. Team members each received a printout that provided a graphical representation of their team's mean teamwork scores on each of the five subscales of the MATS—preparation, execution, evaluation, adjustments, and MTM. As shown in Appendix R, a graph that represented all of the dimensions was first presented in order to provide the teams with an overall sense of their level

of teamwork. Then, focus was given to each individual dimension of teamwork by presenting the preparation, execution, evaluation, adjustment, and team maintenance aspects separately. This allowed team members to identify the aspects that were in greatest need of improvement, which guided the *secondary training strategy* employed thereafter.

For any dimensions that appeared to be particularly diminished and most in need of improvement (based on the team's scores on the MATS), additional training strategies (see Table 6.1) were incorporated as a secondary component of the training sessions. For example, if a team was shown to display relatively lower scores of communication, cooperation, and/or coordination, simulation activities were introduced as a means of targeting these specific dimensions. Further information on the manner in which these secondary strategies were implemented in the current study is provided in Appendix S. This approach of tailoring an intervention to specifically address the needs of the teams—as opposed to a generic, ‘one-size-fits-all’ approach—is taken from past teamwork training research (e.g., Salas et al., 2008) and from behaviour change models in other areas of physical activity psychology (Michie, van Stralen, & West, 2011). Hence, the TTSP was designed to target the most salient teamwork dimensions that required improvement. Three of the teamwork strategies—team goal setting, individual goal setting, and team charters—followed a *direct* intervention approach, whereby the interventionist (DM) implemented the strategy with the team. The other three strategies—simulations, briefs, debriefs—were more *indirect* in the sense that, although the interventionist described and had introductory activities related to these techniques, it was ultimately up to the coaches and players to actually implement them over the course of their season (i.e., before/during/after practices and games).

Data Analysis

Data were analyzed using *SPSS* software (Version 24; IBM SPSS Predictive Analytics, Chicago IL). Missing data was handled using listwise deletion. The primary outcome of interest for this study was change in teamwork across the three measurement time-points. Therefore, change scores for each team from baseline (i.e., time 1) to week 5 (time 2) and from week 5 to week 10 (i.e., time 3) were computed for preparation, execution, evaluation, adjustments, and management of team maintenance. To examine the efficacy of the TTSP, ten separate time by condition Mixed Effects Analyses of Variance (ANOVAs) were carried out—five assessing changes in teamwork (preparation, execution, evaluation, adjustments, and managements of team maintenance) between week 1 and week 5 and five assessing changes from week 5 and week 10. In each model, condition was specified as a fixed factor, while team was specified as a random factor—this was done in order to account for the nesting of the data (i.e., athletes within teams). We also conducted two repeated measures *t*-tests to examine the changes among experimental condition teams in the primary aspect of teamwork targeted with the supplemental training strategy within a team's training sessions (i.e., one of preparation, execution, evaluation, adjustments, or MTM at the week 2 and week 6 sessions). The first *t*-test examined changes in this targeted variable between week 1 and week 5, while the second test examined changes in the targeted variable from week 5 and week 10.

Results

Table 6.3 provides a summary of each team's mean scores for the five aspects of teamwork at baseline, week 5, and week 10. There were no differences on any of the aspects of teamwork with regard to baseline levels of teamwork between participants who took part in the entire study compared to those who dropped out. Results from the five Mixed Effects ANOVAs showed that teamwork training had a significant effect on changes in teamwork from baseline to

Table 6.3. Mean scores for each team and condition at three timepoints of teamwork training study.

Condition (Team)	Baseline Scores					Week 5 Scores					Week 10 Scores				
	Prep	Exec	Eval	Adj	MTM	Prep	Exec	Eval	Adj	MTM	Prep	Exec	Eval	Adj	MTM
Experimental (1) ^a	5.70	4.86	5.48	4.92	4.71	6.31	5.90	6.31	5.88	5.71	–	–	–	–	–
Experimental (2) ^a	4.99	4.29	4.72	3.95	4.16	5.44	5.05	5.24	4.99	5.12	–	–	–	–	–
Experimental (3) ^{b,a}	5.04	5.78	5.89	5.72	5.99	6.08	5.95	6.10	6.21	6.16	6.00	5.92	6.19	6.15	6.54
Experimental (4) ^{b,c}	4.27	4.68	4.54	4.43	4.73	5.81	5.39	5.80	5.18	5.02	5.99	5.11	5.71	5.27	5.78
Experimental (5) ^{b,d}	4.16	4.36	4.53	4.39	4.37	5.39	4.60	5.17	4.93	4.71	5.09	5.93	5.02	4.90	4.76
Experimental (6) ^{c,a}	5.50	5.32	4.66	4.89	4.37	5.91	5.50	5.63	5.78	5.49	6.20	5.96	6.09	6.11	6.23
<i>Condition Mean</i>	<i>4.94</i>	<i>4.88</i>	<i>4.70</i>	<i>4.72</i>	<i>4.72</i>	<i>5.82</i>	<i>5.40</i>	<i>5.71</i>	<i>5.49</i>	<i>5.37</i>	<i>5.82</i>	<i>5.73</i>	<i>5.75</i>	<i>5.61</i>	<i>5.83</i>
Control (7)	4.82	5.28	5.48	5.28	5.24	5.23	5.39	5.83	5.42	5.16	–	–	–	–	–
Control (8)	4.51	3.61	4.25	3.90	4.16	4.05	3.67	4.19	3.83	4.07	3.91	4.87	5.01	5.08	4.29
Control (9)	4.75	4.32	5.27	5.11	5.40	4.69	4.65	4.85	4.80	5.30	5.05	4.90	5.09	5.49	5.65
Control (10)	5.09	4.70	4.40	4.39	4.58	4.80	4.79	4.39	4.53	4.68	4.22	4.01	4.25	4.56	4.55
Control (11)	5.81	5.92	6.26	6.07	6.13	5.98	5.67	6.15	6.00	5.84	5.95	5.66	5.91	5.97	5.65
Control (12)	5.77	5.31	5.42	5.24	5.28	5.58	5.62	5.47	5.54	5.50	5.37	5.32	5.44	5.35	5.06
<i>Condition Mean</i>	<i>5.13</i>	<i>4.86</i>	<i>5.18</i>	<i>5.00</i>	<i>5.13</i>	<i>5.05</i>	<i>4.97</i>	<i>5.13</i>	<i>5.02</i>	<i>5.09</i>	<i>4.90</i>	<i>4.95</i>	<i>5.14</i>	<i>5.29</i>	<i>5.17</i>

Note. Scale scores range from 1-7. The first letter shown next to each experimental team denotes the training activity done at week 2, while the second letter indicates the activity done at week 6; ^a team received simulation-based teamwork training; ^b team participated in team goal setting activity; ^c team participated in team charter activity; ^d team participated in individual goal setting activity. The bolded values in the columns under ‘Week 5 Scores’ indicate the score of the primary aspect of teamwork that was targeted in the team’s first training session; the bolded values in the columns under ‘Week 10 Scores’ indicate the primary aspect of teamwork that was targeted in the team’s second training session.

week 5. Specifically, the effect of condition was significant for change scores of: Preparation, $F(df) = 19.93(1, 102)$, $p < 0.001$, $\eta_p^2 = .163$ (large effect); Execution, $F(df) = 8.24(1, 102)$, $p = 0.005$, $\eta_p^2 = .075$ (medium effect); Evaluation, $F(df) = 20.35(1, 102)$, $p < 0.001$, $\eta_p^2 = .166$ (large effect); Adjustments, $F(df) = 20.45(1, 102)$, $p < 0.001$, $\eta_p^2 = .167$ (large effect); and Management of team maintenance, $F(df) = 20.88(1, 101)$, $p < 0.001$, $\eta_p^2 = .171$ (large effect). The t -test analyzing the change in the score of the primary teamwork aspect that was targeted in the first training session resulted in a significant increase in this variable, $t(df) = 6.50(67)$, $p < .001$.

Although the mean teamwork scores were all higher for the experimental condition compared to the control condition at week 10, the five mixed effects ANOVAs revealed no significant differences between conditions with regard to changes in any of the teamwork scores from time 2 to time 3. Specifically, the effect of condition was not significant for change scores of: Preparation, $F(df) = 0.41(1, 56)$, $p = .522$, $\eta_p^2 = .007$; Execution, $F(df) = 1.38(1, 56)$, $p = .245$, $\eta_p^2 = .024$; Evaluation, $F(df) = 0.81(1, 56)$, $p = .372$, $\eta_p^2 = .014$; Adjustments, $F(df) = 2.62(1, 56)$, $p = .111$, $\eta_p^2 = .045$; or MTM, $F(df) = 3.60(1, 55)$, $p = .063$, $\eta_p^2 = .061$. However, the t -test examining changes in the teamwork aspect that was targeted in this timeframe revealed a significant improvement in this outcome, $t(df) = 2.17(29)$, $p = .038$.

Discussion

The purpose of this study was to test whether teamwork in sport can be enhanced through a team building intervention focused specifically on teamwork. The intervention approach of the TTSP utilized strategies from other contexts (e.g., health care, military, and education settings) that have been shown to be effective in improving teamwork, while also taking into account previous team building research that has taken place within sport. When taken together the

results of this study provide evidence for the efficacy of the TTSP with the teams involved in this intervention. Specifically, significant effects from week 1 to week 5 were evident, such that improvements in teamwork for teams who took part in teamwork training were greater than changes for control condition teams (whose scores stayed approximately the same from baseline to time 2). Moreover, significant changes in the specific aspect of teamwork that was targeted with experimental teams in the first training session (at week 2) were shown over the same period (baseline to week 5). Significant differences between conditions with regard to changes in teamwork were not evident from week 5 to week 10 (i.e., following the second training session), although as we discuss later, the results point to a *maintenance* of teamwork improvement derived in the first half of the study to the end of the 10-week period. Nevertheless, significant changes were evident from week 5 to week 10 with regard to the specific aspect of teamwork that was targeted at the second session (at week 6) with the experimental condition teams. The remainder of this chapter consists of a discussion of these findings, the potential future directions associated with teamwork training in sport research, as well as the limitations associated with this study.

The results from this study provide evidence that teamwork can be trained in sport settings. This is a potentially important finding, as coaches/sport teams are often looking for ways to enhance the functioning of their teams. The effect sizes from time 1 to time 2 suggest that even a single training session that includes feedback on the team's current levels of teamwork as well as secondary training strategies (along with follow-up support) can have a substantive impact on enhancing teamwork. Specifically, large effect sizes were noted for changes in the preparation, evaluation, adjustments, and management of team maintenance aspects of teamwork, while a medium effect size was found for changes in teamwork execution.

The larger effect sizes in the former four aspects of teamwork compared to execution may be unsurprising due to the nature of the training sessions. That is, those four aspects take place during ‘transition’ episodes—between practices and games—whereas teamwork execution behaviours take place during ‘action’ episodes—while teams are actually playing their sport (cf. Marks et al., 2001). Since the teamwork training sessions also took place during a transition episode (i.e., at a team meeting between games and practices), one might reasonably expect the effect sizes to be larger for the aspects of teamwork that were targeted in this episode. Put another way, even when teamwork execution was specifically targeted, the training still took place during a transition episode (i.e., in a team meeting) as opposed to during an action episode. Thus, it would be worth testing whether future teamwork interventions could be conducted during an action episode (i.e., during a team practice while teams are actually playing their sport) in order to derive a comparable large effect for teamwork execution training. Nonetheless, the results shown from time 1 to time 2 still suggest that teamwork execution behaviours can indeed be enhanced (resulting in a medium sized effect) following a single training session that involved teams reflecting on their communication, coordination, and cooperation.

In contrast to the above-noted results following the first teamwork training session, changes in teamwork from week 5 to week 10 (following the second training session) were not significantly different between experimental and control teams. However, it should be noted that the improvements in teamwork for the experimental teams that were observed from baseline to time 2 were *maintained* at the time 3 assessment. That is, while teamwork scores for the control condition teams remained unchanged throughout the entire 10 weeks of the study, the teamwork scores for the experimental teams increased over the first half of the study and were then sustained through the second half. Moreover, although there were no differences observed

between conditions with regard to changes in *all* aspects of teamwork from week 5 to week 10, there were significant changes between these two time-points for experimental teams in terms of the specific aspect of teamwork that was targeted through the supplemental training strategy at the second session. In sum, significant improvements were seen across both timeframes (i.e., week 1 to 5 and week 5 to 10) with regard to the specific aspect of teamwork that was targeted in the team building sessions.

Limitations and Future Directions

The results from previous studies in this dissertation suggest that the benefits of teamwork training might extend beyond changing teamwork itself. Specifically, in the meta-analysis in chapter 5, it was shown that teamwork interventions not only had a significant effect on teamwork but also on team performance. However, it is important to note that (a) none of the studies in that meta-analysis included research from sport settings, and (b) team performance was not examined in the current study. Hence, future research is required to determine whether teamwork training also results in changes in team performance (in addition to the observed changes in teamwork) within the context of sport. Furthermore, in chapter 4, it was shown that higher levels of teamwork were associated with higher levels of team cohesion, collective efficacy, satisfaction with performance, commitment, and enjoyment in sport approximately one month later. Thus, one might reasonably hypothesize that enhancing teamwork through training would result in improvements in these other sport variables. That said, the results from the study in chapter 4 were correlational in nature. Thus, in addition to measuring team performance, future research could consider measuring changes in other salient sport outcomes that emerge as a result of teamwork training. These types of studies would also allow researchers to examine the various mediators and moderators of the effectiveness of teamwork training.

Although we had planned to conduct a randomized controlled trial in order to examine the efficacy of this teamwork training intervention, full randomization was not possible. As a result, a non-randomized, clustered controlled trial design (wherein multiple teams from the same sports organization were all randomized to the same condition) needed to be employed in order to avoid any potential contamination between conditions. Although fully randomized controlled trials are not always feasible in behavioural research (as seen in the current study), they are considered the ‘gold standard’ of designs in intervention research (Sibbald & Roland, 1998). Thus, it would be prudent for researchers conducting future teamwork training studies to employ fully randomized controlled study designs, if possible. Relatedly, the elements of a control condition could also be considered. In this study, control condition teams should be considered to comprise an ‘inactive’ control group as they did not receive any sort of ‘active’ component (related or unrelated to teamwork; e.g., attention-placebo control). There have been recent calls to consider the elements of control conditions in behavioural research in order to confirm that the results obtained in controlled interventions are truly due to the *treatment* that experimental participants receive rather than being merely a result of a relatively smaller amount of attention from interventionists devoted to control participants (e.g., Karlsson & Bergmark, 2015). Future teamwork training studies (and, more generally, other team building studies targeting any group variable) could examine the potential impact of various control conditions on the obtained differences between conditions.

Conclusion

The results of the current study corroborate previous findings (e.g., McEwan et al., 2017) with regard to teamwork training. Specifically, it was shown that a team building intervention that specifically targets teamwork in sport can result in significant improvements in teamwork.

This novel group dynamics approach has the potential to make an important contribution to the field of sport psychology by providing a framework for enhancing the extent to which team members work well together. Future studies could now examine other components of teamwork training programs, including their impact on other psychosocial variables, as well as the explanatory mechanisms and boundary conditions associated with these interventions.

Chapter 7: General Discussion

The overall objective of this dissertation was to examine teamwork in sport, a multidimensional construct that has previously received limited attention within the field of sport psychology. Specifically, I sought to address four purposes: (1) provide a conceptual framework and working definition of teamwork in sport; (2) develop an instrument to measure teamwork in sport; (3) assess the extent to which teamwork relates to other salient constructs in sport; and (4) examine the efficacy of a novel team building intervention designed to enhance teamwork in sport teams. The six studies that were carried out to address these purposes provide evidence that teamwork is a relevant and important variable to consider in sports. The purpose of this final chapter is to synthesize the findings from these studies, discuss the implications of this research and contributions to the literature, note the limitations associated with these studies, and consider various potential avenues for future research on teamwork in sport.

Summary and Implications of the Current Research

Construct validity. One of the general strengths of this dissertation corresponds to the use of contemporary validity theory (cf. Messick, 1995; Hubley & Zumbo, 2011) to guide the six studies. Evidence of four aspects in particular of Messick's (1995) unified theory of construct validity were demonstrated in this research. This evidence included the three aspects that have been described as the "major parts" of construct validation (Benson, 1998; Flora & Flake, 2017)—substantive, structural, and external validity—as well as content validity. First, the feedback obtained from expert reviewers as well as team sport athletes and coaches on the MATS in study 2 provided support for both the content and substantive aspects of validity. Specifically, with regard to content validity, several elements of the questionnaire (e.g., section preambles, items, and scaling) were modified in order to improve the relevance, representativeness, and technical quality of the instrument. The think-aloud protocol (cf. Oremus

et al., 2005) and expert review also provided support for the substantive aspect of validity by considering respondents' interpretations and judgements of the questionnaire. Understanding these response processes is often overlooked in the instrument development and construct validation process (Cizek, Rosenberg, & Koons, 2008). However, the importance of obtaining evidence for these two aspects of validity is underscored by the differences between the initial version of the MATS (see Appendix E) and its final iteration (see Appendix K). Namely, the scaling of the instrument was increased from a 5-point to 7-point scale, the preambles in all 14 sections were changed, and dozens of items were revised, deleted, or added to the questionnaire. Had we failed to consider participants' response processes and make the appropriate modifications to the initial versions of the MATS, it is less likely that we would have been able to obtain support for other aspects of validity thereafter (i.e., factorial/structural validity).

Once support for the content and substantive aspects of validity related to the modified version of the MATS was obtained, we were able to then test other aspects of validity. Specifically, in study 3 we found that the scoring structure of the MATS aligned with the conceptual model of teamwork provided in study 1 (cf. McEwan & Beauchamp, 2014). This is an important step, as it is crucial that the internal structure of data derived from a questionnaire is consistent with the internal structure of the construct's theoretical domain/framework (Messick, 1995). An equally critical step in the construct validation process involves an examination of the external aspect of validity. To obtain support for this aspect, Messick (1995) notes that scores from a criterion measure (in this case, the MATS) should rationally correlate with data from measures of other relevant variables. The conceptual framework provided in study 1 (Figure 2.1) postulated that teamwork is related to several other important constructs in sport, including various outcomes (e.g., team member enjoyment, satisfaction with team and individual

performance) and emergent states (e.g., team cohesion, collective efficacy). Such evidence for external validity was obtained in study 4, as scores from the MATS correlated with data from a range of sport measures (these findings are discussed in greater detail later in this chapter).

Hence, while future research is warranted in order to provide further evidence of predictive utility, the integrated findings from the six studies in this dissertation provided a critical “first step” in the construct validation process with respect to teamwork in sport (cf. Messick, 1995)

Conceptual contributions. One of the major contributions of this dissertation involves the provision of greater conceptual clarity related to teamwork in sport. That is, rather than simply being considered as “what teams do” (cf. Carron et al., 2012, p. 311), the research subsumed within this dissertation indicates that teamwork is a complex and multidimensional construct. The theoretical and integrative review of teamwork reported in chapter 2, not only resulted in the provision of an evidence-informed definition of teamwork in sport, but also produced a viable conceptual framework that could be tested in subsequent research. Of particular note, this theoretical and integrative review of teamwork provided an important basis for understanding the different behaviours/dimensions that comprise teamwork—this allowed us to then carry out the remaining studies in this dissertation.

Building on study 1, our understanding of teamwork was also enhanced throughout the five studies thereafter by noting (a) the *parallels* of this construct within sport settings compared to teamwork research from other team contexts, and (b) the components of teamwork that appear to be *unique* to sport/discrepant from other settings. For example, these studies provided evidence that teamwork in sport is indeed comprised of five overarching aspects (i.e., preparation, execution, evaluation, adjustments, and management of team maintenance) and 14 lower-order behavioural dimensions, as has been demonstrated in other team contexts (cf.

Rousseau et al., 2006). In particular, the assessment of the psychometric properties of the MATS in study 3 provided evidence of good model-data fit when we tested five separate measurement models corresponding to those overarching aspects of teamwork. This multidimensionality was also evident in study 6 of the dissertation, as each team displayed different levels in each of the five aspects of teamwork. For instance, for some teams in study 6, their observed preparation, execution, evaluation, adjustments, and management of team maintenance scores differed by over 1 point (on the 7-point scale of the MATS) between each other (e.g., team 1 had a baseline score of 5.7 for preparation and 4.7 for MTM).

Various aspects of this research also showed that certain components of teamwork might not apply to sport (or, at the very least, not to the same extent) as they do in other team contexts. For example, one essential element of the ‘performance monitoring’ dimension in other team contexts involves teammates monitoring each other’s performance (Bjornberg, 2014). We, therefore, created an item in the preliminary MATS that reflected this component (see item 4 of the performance monitoring section in Appendix E). However, when asked to provide feedback on this initial version of the questionnaire in the think-aloud section of study 2, several participants remarked that this is not an applicable/appropriate behaviour in sport and should, therefore, be deleted. As one coach stated, “I do not want my players breathing down each other’s necks like that.” Had we not deleted this item, teams in studies 3, 4, and/or 6 may have scored lower on the performance monitoring dimension of the MATS than they should have simply because they responded to this item with a low rating. In other words, including this item may have skewed the results of some teams since it is not actually indicative of effective performance monitoring in sport. In sum, clarity regarding the specific behaviours that comprise effective teamwork in sports was informed not only by the similarities of the findings between

the current research and existing research on teamwork in other contexts, but also by the distinctions between these contexts (cf. Messick, 1995).

Measuring teamwork. As implied above, the creation of a questionnaire to measure teamwork in sport (the MATS) was another major contribution of the research within this dissertation. In addition to the support that was shown for the various aspects of validity related to the MATS (described above), we also obtained evidence of excellent reliability of data derived from each of the 14 dimensions that it measures. When taken in concert, the MATS represents a conceptually-sound and psychometrically-robust instrument to assess teamwork within sports teams. This questionnaire will now enable researchers to examine this construct in a manner that had not been available previously. Moreover, the measure can be used by coaches and/or sport psychology consultants to derive a profile of teamwork processes—based on the 14 dimensions and five overarching aspects of teamwork—within their sports team. Hence, the questionnaire will be of use for both research and applied purposes—in either case, the MATS has the potential to provide important insight into the extent to which team members work well together. Both of these purposes were examined in the current line of work (following studies 2 and 3), as we used the MATS to test (a) whether teamwork is related to various sport outcomes (study 4), and (b) if teamwork can be improved through training (study 6).

Relationships with other salient constructs. The third major contribution of this dissertation was the finding that teamwork positively correlated with data from a range of salient individual- and group-level variables (measured approximately 4 to 6 weeks after the MATS was completed). Specifically, the findings from study 4 suggest that when athletes believe that their team works well together, they are more likely to: experience a greater sense of unity within their team; believe in the team's abilities to be successful; feel satisfied with their team's as well as

their own performance; be more committed to their team; and enjoy participating in their sport. Each of these variables have been shown to be important components of team effectiveness across an array of contexts (Mathieu et al., 2008). Despite the limitations of correlational research, the findings from current research provide initial evidence that teamwork is a relevant and important construct to consider in sport as well.

Teamwork training. The fourth major contribution from this dissertation concerns the finding that teamwork can be enhanced through intervention. Specifically, we found that various teamwork training strategies can improve teamwork across a range of team contexts (study 5), including sport (study 6). The findings from the meta-analysis suggest that training needs to involve *experiential activities* for team members in order to be beneficial. Simply having a coach, expert, or motivational speaker lecture teams on the importance of teamwork or giving tips on how they can improve teamwork behaviours, for example, is a not sufficient way of enhancing teamwork. Rather, team members need to be active participants in training and obtain first-hand experience in learning (a) what exactly teamwork involves, and (b) how it can be enhanced. The specific training strategies that have been shown to have a positive effect on teamwork in previous research (study 5) include workshop activities (e.g., feedback, goal setting, and team charters), team reviews (e.g., briefs to prepare for team tasks and debriefs to reflect on the team's performance), and team simulations (e.g., team scrimmages in practices with scout teams who mimic an upcoming opponent). These strategies were, therefore, embedded within our teamwork training in sport program (study 6). The results of this final study—that teamwork can be enhanced through training within sport teams—is an important finding in terms of the practical application of this research. That is, we not only have a better sense of what exactly

comprises teamwork in sport and how we can measure it, but sports teams now also have a framework for improving their teamwork behaviours.

In addition to actively engaging team members, it is also important to note that these workshop activities, reviews, and simulation exercises target *multiple* dimensions of teamwork. This was a key finding from our meta-analysis of teamwork training and, as such, was taken into consideration in developing the teamwork training in sport protocol. Thus, even if the communication on a team requires improvement, for instance, it appears to be important to utilize strategies that target other aspects as well, such as coordination and cooperation (e.g., via simulation-based teamwork training). Reflecting upon the definition of teamwork may offer a reasonable explanation as to why this finding emerged. Specifically, it was noted in study 1 that teams are *dynamic* entities and, by extension, teamwork is a *dynamic* process. Hence, the behavioural dimensions of teamwork do not occur in a vacuum and are not mutually exclusively. For instance, players on a basketball team do not simply communicate with each other during a game. Rather, they communicate *while also* managing the sequence and timing of their actions (i.e., coordination) and helping one another (i.e., cooperation). Therefore, it would seem that practising these three dimensions of teamwork together (as opposed to focusing on them separately) would more accurately simulate the manner in which teammates work together during the team's task/competition in sport.

There was an insufficient amount of reliable data from the studies included in our meta-analysis to determine how extensive (e.g., in terms of contact time between interventionists and team members) teamwork training should be. Therefore, we began our examination of teamwork training in sport by simply implementing a single training session (between two measurement points), followed by a second booster session approximately one month thereafter (between

another two measurement points). Although future research is clearly warranted to determine whether more time-intensive training results in greater effects on teamwork (see the ‘future directions’ section below), it appears at this point that incorporating just one training session (along with follow-up support) can result in meaningful improvements on several aspects of teamwork. This is an important finding as some sports teams may find it difficult/unrealistic to integrate several training sessions throughout the course of the team’s tenure due to time restrictions. Instead, the evidence from study 6 indicates that even including a single one-hour session devoted to teamwork training can have a significant impact on the extent to which that team works effectively. A second session may then help boost any lagging aspects of teamwork that still require attention. In sum, the research from this dissertation indicates that an effective means of improving teamwork involves the provision of (a) feedback to coaches and players regarding their team’s current levels of teamwork, (b) secondary strategies that target multiple dimensions of teamwork and actively engage team members in learning and practising teamwork, and (c) follow-up support with coaches (such as through email contact) about how they can continue to foster teamwork within their teams following training sessions.

Limitations of the Current Research and Future Directions

Despite the contributions of this research to the field of sport psychology, there are several limitations that should be highlighted. These limitations are organized below in relation to: (a) the construct validation process as it pertains to teamwork in sport; (b) conceptual clarity of teamwork in sport; (c) considerations for measuring teamwork; (d) examining the relationships between teamwork and other constructs in sport; and (e) training teamwork with sports teams. Within the discussion of each of these five themes, various potential avenues of future research that may help address these limitations are noted.

Construct validity. As an ongoing process, construct validation takes place over multiple studies with several aspects of validity being assessed throughout (Messick, 1995). Within this dissertation, evidence of validity was derived in relation to the content, substantive, structural, and external aspects. Although the latter three, in particular, are seen as the major aspects of validity (Benson, 1998; Flora & Flake, 2017), research on teamwork in sport would be strengthened through further evidence supporting: (a) generalizability—the extent to which score properties and interpretations generalize across populations, contexts, and tasks; and (b) consequential validity—the implications that may result from using a test (Messick, 1995). With regard to generalizability, it is not to say that the research presented in this dissertation necessarily *lacked* generalizability. Rather, the generalizability of the findings is simply bound to the samples included in this work. For instance, teams from 15 different sports were included in our analysis of the psychometric properties of the MATS in study 3. While this provided an initial indication that the structural properties of the MATS apply to these sports, the generalizability of these findings would be enhanced through further research with more teams from these sports, as well as with teams from other sports (e.g., team bobsleigh, American football, team speed skating). This underscores the point that support for generalizability is obtained through an *accumulation* of research over years of study.

Although we did not seek to directly examine the consequential validity of measures derived from the MATS, it could be argued that this aspect was addressed to some extent in the final study. Specifically, Messick (1995) postulated that support for this aspect of validity is obtained, in part, by appraising the consequences of score interpretation as “a basis for action” (p. 749). In study 6, interpretations of team scores from the MATS were used to identify specific means of interventions (vis-à-vis the secondary strategies that we utilized in the teamwork

training sessions), which subsequently resulted in improvements in teamwork behaviours (a beneficial consequence of test administration). Nonetheless, in addition to these positive intended consequences of using the MATS, it is certainly recognized that there are other important elements to the consequential aspect of validity. Specifically, there may be *unintended* negative corollaries (or additional positive consequences that we did not previously consider) of having teams complete the MATS. Thus, the validity of data derived from the MATS would be enhanced to an even greater extent through future research examining these consequences.

Conceptual contributions. The teamwork model provided in study 1 suggests that there are five aspects of teamwork in sport—preparation, execution, evaluation, adjustments, and management of team maintenance—which are comprised of 14 behavioural dimensions (see Figure 2.1). Although support for this model emerged in the subsequent studies of this dissertation (particularly in studies 3 and 4), it is worth reflecting on the feedback loop shown within the regulation of team performance component of this model. That is, preparation is theorized to causally lead to execution which leads to evaluation which leads to adjustments; these adjustments then loop back to the preparation phase where the process replays. In other words, if teams prepare well prior to an action episode (e.g., team competition), they will then be able to execute their teamwork behaviours effectively; thereafter, if teams take time to reflect on their performance from the execution phase, they can then make any adjustments that will (ostensibly) enhance their future performance as they begin to prepare for another action episode. Although study 4 provided preliminary evidence that these four phases are interrelated (and that they are also related to management of team maintenance behaviours), we did not conduct any sort of longitudinal, path, or multiple mediation analysis that specifically tested this feedback loop. Hence, although beyond the purposes of the current research in this dissertation, this

theorized feedback loop should be examined in future studies using other study designs (e.g., longitudinal studies) and advanced statistical techniques (e.g., structural equation modeling). Such examinations would allow for a more in-depth understanding of this multi-phasic process of teamwork.

It is also worth noting that the conceptual model presented in study 1 not only provides a framework of teamwork in sport but also of team effectiveness. This model suggests that team inputs impact teamwork behaviours which then affect outcomes and, in turn, emergent states (e.g., cohesion); a reciprocal relationship between teamwork processes and emergent states are also theorized to occur as teams continue to develop. Presenting our teamwork model within this broader framework was important in order to demonstrate how teamwork relates to other important constructs in sport. That said, the research in this dissertation focused predominantly on teamwork and, thus, there is insufficient evidence at this point to explain how exactly these team inputs, outcomes, and emergent states relate to teamwork over time within sport.

Conducting various types of multivariate assessments of this broader team effectiveness model would provide empirical evidence for how teamwork affects, and is affected by, other inputs, outcomes, and emergent states. For example, team size has been noted as an important input variable in past teamwork research, as it can influence various outcomes of team effectiveness (e.g., Klein et al., 2009; Mathieu et al., 2008). Thus, it would certainly be valuable to consider team size in future studies on teamwork in sport. For example, perhaps team size moderates the relationships between teamwork and various outcomes (e.g., team performance) and emergent states (e.g., team cohesion) over the course of a team's season. Again, longer-term studies utilizing more sophisticated statistical methods (e.g., multiple mediation, moderated mediation,

path analysis) are necessary in order to test the broader team effectiveness in sport model presented in study 1.

This dissertation represents the first collection of work that has examined teamwork in relation to any form of physical activity. Of course, there are other settings beyond competitive sport where groups of individuals partake in physical activity together, such as in grade-school physical education (PE) or group exercise classes. Thus, a question arises as to whether teamwork is relevant in these settings as well. Parenthetically, there have been previous instances whereby initial research on a team construct was conducted in sport, and subsequent research showed that this construct was pertinent in other physical activity settings as well. For example, research on *cohesion* in relation to physical activity began in sport settings (i.e., *team cohesion*) and then progressed to group exercise settings (i.e., *exercise group cohesion*; Burke, Davies, and Carron, 2014). In both settings, it was shown that the unity of a group of individuals around their instrumental and social objectives played a significant role in affecting a range of outcomes (e.g., motivation to be physically active, continued participation in exercise classes). In a similar manner, future research could examine the relevance and implications of teamwork in other areas of group physical activity. For instance, does interpersonal support between students in physical education classes predict student physical activity engagement? Examining research questions such as this would provide further assessments of the pervasiveness of this construct, and potentially provide a novel means of understanding/improving participation in physical activity.

Measuring teamwork. As detailed in chapter 3, the MATS represents a comprehensive measure of a new and potentially viable conceptual model of teamwork in sport. Although it is possible that this questionnaire could be adapted in various ways—namely, to test teamwork in other team contexts—it is important to recognize that the MATS was created specifically to

measure teamwork involving *sports* teams (as opposed to teamwork in *any* setting). Hence, adapting the questionnaire in order to measure teamwork in other contexts might affect the measurement of teamwork. For instance, the examples provided in the preambles of each section of the questionnaire (which signifies the measurement of a separate dimension of teamwork) were based on examples given in the literature and by participants from study 2. It is important that researchers translate/adapt these examples in a manner that ensures the same dimension of teamwork is still tested in each respective section of the questionnaire, as opposed to a qualitatively different concept. Moreover, there may be some items included in the questionnaire that do not apply in other team contexts, as well as an absence of items that should be added when measuring teamwork in those settings. For example, as previously mentioned, an item that reflected mutual performance monitoring between teammates was deleted as several participants felt this was not appropriate in sports teams. However, research in other contexts has found that this is an important component of performance monitoring (Bjornberg, 2014). Therefore, it would be prudent for researchers seeking to adapt this questionnaire to other settings to add an item (or items) reflecting this aspect of monitoring. While amendments such as this could ameliorate some concerns of testing teamwork in these other settings, it is important to recognize that such modifications may affect the reliability and validity of measures derived from such an adapted version of the MATS.

Although a strength of the MATS lies in its comprehensiveness—measuring each of the five broad aspects and 14 dimensions of teamwork—it is somewhat lengthy. Most participants in our studies required approximately 15-20 minutes to complete the measure. This did not seem to be problematic with the current teams; however, for some teams and/or researchers in the future, a less time-intensive measure may be preferred. This raises a question as to whether a shortened

version of the MATS could be constructed. It would seem that this measure would have to consist of at least 14 items in order to test each of the dimensions of teamwork. On the one hand, it is possible that this amendment would be unable to capture as much nuance of a team's level of teamwork. For example, the communication of a team would be based on a single, general item in such a shortened measure, as opposed to the five items in the current instrument that capture various elements of effective team communication. On the other hand, a brief measure of teamwork may provide researchers with greater flexibility when conducting studies on teamwork. For example, if this modified measure required significantly less time to complete, researchers could conceivably have participants complete other measures or activities within the same study session without it being overly time-consuming. It is important, however, to recognize that while a shortened version of this questionnaire may be useful in future studies, researchers would have to re-examine the reliability and validity of data derived from that abbreviated measure.

Relationships with other salient constructs. With regard to the importance of teamwork in sport, results from the fourth study in this dissertation indicate that teamwork in sport is related to several other constructs (e.g., team cohesion, member enjoyment). Nonetheless, there are several ways in which future research could examine the external relationships of the MATS in greater detail. For one, there are many other constructs worth considering that were not examined in this dissertation. For example, dropout from youth sport has increased in recent years (Canadian Heritage, 2013; National Sporting Goods Association, 2011) and, as such, several organizations—including Canada's *Social Sciences and Humanities Research Council (SSHRC)* and *Sport Canada*—are seeking evidence-based strategies to enhance sport participation (Social Sciences and Humanities Research Council, 2017). Could the extent to

which team members work well together predict athlete retention in sport? Answering research questions such as this would help researchers and key stakeholders (e.g., coaches, sport organizations) better appreciate the need to foster teamwork in sport. Second, although the findings from study 4 provide a notable first step in examining external validity related to teamwork in sport, there are likely to be variables that moderate the observed relationships, as well as mediating variables that explain how/why those relationships emerged. Moving beyond simple correlation work and examining these boundary conditions and explanatory mechanisms will no doubt help advance our understanding of teamwork in sport. Third, as noted in the definition presented in study 1, teamwork is a dynamic process that develops over time as a result of various temporal (e.g., time-point of a team's tenure) and situational (e.g., changes in player personnel) factors. As such, future research would benefit from taking this time-component into consideration to a greater extent, such as by examining the relationships between teamwork and external variables over the entirety of a team's season (as opposed to a limited window within a team's competitive season as was done in study 4).

Teamwork training. Although the final study of this dissertation provides preliminary evidence that the teamwork of a sports team can be enhanced through training, it remains to be seen if this training affects other constructs. Study 4 showed that teamwork in sport is related a range of constructs (e.g., satisfaction with performance, player commitment to one's team) and study 5 demonstrated that teamwork training in many other contexts has significant effects on team performance. Although it might be reasonable to hypothesize that teamwork training therefore enhances variables beyond teamwork itself, future research within sport examining these changes in external measures is required. Such evidence would highlight the substantive implications of having players, coaches, and sport psychology consultants devote time over the

course of their season to activities that enhance teamwork. Furthermore, as this pilot study was the first teamwork training intervention that has been conducted with sport teams, it was beyond our purposes to examine any mediators and/or moderators of this intervention. For example, one of the interesting findings from our meta-analysis involved the differential effects of teamwork training for newly-formed teams compared to intact teams who had already been together for a relatively longer period of time. Unfortunately, we were unable to examine these potential differences in the final study because only two teams were considered intact (having played together for several months or, for some players, several years) while the remaining teams had only recently been brought together. Moreover, there may be differential effects of teamwork training on team effectiveness based on the size of a sports team, which could range from a dyad (e.g., doubles tennis team) to multiple teammates (e.g., Canadian football team). Future research examining the impact of these and other input variables (e.g., gender, personality characteristics of team members) would help determine for whom, under what conditions, and how teamwork training impacts the effectiveness of sport teams.

Study 6 involved the use of seven training strategies that have been shown to be effective in enhancing teamwork among teams from contexts outside of sport (cf. McEwan et al., 2017; McEwan et al., under review). In other words, these specific strategies were selected to be used in our final study due to the evidence base supporting their utility. Although, overall, these strategies were found to enhance teamwork in our intervention study with sport teams, it is certainly possible that other strategies could be useful as well. Testing novel strategies would help determine if teamwork can be improved beyond what was demonstrated in study 6. For example, researchers could consider conducting ethnographic research wherein they examine how players and/or coaches of high-performance teams develop teamwork within their team in

order to determine whether these strategies differ from the ones utilized in study 6 of this dissertation. The efficacy of any strategies that emerge from that research could then be examined in subsequent studies.

It would also be useful to determine whether more indirect team building approaches can be utilized to enhance teamwork. In study 6 of this dissertation, a team interventionist worked directly with the players of the teams by providing exercises for the teams during a teamwork training session (and then encouraged the teams to continue to implement these strategies on an ongoing basis). Could similar benefits of teamwork training be seen if coaches were to conduct teamwork training exercises with their teams themselves? In the meta-analysis examining the efficacy of team building in sport by Martin et al. (2009), comparable effect sizes were shown regardless of the mode of delivery. Future research could, therefore, examine whether similar effects between direct and indirect interventions also emerge for teamwork training in sport. For example, researchers could train coaches to implement strategies (from study 6) that target the extent to which the members of their teams work well together, and then examine any subsequent changes in teamwork that occur within those teams. Such research could be essential in terms of enhancing the reach of teamwork training. That is, if similar effects (to those reported in study 6) are shown for indirect teamwork training approaches on team effectiveness, there is the potential for having a greater number of teams employing, and benefitting from, teamwork training. Specifically, one consultant/applied researcher could train several coaches at one time-point (e.g., as part of a coaches' workshop) rather than having to meet with each team separately across multiple one-on-one sessions.

Research examining the effects of teamwork training over longer periods of time beyond ten weeks (e.g., over a team's entire season) would also be beneficial. Specifically, this type of

work could examine a potential dose-response relationship between teamwork training and resulting team effectiveness. That is, do teams who receive *more* teamwork training (e.g., several training sessions at multiple time-points over the course of an entire season) derive *greater* improvements in teamwork (and other outcomes) compared to those who receive less training (e.g., one session, or—as in study 6—two training sessions separated by approximately one month)? It is possible that the answer to this question is different from team to team—some teams may indeed benefit from having more contact time during training, whereas one or two sessions may be sufficient for other teams. For example, some experimental condition teams (e.g., teams 3 and 6) from the final study of this dissertation increased their teamwork scores to a very high level over two training sessions across 10 weeks (i.e., >6 out of 7 on average for the five aspects measured at time 3). For these teams, further training may be redundant in that it might not result in any additional improvements in teamwork. Other teams, however, still had relatively lower scores by the end of the 10-week study (e.g., team 5). For these latter teams, it would be useful to determine whether additional training would be beneficial. It is possible that some teams simply require more time and opportunities for training (i.e., beyond a couple sessions one month apart) than others in order for significant improvements to eventually emerge. It is also possible that some teams may be resistant to training for some reason and, as such, would not benefit from additional training. Ethnographic studies or N-of-1 designs may help researchers test—and draw stronger conclusions about—differences between individual teams, as opposed to study designs/analytic methods that examine differences between an entire group of teams in a training versus no-training condition (as was the case in study 6 of this dissertation; cf. Smith, 2012).

Conclusion

The collection of original research presented in this dissertation has helped open up a novel line of inquiry within the field of sport psychology. In particular, the provision of a theoretical model, questionnaire, and training framework related to teamwork in sport can allow research on this construct to begin to burgeon. Together, this research provides an important basis to move from mere assumption to deriving actual evidence supporting the relevance and importance of teamwork in sport.

References

References marked with an asterisk indicate studies included in the meta-analysis (Chapter 5)

- *Aaron, J. R., McDowell, W. C., & Herdman, A. O. (2014). The effects of a team charter on student team behaviors. *Journal of Education for Business*, 89, 90–97. doi: 10.1080/08832323.2013.763753
- Achille, L. B., Schulze, K. G., & Schmidt-Nielsen, A. (1995). An analysis of communication and the use of military terms in Navy team training. *Military Psychology*, 7(2), 95–107. doi: 10.1207/s15327876mp0702_4
- Anastasi, A. (1950). The concept of validity in the interpretation of test scores. *Educational and Psychological Measurement*, 10(1), 67-78.
- Argote, L. , & McGrath, J. E. (1993). Group processes in organizations: Continuity and change. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology* (Vol. 8, pp. 333-389). Chichester, UK: Wiley.
- Aoyagi, M. W., Cox, R. M., & McGuire, R. T. (2008). Organizational citizenship behavior in sport: Relationships with leadership, team cohesion, and athlete satisfaction. *Journal of Applied Sport Psychology*, 20, 25-41. doi: 10.1080/10413200701784858
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.
- Barnard, A., Hambric, S., & Porter, S. (2010, April). Evaluation of crowd noise in Beaver Stadium during a 2009 Penn State football game. In *INTER-NOISE and NOISE-CON Congress and Conference Proceedings* (Vol. 2010, No. 2, pp. 217-228). Institute of Noise Control Engineering.
- Barnes, C. M., Hollenbeck, J. R., Wagner, D. T., Derue, D. S., Nahrgang, J. D., & Schwind, K. M. (2008). Harmful help: The costs of backing up behavior in teams. *Journal of Applied Psychology*, 93, 529-539. doi: 10.1037/0021-9010.93.3.529

- Barron, B. (2000). Achieving coordination in collaborative problem-solving groups. *Journal of the Learning Sciences*, 9, 403–436.
- Beal, D. J., Cohen, R. R., Burke, M. J., & McLendon, C. L. (2003). Cohesion and performance in groups: A meta-analytic clarification of construct relations. *Journal of Applied Psychology*, 88, 989-1004. doi: 10.1037/0021-9010.88.6.989
- Beauchamp, M. R. (2005). Towards an applied model of role perceptions and group dynamics in sport: From theory and research to practice. In S. Jowett & M. Jones (Eds.) *Psychology of sports coaching* (pp. 44-54). Leicester: British Psychological Society.
- Beauchamp, M. R., & Bray, S. R. (2001). Role ambiguity and role conflict within interdependent teams. *Small Group Research*, 32, 133-157. doi: 10.1177/104649640103200202
- Beauchamp, M. R., Bray, S. R., Eys, M. A., & Carron, A. V. (2002). Role ambiguity, role efficacy, and role performance: Multidimensional and mediational relationships within interdependent sport teams. *Group Dynamics: Theory, Research, and Practice*, 6, 229-242. doi: 10.1037//1089-2699.6.3.229
- Beauchamp, M. R., Bray, S. R., Eys, M. A., & Carron, A. V. (2003). The effect of role ambiguity on competitive state anxiety. *Journal of Sport and Exercise Psychology*, 25, 77-92.
- Beauchamp, M. R., McEwan, D., & Waldhauser, K. (2017). Team building: Conceptual, methodological, and applied considerations. *Current Opinion in Psychology*, 16, 114-117. doi: 10.1016/j.copsyc.2017.02.031
- *Beck-Jones, J. J. (2004). *The effect of cross-training and role assignment in cooperative learning groups on task performance, knowledge of accounting concepts, teamwork behavior, and acquisition of interpositional knowledge* (Doctoral dissertation). Retrieved

from Dissertation Abstracts International Section A: Humanities and Social Sciences.
(Order No. 3098363)

*Becker, E. A., & Godwin, E. M. (2005). Methods to improve teaching interdisciplinary teamwork through computer conferencing. *Journal of Allied Health, 34*(3), 169–176.

Benson, J. (1998). Developing a strong program of construct validation: A test anxiety example. *Educational Measurement: Issues and Practice, 17*, 10–17. doi: 10.1111/j.1745-3992.1998.tb00616.x

*Beranek, P. M., & Martz, B. (2005). Making virtual teams more effective: Improving relational links. *Team Performance Management: An International Journal, 11*(5/6), 200–213. doi: 10.1108/13527590510617774

*Bjornberg, N. H. (2014). *Mutual performance monitoring in virtual teams* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (UMI No. 1525402).

*Bommer, W. H., Johnson, J. L., Rich, G. A., Podsakoff, P. M., & MacKenzie, S. B. (1995). On the interchange ability of objective and subjective measures of employee performance. *Personnel Psychology, 48*(3), 587- 605. doi:10.1111/j.1744-6570.1995.tb01772.x

Borenstein, M., Hedges, L., Higgins, J. P. T., & Rothstein, H. R. (2005). *Comprehensive meta-analysis* (2nd Ed.). Englewood, NJ: Biostat.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. West Sussex, UK: John Wiley & Sons, Ltd.

*Brannick, M. T., Prince, C., & Salas, E. (2005). Can PC-based systems enhance teamwork in the cockpit? *The International Journal of Aviation Psychology, 15*, 173–187. doi: 10.1207/s15327108ijap1502_4

- Brawley, L. R., & Paskevich, D. M. (1997). Conducting team building research in the context of sport and exercise. *Journal of Applied Sport Psychology*, 9, 11-40. doi: 10.1080/10413209708415382
- Bray, S. R. (2004). Collective efficacy, group goals, and group performance of a muscular endurance task. *Small Group Research*, 35, 230-238. doi: 10.1177/1046496403260531
- *Brown, T. A. (2006). *Confirmatory factor analysis for applied research*. New York: Guilford Press.
- Bruner, M. W., Eys, M. A., Beauchamp, M. R., & Côté, J. (2013). Examining the origins of team building in sport: A citation network and genealogical approach. *Group Dynamics: Theory, Research, and Practice*, 17, 30-42. doi: 10.1037/a0030114
- *Buller, P. F., & Bell, C. H. (1986). Effects of team building and goal setting on productivity: A field experiment. *Academy of Management Journal*, 29(2), 305-328.
- Burke, S. M., Davies, K. M., & Carron, A. V. (2014). Group cohesion in sport and exercise settings. In M. R. Beauchamp & M. A. Eys (Eds.), *Group dynamics in exercise and sport psychology, second edition* (pp. 147-163). Routledge: London.
- Burton, D., & Weiss, C. (2008). The fundamental goal concept: The path to process and performance success. *Advances in Sport Psychology*, 3, 339-375.
- *Bushe, G. R., & Coetzer, G. (1995). Appreciative inquiry as a team-development intervention: A controlled experiment. *The Journal of Applied Behavioral Science*, 31(1), 13-30.
- Canadian Heritage (2013). Sport participation 2010: Research paper. Retrieved August 17, 2013 from http://publications.gc.ca/collections/collection_2013/pc-ch/CH24-1-2012-eng.pdf
- *Cannon-Bowers, J. A., Salas, E., Blickensderfer, E., & Bowers, C. A. (1998). The impact of cross-training and workload on team functioning: A replication and extension of initial

- findings. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 40(1), 92-101.
- Carron, A. V., Brawley, L. R., & Widmeyer, W. N. (1998). Measurement of cohesion in sport and exercise. In J. L. Duda (Ed.), *Advances in sport and exercise psychology measurement* (pp. 213-226). Morgantown, WV: Fitness Information Technology.
- Carron, A. V., Bray, S. R., & Eys, M. A. (2002). Team cohesion and team success in sport. *Journal of Sport Sciences*, 20, 119-126. doi: 10.1080/026404102317200828
- Carron, A. V., Colman, M. M., Wheeler, J., & Stevens, D. (2002). Cohesion and performance in sport: A meta-analysis. *Journal of Sport and Exercise Psychology*, 24, 168-188.
- Carron, A. V., Martin, L. J., & Loughhead, T. M. (2012). Teamwork and performance. In S. N. Murphy (Ed.), *The Oxford handbook of sport and performance psychology* (pp. 309-327). New York: Oxford University Press.
- Carron, A.V., Widmeyer, W.N., & Brawley, L.R. (1985). The development of an instrument to assess cohesion in sport teams: The Group Environment Questionnaire. *Journal of Sport Psychology*, 7, 244–266.
- Chan, D. (1998). Functional relations among constructs in the same content domain at different levels of analysis: A typology of composition models. *Journal of Applied Psychology*, 83, 234-246. doi : 10.1037//0021-9010.83.2.234
- *Chang, S., Waid, E., Martinec, D. V, Zheng, B., & Swanstrom, L. L. (2008). Verbal communication improves laparoscopic team performance. *Surgical Innovation*, 15(2), 143–147. doi: 10.1177/1553350608318452
- *Cheater, F. M., Hearnshaw, H., Baker, R., & Keane, M. (2005). Can a facilitated programme promote effective multidisciplinary audit in secondary care teams? An exploratory trial.

- International Journal of Nursing Studies*, 42(7), 779–791. doi:
10.1016/j.ijnurstu.2004.11.002
- Cizek, G. J., Rosenberg, S. L., & Koons, H. H. (2008). Sources of validity evidence for educational and psychological tests. *Educational and Psychological Measurement*, 68, 397-412.
- Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment*, 7(3), 309-319.
- *Clay-Williams, R., McIntosh, C. A., Kerridge, R., & Braithwaite, J. (2013). Classroom and simulation team training: A randomized controlled trial. *International Journal for Quality in Health Care*, 25(3), 314-321. doi: 10.1093/intqhc/mzt027
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159. doi:10.1037/0033-2909.112.1.155
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 296-334.
- Dale, G. A., & Wrisberg, C. A. (1996). The use of a performance profiling technique in a team setting: Getting the athletes and coach on the " same page". *The Sport Psychologist*, 10, 261-277.
- *Dalenberg, S., Vogelaar, A. L., & Beersma, B. (2009). The effect of a team strategy discussion on military team performance. *Military Psychology*, 21, S31-S46. doi:
10.1080/08995600903249107
- *DeCoster, J., & Claypool, H. M. (2004). A meta-analysis of priming effects on impression formation supporting a general model of informational biases. *Personality and Social Psychology Review*, 8(1), 2–27. doi:10.1207/s15327957pspr0801_1

- *De Dreu, C. K. W. (2007). Cooperative outcome interdependence, task reflexivity and team effectiveness: A motivated information processing approach. *Journal of Applied Psychology*, 92(3), 628-638. doi:10.1037/0021-9010.92.3.628
- De Dreu, C. K. W., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, 88, 741-749. doi: 10.1037/0021-9010.88.4.741
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11, 227-268.
- DeFreese, J. D., & Smith, A. L. (2012). Teammate social support, burnout, and self-determined motivation in collegiate athletes. *Psychology of Sport and Exercise*, 14, 258-265. doi: 10.1016/j.psychsport.2012.10.009
- *Deneckere, S., Euwema, M., Lodewijckx, C., Panella, M., Mutsvari, T., ... Vanhaecht, K. (2013). Better interprofessional teamwork, higher level of organized care, and lower risk of burnout in acute health care teams using care pathways: A cluster randomized controlled trial. *Medical Care*, 51(1), 99-107. doi: 10.1097/MLR.0b013e3182763312
- DeVellis, R. F. (2003). *Scale development: Theory and applications* (Vol. 26). Thousand Oaks: Sage publications.
- *Dibble, R. (2010). *Collaboration for the common good: An examination of internal and external adjustment* (Doctoral dissertation). Retrieved from Dissertation Abstracts International Section A: Humanities and Social Sciences. (UMI No. 3404571)
- Drach-Zahavy, A., & Somech, A. (2001). Understanding team innovation: The role of team processes and structures. *Group Dynamics: Theory, Research, and Practice*, 5, 111-123. doi: 10.1037/1089-2699.5.2.111

- Eccles, D. (2010). The coordination of labour in sports teams. *International Review of Sport and Exercise Psychology*, 3, 154-170. doi: 10.1080/1750984X.2010.519400
- Eccles, D., & Tenenbaum, G. (2004). Why an expert team is more than a team of experts: A social-cognitive conceptualization of team coordination and communication in sport. *Journal of Sport and Exercise Psychology*, 26, 542-560.
- *Eden, D. (1986). Perspectives team development: Quasi-experimental confirmation among combat companies. *Group & Organization Management*, 11(3), 133-146.
- *Ellis, A. P. J., Bell, B. S., Ployhart, R. E., & Hollenbeck, J. R. (2005). An evaluation of generic teamwork skills training with action teams: Effects on cognitive and skill-based outcomes. *Personnel Psychology*, 58, 641-672.
- Ellis, S., Mendel, R., & Nir, M. (2006). Learning from successful and failed experience: the moderating role of kind of after-event review. *Journal of Applied Psychology*, 91(3), 669-680. doi: 10.1037/0021-9010.91.3.669
- *Emmert, M. C. (2011). *Pilot test of an innovative interprofessional education assessment strategy* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (UMI No. 3520036)
- *Entin, E. E., & Serfaty, D. (1999). Adaptive team coordination. *Human Factors*, 41(2), 312-325. doi: 10.1518/001872099779591196
- Erickson, K., Côté, J., Hollenstein, T., & Deakin, J. (2011). Examining coach-athlete interactions using state space grids: An observational analysis in competitive youth sport. *Psychology of Sport and Exercise*, 12(6), 645-654. doi: 10.1016/j.psychsport.2011.06.006

- Eys, M. A., Jewitt, E., Evans, M. B., Wolf, S., Bruner, M. W., & Loughead, T. M. (2013). Coach-initiated motivational climate and cohesion in youth sport. *Research Quarterly for Exercise and Sport*, 84, 373-383.
- Eys, M. A., Lougheed, T., Bray, S. R., & Carron, A. V. (2009). Development of a cohesion questionnaire for youth: The Youth Sport Environment Questionnaire. *Journal of Sport and Exercise Psychology*, 31, 390-408.
- Eys, M.A., Patterson, M.M., Loughead, T.M., & Carron, A.V. (2006). Team building in sport. In J. Duda, D. Hackfort, & R. Lidor (Eds.), *Handbook of research in applied sport psychology: International perspectives* (pp. 219–231). Morgantown, WV: Fitness Information Technology.
- *Fandt, P. M., Richardson, W. D., & Conner, H. M. (1990). The impact of goal setting on team simulation experience. *Simulation & Gaming*, 21(4), 411–422. doi: 10.1177/104687819002100405
- Field, A. P., & Gillett, R. (2010). How to do a meta-analysis. *British Journal of Mathematical and Statistical Psychology*, 63(3), 665–694. doi:10.1348/000711010x502733
- Flesch, R. (1948). A new readability yardstick. *Journal of Applied Psychology*, 32(3), 221-233.
- Flora, D. B., & Flake, J. K. (2017). The purpose and practice of exploratory and confirmatory factor analysis in psychological research: Decisions for scale development and validation. *Canadian Journal of Behavioural Science*, 49, 78-88. doi: 10.1037/cbs0000069
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18, 382-388. doi: 10.2307/3150980

- Freeman, P., & Rees, T. (2010). Perceived social support from teammates: Direct and stress-buffering effects on self-confidence. *European Journal of Sport Sciences*, 10, 59-67.
- Freeman, P., & Rees, T. (2009). How does perceived support lead to better performance? An examination of potential mechanisms. *Journal of Applied Sport Psychology*, 21, 429-441. doi: 10.1080/10413200903222913
- *Friedlander, F. (1967). The impact of organizational training laboratories upon the effectiveness and interaction of ongoing work groups. *Personnel Psychology*, 20(3), 289-307.
- Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, 38, 69-119. doi: 10.1016/S0065-2601(06)38002-1
- *Green, L. R. (1994). *The effectiveness of tactical adaptation and coordination training on team performance in tactical scenarios*. Unpublished master's thesis, Naval Postgraduate School, Monterey, California.
- Hacker, W. (2003). Action regulation theory: A practical tool for the design of modern work processes. *European Journal of Work and Organizational Psychology*, 12, 105-130. doi: 10.1080/13594320344000075
- Hackman, J. R., & Katz, N. (2010). Group behavior and performance. In S. T. Fiske, D. T. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (pp. 1208-1251). Hoboken: John Wiley and Sons.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.

- Halevy, N., Chou, E. Y., Galinsky, A. D., & Murnighan, J. K. (2012). When hierarchy wins: Evidence from the National Basketball Association. *Social Psychological and Personality Science*, 3, 398-406. doi: 10.1177/1948550611424225
- Hardy, J., Eys, M. A., & Carron, A. V. (2005). Exploring the potential disadvantages of high cohesion in sports teams. *Small Group Research*, 36, 166-187. doi: 10.1177/1046496404266715
- Harrison, D. (2015, May 19). Todd McLellan named 14th head coach in Oilers history. *CBC Sports*. Retrieved from: www.cbc.ca.
- *Haslam, S. A., Wegge, J., & Postmes, T. (2009). Are we on a learning curve or a treadmill? The benefits of participative group goal setting become apparent as tasks become increasingly challenging over time. *European Journal of Social Psychology*, 39(3), 430-446. doi: 10.1002/ejsp.546
- Higgins J. P., & Green S. (2008). Cochrane handbook for systematic reviews of interventions (Vol. 5.1.0). *The Cochrane Collaboration*. Available from www.cochrane-handbook.org
- Hogg, M. A., & Terry, D. J. (2000). Social identity and self-categorization processes in organizational contexts. *The Academy of Management Review*, 25, 121-140.
- Holt, N. L., Knight, C. J., & Zukiwski, P. (2012). Female athletes' perceptions of teammate conflict in sport: Implications for sport psychology consultants. *The Sport Psychologist*, 26, 135-154.
- Holt, N. L., & Hoar, S. (2006). The multidimensional construct of social support. In S. Hanton, & S. D. Mellalieu (Eds.), *Literature reviews in sport psychology* (pp. 119-226). New York: Nova Science.

- Holt, N. L., & Sparks, A. C. (2001). An ethnographic study of cohesiveness in a college soccer team over a season. *The Sport Psychologist*, 15, 237-259.
- Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural Equation Modeling: Concepts, issues, and applications*. Thousand Oaks, CA: Sage.
- Hubley, A. M., & Zumbo, B. D. (1996). A dialectic on validity: Where we have been and where we are going. *The Journal of General Psychology*, 123(3), 207-215.
- Humphrey, D., & Rees, F. (Directors). (1999). *Living with lions* [documentary]. United Kingdom: Ocelot/Worldmark.
- Hunt, E. A., Shilkofski, N. A., Stavroudis, T. A., & Nelson, K. L. (2007). Simulation: Translation to improved team performance. *Anesthesiology Clinics*, 25(2), 301-319.
- *Ikomi, P. A., Boehm-Davis, D. A., Holt, R. W., & Incalcaterra, K. A. (1999). *Jump seat observations of advanced crew resource management (ACRM) effectiveness*. Paper presented at the Proceedings of the Tenth International Symposium on Aviation Psychology, Columbus, OH.
- Ilgén, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in organizations: From Input-Process-Output models to IMO models. *Annual Review of Psychology*, 56, 517-543. doi: 10.1146/annurev.psych.56.091103.070250
- Janis, I. L. (1972). *Victims of groupthink*. Boston: Houghton-Mifflin.
- *Jankouskas, T. S. (2010). *Crisis Resource Management training: Impact on team process and team effectiveness* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Order No. 3420158)

- *Jarrett, S. (2012). *The comparative effectiveness of after-action reviews in co-located and distributed team training environments* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Order No. 3532135)
- Jones, G. (2002). Performance excellence: A personal perspective on the link between sport and business. *Journal of Applied Sport Psychology*, 14, 268-281. doi: 10.1080/10413200290103554
- Jowett, S., Shanmugam, V., & Caccoulis, S. (2012). Collective efficacy as a mediator of the association between interpersonal relationships and athlete satisfaction in team sports. *International Journal of Sport and Exercise Psychology*, 10, 66-78. doi: 10.1080/1612197X.2012.645127
- Karlsson, P., & Bergmark, A. (2015). Compared with what? An analysis of control-group types in Cochrane and Campbell reviews of psychosocial treatment efficacy with substance use disorders. *Addiction*, 110(3), 420-428.
- *Kim, L. Y. (2014). *The effects of simulation-based TeamSTEPPS interprofessional communication and teamwork training on patient and provider outcomes* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (Order No. 3637609)
- Kincaid, J. P., Fishburne Jr, R. P., Rogers, R. L., & Chissom, B. S. (1975). *Derivation of new readability formulas for Navy enlisted personnel*. Naval Technical Training Command Millington TN Research Branch.
- Klein, C., DiazGranados, D., Salas, E., Le, H., Burke, C. S., Lyons, R., & Goodwin, G. F. (2009). Does team building work? *Small Group Research*, 40(2), 181–222. doi: 10.1177/1046496408328821

- Kleingeld, A., van Mierlo, H., & Arends, L. (2011). The effect of goal setting on group performance: A meta-analysis. *Journal of Applied Psychology*, 96, 1289-1304. doi: 10.1037/a0024315
- *Kring, J. P. (2005). *Communication modality and after action review performance in a distributed immersive virtual environment* (Doctoral dissertation). Retrieved from *Dissertation Abstracts International: Section B: The Sciences and Engineering*, 66(1-B). (Order No. 3162098)
- Kristiansen, E., & Roberts, G. C. (2009). Young elite athletes and social support: Coping with competitive and organizational stress in “Olympic” competition. *Scandinavian Journal of Medicine and Science in Sports*, 20, 686-695. doi: 10.1111/j.1600-0838.2009.00950.x
- Kyllo, L. B., & Landers D. M. (1995). Goal setting in sport and exercise: A research synthesis to resolve the controversy. *Journal of Sport and Exercise Psychology*, 17, 117-137.
- Lakhani, J., Benzies, K., & Hayden, K. A. (2012). Attributes of interdisciplinary research teams: A comprehensive review of the literature. *Clinical and Investigative Medicine*, 35, E260-E265.
- Latham, G. P., & Locke, E. A. (1991). Self-regulation through goal setting. *Organizational Behavior and Human Decision Processes*, 50(2), 212-247.
- Lausic, D., Tennebaum, G., Eccles, D., Jeong, A., & Johnson, T. (2009). Intrateam communication and performance in doubles tennis. *Research Quarterly for Exercise and Sport*, 80, 281-290. doi: 10.1090/02701367.2009.10599563
- LePine, J. A., Piccolo, R. F., Jackson, C. L., Mathieu, J. E., & Saul, J. R. (2008). A meta-analysis of teamwork processes: Tests of a multidimensional model and relationships with team

- effectiveness criteria. *Personnel Psychology*, 61, 273-307. doi: 10.1111/j.1744-6570.2008.00114.x
- Lewin, K. (1935). *A dynamic theory of personality*. New York: McGraw-Hill.
- Lewis, M. D., Lamey, A. V., & Douglas, L. (1999). A new dynamic systems method for the analysis of early socioemotional development. *Developmental Science*, 2(4), 457-475.
- Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American Psychologist*, 57, 705-717. doi: 10.1037/0003-066X.57.9.705
- Longenecker, C. O., Scazzero, J. A., & Stansfield, T. T. (1994). Quality improvement through team goal setting, feedback, and problem solving: A field experiment. *International Journal of Quality & Reliability Management*, 11(4), 45-52. doi: 10.1108/02656719410057944
- Maas, C. J., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology*, 1(3), 86-92.
- MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1(2), 130-149.
- Magyar, T. M., Feltz, D. L., & Simpson, I. P. (2004). Individual and crew level determinants of collective efficacy in rowing. *Journal of Sport and Exercise Psychology*, 26, 136-153.
- Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *The Academy of Management Review*, 26, 356-376. doi: 10.2307/259182

- Marks, M. A., & Panzer, F. J. (2004). The influence of team monitoring on team processes and performance. *Human Performance*, 17, 25-41. doi: 10.1207/S15327043HUP1701_2
- *Marshall, S., Harrison, J., & Flanagan, B. (2009). The teaching of a structured tool improves the clarity and content of interprofessional clinical communication. *Quality & Safety in Health Care*, 18(2), 137. doi: 10.1136/qshc.2007.025247
- Martin, L. J., Carron, A. V., & Burke, S. M. (2009). Team building interventions in sport: A meta-analysis. *Sport and Exercise Psychology Review*, 5, 3-18.
- *Martinez-Moreno, E., Zornoza, A., Orengo, V., & Thompson, L. F. (2015). The effects of team self-guided training on conflict management in virtual teams. *Group Decision and Negotiation*, 905-923. doi: 10.1007/s10726-014-9421-7
- Mathieu, J. M., Heffner, T. S., Goodwin, G. F., Cannon-Bowers, J. A., & Salas, E. (2005). Scaling the quality of teammates' mental models: Equifinality and normative comparisons. *Journal of Organizational Behavior*, 26, 37-56. doi: 10.1002/job.296
- Mathieu, J. M., Maynard, T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management*, 34, 410-476. doi: 10.1177/0149206308316061
- Mathieu, J. E., & Rapp, T. L. (2009). Laying the foundation for successful team performance trajectories: The roles of team charters and performance strategies. *Journal of Applied Psychology*, 94(1), 90-103. doi: 10.1037/a0013257
- McCarthy, P. J., Jones, M. V., & Clark-Carter, D. (2008). Understanding enjoyment in youth sport: A developmental perspective. *Psychology of Sport and Exercise*, 9, 142-156. doi: 10.1016/j.psychsport.2007.01.005

- *McCulloch, P., Mishra, A., Handa, A., Dale, T., Hirst, G., & Catchpole, K. (2009). The effects of aviation-style non-technical skills training on technical performance and outcome in the operating theatre. *Quality and Safety in Health Care*, 18, 109–115. doi: 10.1136/qshc.2008.032045
- McEwan, D., & Beauchamp, M. R. (2014). Teamwork in sport: A theoretical and integrative review. *International Review of Sport and Exercise Psychology*, 7(1), 229-250. doi: 10.1080/1750984X.2014.932423
- McEwan, D., Ruissen, G. R., Eys, M. A., Zumbo, B. D., & Beauchamp, M. R. (2017). The effectiveness of teamwork training on teamwork behaviors and team performance: A systematic review and meta-analysis of controlled interventions. *PLOS ONE*, 12(1), e0169604. doi: 10.1371/journal.pone.0169604
- McEwan, D., Waldhauser, K., Faulkner, G., & Beauchamp, M. R. (under review). A scoping review of teamwork training interventions. *Manuscript submitted for peer-review*.
- McGrath, J. E. (1964). *Social psychology: A brief introduction*. New York: Holt, Rinehart & Winston.
- Mellalieu, S., Shearer, D. A., & Shearer, C. (2013). A preliminary survey of interpersonal conflict at major games and championships. *The Sport Psychologist*, 27, 120-129.
- Messick, S. (1995). Validity of psychological assessment: Validation of inferences from persons' responses and performances as scientific inquiry into score meaning. *American Psychologist*, 50(9), 741-749.
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 42-52.

- *Morey, J. C., Simon, R., Jay, G. D., Wears, R. L., Salisbury, M., Dukes K. A., & Berns, S. D. (2002). Error reduction and performance improvement in the emergency department through formal teamwork training: Evaluation results of the MedTeams project. *Health Services Research, 37*(6), 1553-1581. doi: 10.1111/1475-6773.01104
- Morgan, P. B. C., Fletcher, D., & Sarkar, M. (2013). Defining and characterizing team resilience in elite sport. *Psychology of Sport and Exercise, 14*, 549-559.
- Murphy-Mills, J., Bruner, M. W., Erickson, K., & Côté, J. (2011). The utility of the state space grid method for studying peer interactions in youth sport. *Journal of Applied Sport Psychology, 23*(2), 159-174.
- Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide, Version 8*. Los Angeles, CA: Muthén & Muthén.
- Muthén, B. O., & Satorra, A. (1995). Complex sample data in structural equation modeling. *Sociological Methodology, 25*, 267-316. doi: 10.2307/271070
- Myers, N. D., Feltz, D. L., & Short, S. E. (2004). Collective efficacy and team performance: A longitudinal study of collegiate football teams. *Group Dynamics: Theory, Research, and Practice, 8*, 126-138. doi: 10.1037/1089-2699.8.2.126
- National Sporting Goods Association (2011). 2011 vs 2001 Youth Sports Participation. Retrieved August 26, 2013 from http://www.nsga.org/files/public/2011vs2001_Youth_Participation_website.pdf
- O'Dea, A., O'Connor, P., & Keogh, I. (2014). A meta-analysis of the effectiveness of crew resource management training in acute care domains. *Postgraduate Medical Journal, 90*(1070), 699–708. doi: 10.1136/postgradmedj-2014-132800

*O’Leary, K. J., Haviley, C., Slade, M. E., Shah, H. M., Lee, J., & Williams, M. V. (2011).

Improving teamwork: Impact of structured interdisciplinary rounds on a hospitalist unit.

Journal Of Hospital Medicine, 6(2), 88–93. doi: 10.1002/jhm.714

*Padmo Putri, D. A. (2012). *The effect of communication strategy and planning intervention on*

the processes and performance of course material development teams (Doctoral

dissertation). Retrieved from Dissertation Abstracts International Section A: Humanities

and Social Sciences. (UMI No. 3519429)

Paradis, K. F., & Martin, L. J. (2013). Team building in sport: Linking theory and research to

practical application. *Journal of Sport Psychology in Action*, 3, 159-170. doi:

10.1080/21520704.2011.653047

Pentland, A. (2013). The new science of building great teams: The chemistry of high-performing

groups is no longer a mystery. In *Harvard Business Review’s 10 Must Reads on Teams*

(pp. 1-20). Boston: Harvard Business School Publishing Corporation.

Peters, G-J. Y., de Bruin, M., & Crutzen, R. (2015). Everything should be as simple as possible,

but no simpler: Towards a protocol for accumulating evidence regarding the active

content of health behaviour change interventions. *Health Psychology Review*, 9(1) 1-14.

doi: 10.1080/17437199.2013.848409

Porter, C. O. L. H., Hollenbeck, J. R., Ilgen, D. R., Ellis, A. P. J., West, B. J., & Moon, H.

(2003). Backing up behaviors in teams: The role of personality and legitimacy of need.

Journal of Applied Psychology, 88, 391-403. doi: 10.1037/0021-9010.88.3.391

Prapavessis, H., & Carron, A. V. (1997). Sacrifice, cohesion, and conformity to norms in sport

teams. *Group Dynamics: Theory, Research, and Practice*, 1, 231-240. doi: 10.1037/1089-

2699.1.3.231

- Prapavessis, H., Carron, A. A., & Spink, K. S. (1996). Team building in sport. *International Journal of Sport Psychology*, 27, 269-285.
- *Prichard, J. S., & Ashleigh, M. J. (2007). The effects of team-skills training on transactive memory and performance. *Small Group Research*, 38(6), 696-726. doi: 10.1177/1046496407304923
- Prince, C., & Salas, E. (1993). Training and research for teamwork in the military aircrew. In E. Wiener, B. Kanki, & R. Helmreich (Eds.), *Cockpit resource management* (pp. 337-366). San Diego, CA: Academic Press.
- *Rapp, T. L., & Mathieu, J. E. (2007). Evaluating an individually self-administered generic teamwork skills training program across time and levels. *Small Group Research*, 38(4), 532-555. doi: 10.1177/1046496407300479
- Rasker, P. C., Post, W. M., & Schraagen, M. C. (2000). Effects of two types of intra-team feedback on developing a shared mental model in command and control teams. *Ergonomics*, 43, 1167-1189. doi: 10.1080/00140130050084932
- Reimer, H. A., & Chelladurai, P. (1998). Development of the Athlete Satisfaction Questionnaire (ASQ). *Journal of Sport and Exercise Psychology*, 20, 127-156.
- Rosenberg, M. S. (2005). The file-drawer problem revisited: A general weighted method for calculating fail-safe numbers in meta-analysis. *Evolution*, 59(2), 464. doi:10.1554/04-602
- Rosenfeld, L. B., & Richman, J. M. (1997). Developing effective social support: Team building and the social support process. *Journal of Applied Sport Psychology*, 9, 133-153. doi: 10.1080/10413209708415388
- Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, 86(3), 638-641. doi:10.1037/0033-2909.86.3.638

- Rousseau, V., Aubé, C., & Savoie, A. (2006). Teamwork behaviors: A review and integration of frameworks. *Small Group Research*, 37, 540-570. doi: 10.1177/1046496406293125
- Rovio, E., Eskola, J., Kozub, S. A., Duda, J. L., & Lintunen, T. (2009). Can high group cohesion be harmful?: A case study of a junior ice-hockey team. *Small Group Research*, 40, 421-435. doi: 10.1177/1046496409334359
- Salas, E., DiazGranados, D., Klein, C., Burke, C. S., Stagl, K. C., Goodwin, G. F., & Halpin, S. M. (2008). Does team training improve team performance? A meta-analysis. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 50, 903-933. doi: 10.1518/001872008X375009
- Salas, E., Nichols, D. R., & Driskell, J. E. (2007). Testing three team training strategies in intact teams: A meta-analysis. *Small Group Research*, 38(4), 471-488.
doi:10.1177/1046496407304332
- Scanlan, T. K., Carpenter, P. J., Schmidt, G. W., Simons, J. P., & Keeler, B. (1993). An introduction to the Sport Commitment Model. *Journal of Sport and Exercise Psychology*, 15, 1-15.
- Schulz-Hardt, S., Jochims, M., & Frey, D. (2002). Productive conflict in group decision making: Genuine and contrived dissent as strategies to counteract biased information seeking. *Organizational Behavior and Human Decision Processes*, 88, 563-586. doi: 10.1016/S0749-5978(02)00001-8
- Schurig, I. A. (2013). *An investigation of the effect of after-action reviews on teams' performance-efficacy relationships*. Retrieved from Dissertation Abstracts International: Section B: The Sciences and Engineering. (Accession or Order No. 3524760)

- Senecal, J., Loughead, T. M., & Bloom, G. A. (2007). A season-long team-building intervention: Examining the effect of team goal setting on cohesion. *Journal of Sport and Exercise Psychology, 30*, 186-199.
- Short, S. E., Sullivan, P., & Feltz, D. L. (2005). Development and preliminary validation of the collective efficacy questionnaire for sports. *Measurement in Physical Education and Exercise Science, 9*(3), 181-202.
- Sibbald, B., & Roland, M. (1998). Understanding controlled trials. Why are randomised controlled trials important?. *BMJ: British Medical Journal, 316*, 201.
- *Siegel, A. I., & Federman, P. J. (1973). Communications content training as an ingredient in effective team performance. *Ergonomics, 16*(4), 403–416. doi: 10.1080/0014013730892453)
- *Sikorski, E. G., Johnson, T. E., & Ruscher, P. H. (2012). Team knowledge sharing intervention effects on team shared mental models and student performance in an undergraduate science course. *Journal of Science Education and Technology, 21*(6), 641–651. doi: 10.1007/s10956-011-9353-9
- Sinclair, A. L. (2003). The effects of justice and cooperation on team effectiveness. *Small Group Research, 34*, 74-100. doi: 10.1177/1046496402239578
- Smith, J. D. (2012). Single-case experimental designs: A systematic review of published research and current standards. *Psychological Methods, 17*, 510–550. doi:10.1037/a0029312
- Smith, G. T. (2005). On construct validity: issues of method and measurement. *Psychological Assessment, 17*(4), 396-408. doi: 10.1037/1040-3590.17.4.396

- Smith, M. J., Arthur, C. A., Hardy, J., Callow, N., & Williams, D. (2013). Transformational leadership and task cohesion in sport: The mediating role of intrateam communication. *Psychology of Sport and Exercise, 14*, 249-257. doi: 10.1016/j.psychsport.2012.10.002
- Smith, K. G., Locke, E. A., & Barry, D. (1990). Goal setting, planning, and organizational performance: An experimental simulation. *Organizational Behavior and Human Decision Processes, 46*, 118–134.
- *Smith-Jentsch, K. A., Cannon-Bowers, J. A., Tannenbaum, S. I., & Salas, E. (2008). Guided team self-correction: Impacts on team mental models, processes, and effectiveness. *Small Group Research, 39*, 303-327. doi: 10.1177/1046496408317794
- *Smith-Jentsch, K. A., Salas, E., & Baker, D. P. (1996). Training team performance-related assertiveness. *Personnel Psychology, 49*(4), 909–936. doi: 10.1111/j.1744-6570.1996.tb02454.x
- Social Sciences and Humanities Research Council (2017). Sport participation research initiative. Retrieved July 30, 2017 from www.sshrc-crsh.gc.ca/funding-financement/programs-programmes/sport_can-eng.aspx.
- Stevens, M. J., & Campion, J. A. (1999). Staffing work teams: Development and validation of a selection test for teamwork settings. *Journal of Management, 25*, 207-228.
- *Stout, R. J., Salas, E., & Fowlkes, J. E. (1997). Enhancing teamwork in complex environments through team training. *Group Dynamics: Theory, Research, and Practice, 1*(2), 169–182. doi: 10.1037/1089-2699.1.2.169
- Sullivan, P. & Feltz, D. L. (2003). The preliminary development of the Scale for Effective Communication in Team Sports (SECTS). *Journal of Applied Social Psychology, 33*, 1693-1715. doi: 10.1111/j.1559-1816.2003.tb01970.x

- Sullivan, P. J., & Feltz, D. (2001). The relationship between intrateam conflict and cohesion within hockey teams. *Small Group Research*, 32, 342-355. doi: 10.1177/104649640103200304
- Swaab, R. I., Schaerer, M., Anicich, E. M., Ronay, R., & Galinsky, A. D. (2014). The too-much-talent effect: Team interdependence determines when more talent is too much or not enough. *Psychological Science*, 25(8), 1581-1591. doi: 10.1177/0956797614537280
- Tamminen, K. A., & Gaudreau, P. (2014). Coping, social support, and emotion regulation in teams. In M. R. Beauchamp & M. A. Eys (Eds.), *Group dynamics in exercise and sport psychology: Contemporary themes (2nd ed.)*. New York: Routledge.
- Tannenbaum, S. I., & Cerasoli, C. P. (2013). Do team and individual debriefs enhance performance? A meta-analysis. *Human Factors*, 55(1), 231–245. doi: 10.1177/0018720812448394
- Tekleab, A. G., Quigley, N. R., & Tesluk, P. E. (2009). A longitudinal study of team conflict, conflict management, cohesion, and team effectiveness. *Group and Organization Management*, 34, 170-205. doi: 10.1177/1059601108331218
- Thomas, E. J., Taggart, B., Crandell, S., Lasky, R. E., Williams, A. L., ... & Helmreich, R. L. (2007). Teaching teamwork during the Neonatal Resuscitation Program: A randomized trial. *Journal of Perinatology*, 27(7), 409-414.
- Totterdell, P. (2000). Catching moods and hitting runs: Mood linkage and subjective performance in professional sport teams. *Journal of Applied Psychology*, 85, 848-859.
- *Villado, A. J., & Arthur Jr, W. (2013). The comparative effect of subjective and objective after-action reviews on team performance on a complex task. *Journal of Applied Psychology*, 98(3), 514-528. doi: 10.1037/a0031510

- *Volpe, C. E., Cannon-Bowers, J. A., Salas, E., & Spector, P. E. (1996). The impact of cross-training on team functioning: An empirical investigation. *Human Factors*, 38(1), 87–100. doi: 10.1518/001872096778940741
- Ward, P. (1997). *360-degree feedback*. London: Institute of Personnel and Development.
- *Weaver, S. J., Rosen, M. A., DiazGranados, D., Lazzara, E. H., Lyons, R., Salas, E., ... King, H. B. (2010). Does teamwork improve performance in the operating room? A multilevel evaluation. *Joint Commission Journal on Quality and Patient Safety*, 36(3), 133–142.
- *Wegge, J., & Haslam, S. A. (2005). Improving work motivation and performance in brainstorming groups: The effects of three group goal-setting strategies. *European Journal of Work and Organizational Psychology*, 14(4), 400-430. doi: 10.1080/13594320500349961
- *Weller, J. M., Torrie, J., Boyd, M., Frengley, R., Garden, A., ... & Frampton, C. (2014). Improving team information sharing with a structured call-out in anaesthetic emergencies: A randomized controlled trial. *British Journal of Anaesthesia*, 112(6), 1042-1049. doi: 10.1093/bja/aet579
- Wilczenski, F. L., Bontrager, T., Ventrone, P., & Correia, M. (2001). Observing collaborative problem-solving processes and outcomes. *Psychology in the Schools*, 38, 269-281. doi: 10.1002/pits.1017
- Willis, G. (2005). *Cognitive interviewing: A tool for improving questionnaire design*. Thousand Oaks, CA: Sage.
- Wittenbaum, G. M., Hollingshead, A. B., Paulus, P. B., Hirokawa, R. Y., Ancona, D. G., Peterson, R. S., et al. (2004). The functional perspective as a lens for understanding groups. *Small Group Research*, 35, 17-43. doi: 10.1177/1046496403259459

- Wu, A. D., & Zumbo, B. D. (2008). Understanding and using mediators and moderators. *Social Indicators Research*, 87(3), 367-392.
- Yeatts, D. E., & Hyten, C. (1998). *High-performing self-managed work teams*. Thousand Oaks: Sage.
- Yukelson, D. (1997). Principles of effective team building interventions in sport: A direct services approach at Penn State University. *Journal of Applied Sport Psychology*, 9, 73-96. doi: 10.1080/10413209708415385
- Zumbo, B. D., Gadermann, A. M., & Zeisser, C. (2007). Ordinal versions of coefficients alpha and theta for Likert rating scales. *Journal of Modern Applied Statistical Methods*, 6(1), 21-29.

ELITE & RECREATIONAL ATHLETES NEEDED!



What's Involved?

This study involves completing a questionnaire about your experiences on your sports team and answering questions (in a focus group format) from a questionnaire that we are developing to assess teamwork in sports. It is anticipated that this will take approximately **45-60 minutes** of your time. This study is being conducted through the Psychology of Exercise, Health, & Physical Activity Laboratory within UBC's School of Kinesiology.

Am I Eligible to Participate?

We are currently looking for adults who are 18+ to participate in this study. If you would like to participate, **please contact Desi at the email address listed below**. Data collection will begin in July.

What are the Benefits of Participating in this Study?

Participants will be given **\$10** for their participation.

What are the Risks Associated with this Study?

There are **no** known risks associated with participating in this study.

Will the information I Provide Remain Confidential?

Only **limited confidentiality** can be offered as the investigators cannot control what other participants, that take part in focus groups, do with the information discussed. Regardless, the information we will be discussing will not be of a sensitive nature; we are simply looking to get some feedback on some questionnaire items (about team sports) that we have developed.

Appendix B: Letter of Information for Study 2 – Athlete Review (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan
School of Kinesiology
University of British Columbia

Project Title: Assessing the Content Validity of the Multidimensional Assessment of Teamwork in Sports (MATS)

Purpose: The purpose of this study is to refine and pretest a preliminary measure of *teamwork in sports*.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. Able to read and converse in English
2. Currently or recently (within one year) part of a sports team as a coach or athlete

Involvement: Should you choose to participate, we will ask you to complete a questionnaire and answer a few follow-up questions about this questionnaire in a small focus group setting. The discussions that take place within these focus groups will be tape recorded and transcribed for analysis. Your participation should take approximately 45-60 minutes.

Benefits: To compensate you for your time, participants will be given \$10.

Confidentiality: Any information that you provide within these discussions will be made anonymous. This means that no information that can identify you will be made available within any reports that may result from this research. Completed data (i.e., questionnaires, audio tapes) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310). All computer files will be kept on an encrypted removable drive in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym). We will make sure that any recordings (e.g., tape recordings, written records) of our discussions are not heard or read by anyone other than researchers involved with this study. You should note that we cannot control what other participants do with the information discussed in these focus groups (i.e., speak with

others outside of the group), and as such if there is anything you'd like to share with us in confidence that you do so after the focus group session (i.e., on a one-on-one basis).

Participation: Participation in this study is voluntary and individuals may decline to answer any question(s) that they choose. There are no known psychological or physical risks associated with participation. You may choose to decline or withdraw your participation at any time throughout the course of the study.

We want to hear your opinion on these issues. There are no right or wrong answers. There are no good or bad answers and this is NOT a test. Your answers are very important to us so please make sure you answer honestly.

If for ANY reason, you do not want to take part in this study that's fine, you don't have to. It is up to you if you want to take part or not. You are also free to withdraw at any time without having to give any reason. If you drop out you will not experience ANY negative consequences at all.

Should you have any further questions concerning the study, please feel free to contact either Desi McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desi McEwan by the Social Sciences and Humanities Research Council of Canada.

Thank you for your help,

Desi McEwan, MSc & Mark Beauchamp, PhD

Appendix C: Consent Form for Study 2 – Athlete Review (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Consent Form

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan, MSc
School of Kinesiology
University of British Columbia

Project Title: Assessing the Content Validity of the Multidimensional Assessment of Teamwork in Sports (MATS)

Purpose: The purpose of this study is to refine and pretest a preliminary measure of *teamwork in sports*.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. Able to read and converse in English
2. Currently or recently (within one year) part of a sports team

Involvement: Should you choose to participate, we will ask you to complete a short questionnaire and answer a few follow-up questions about this questionnaire in a small focus group setting. The discussions that take place within these focus groups will be tape recorded and transcribed for analysis. Your participation should take approximately 45-60 minutes.

Benefits: Should you choose to participate, you will be given \$10 to compensate you for your time and effort.

Confidentiality: Any information that you provide within these discussions will be made anonymous. This means that no information that can identify you will be made available within any reports that may result from this research. Completed data (i.e., questionnaires, audio tapes) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310). All computer files will be kept on a secured password-protected computer in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym). We will make sure that any recordings (e.g., tape recordings, written records) of our discussions are not heard or read by anyone other than researchers involved with this study. You should note that we cannot control what other participants do with the information discussed in these focus groups

(i.e., speak with others outside of the group), and as such if there is anything you'd like to share with us in confidence that you do so after the focus group session (i.e., on a one-on-one basis).

Participation: Participation in this study is voluntary and individuals may decline to answer any question(s) that they choose. There are no known psychological or physical risks associated with participation. You may choose to decline or withdraw your participation at any time throughout the course of the study.

If for ANY reason, you do not want to take part in this study, that's fine; you don't have to. It is up to you if you want to take part or not. You are also free to withdraw at any time without having to give any reason. If you drop out you will not experience ANY negative consequences at all.

Should you have any further questions concerning the study please feel free to contact either Desmond McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desmond McEwan by the Social Sciences and Humanities Research Council of Canada.

***Consent:** By signing below, I am acknowledging that the study has been explained to me, I understand what is involved, and I agree to take part in this study. It also means that I understand that my participation in this study is entirely my choice, and that I may pull out from the study at any time without having to give any reason for doing so and without experiencing any negative consequences. I understand that that if I do not wish to answer any question or discuss any topic that is raised, I may refuse to answer and the interviewer will go on to the next question.*

By signing this form you have consented to participate in this study.

SIGNED.....

NAME IN BLOCK LETTERS.....

DATE.....

**Appendix D: Demographic Form for Study 2 – Athlete Review & Study 3 (Chapter 3);
Study 6 (Chapter 6)**

Demographic Form

1. What is your age (years)? _____
2. If you are in grade school, what grade are you in? _____
3. Gender (check one): ☐ Male ☐ Female
4. What is the highest level of education you have completed?
☐ Some grade school ☐ Some college/university ☐ Some graduate school
☐ High school diploma ☐ College diploma/university degree ☐ Graduate degree
5. What sport do you currently play/coach? For the purposes of this questionnaire, PLEASE PROVIDE **ONE** ONLY: _____
6. What is the name of the team for which you currently play/coach? For the purposes of this questionnaire, PLEASE PROVIDE **ONE** ONLY and answer questions based on this team:

7. What level of competition does this team play at? PLEASE PROVIDE **ONE** ONLY.
☐ Recreational/house league ☐ Local Elite/Rep ☐ University/college
☐ Provincial team ☐ National team ☐ Professional
8. How long have you been part of this team (months and years)? _____

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

Appendix E: Version 1 of the MATS (Pre-Focus Group, Chapter 3)

In this section, we would like you to describe the team with whom you currently compete. To answer each question, please circle the number that best describes what you think. **If a question is irrelevant, or if you are unsure or do not know the answer, leave the answer blank.** Please be as honest as possible, and answer your level of agreement with each statement. None of your coaches or teammates will be able to see your answers on this questionnaire at any time.

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to your team's **overall purpose/reasons for coming together**.

Please rate your level of agreement for each item from 1 to 5.

1. Our team has defined a clear overall purpose for being together	1	2	3	4	5
2. Our team has identified a mission that all members agree on	1	2	3	4	5
3. We have specified an appropriate reason for coming together as a team	1	2	3	4	5
4. We have thoroughly analyzed what our team's objectives are	1	2	3	4	5
5. Our team has established team objectives to which we are all committed	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to **team goals that your team strives to obtain** in order to achieve the team's overall purpose(s).

Please rate your level of agreement for each item from 1 to 5.

1. Our team identifies specific levels of performance that are required in order to achieve our team objectives	1	2	3	4	5
2. We set challenging team goals	1	2	3	4	5
3. Our team sets appropriate goals	1	2	3	4	5
4. We establish goals with which all teammates agree	1	2	3	4	5
5. Our team sets goals that are clearly understood by all teammates	1	2	3	4	5
6. Our team sets specific goals to which all members are committed	1	2	3	4	5

The following items relate to **plans of actions that your team establishes** in order to achieve the team's goals.

Please rate your level of agreement for each item from 1 to 5.

1. We make action plans that specify how we will achieve our team goals	1	2	3	4	5
2. Our team develops effective strategies	1	2	3	4	5
3. We map out team strategies that we all agree on	1	2	3	4	5
4. Our team takes note of the most important things that need to be done to be successful	1	2	3	4	5
5. We identify specific responsibilities that each member must fulfill within the team	1	2	3	4	5
6. Our team develops action plans that are clearly understood by all team members	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to team members' **coordination with each other as your team performs its sport**.

Please rate your level of agreement for each item from 1 to 5.

1. Overall, team members coordinate well with each other	1	2	3	4	5
2. Teammates' actions are executed in harmony with each other	1	2	3	4	5
3. Team members are in the correct physical position while executing their assignments	1	2	3	4	5
4. Team members execute their jobs at the correct time	1	2	3	4	5
5. Each team member's actions are properly sequenced with each other	1	2	3	4	5

The following items relate to team members' **cooperation with each other as your team performs its sport**.

Please rate your level of agreement for each item from 1 to 5.

1. In general, team members work well together	1	2	3	4	5
2. Teammates work together as one	1	2	3	4	5
3. Our team performs as a united team rather than a bunch of individuals	1	2	3	4	5
4. Teammates help each other when completing team tasks	1	2	3	4	5
5. All team members execute their duties with full effort	1	2	3	4	5
6. Each member does anything that needs to be done for us to be success	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to team members' **communication with each other as your team performs its sport**.

Please rate your level of agreement for each item from 1 to 5.

1. Our team communicates well during competition	1	2	3	4	5
2. Team members communicate an appropriate amount with each other	1	2	3	4	5
3. The communication between teammates is effective	1	2	3	4	5
4. Teammates communicate clearly with each other	1	2	3	4	5
5. Teammates communicate in a manner that is easy to understand	1	2	3	4	5
6. Teammates communicate with each other at appropriate times	1	2	3	4	5

The following items relate to your team **monitoring its progress towards achieving the team's purpose(s)**.

Please rate your level of agreement for each item from 1 to 5.

1. Our team monitors how well we are performing	1	2	3	4	5
2. We evaluate our progression towards team goal accomplishment	1	2	3	4	5
3. Team members assess how they are performing individually	1	2	3	4	5
4. Teammates keep track of how other members are performing	1	2	3	4	5
5. Our team appraises which performances have been successful	1	2	3	4	5
6. We assess which performances have been unsuccessful	1	2	3	4	5
7. Our team actively makes note of what still needs to be done in order to accomplish our goals	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to **monitoring environmental conditions that can affect the accomplishment of the team's purpose(s)**, such as changes in personnel (e.g., coaches, players), resources (e.g., funding, equipment, training facilities), and external factors (e.g., different playing conditions, weather).

Please rate your level of agreement for each item from 1 to 5.

1. Our team monitors any variables that may affect how well we perform	1	2	3	4	5
2. We keep track of changes in personnel that occur within our team	1	2	3	4	5
3. We actively make note of the resources available to our team	1	2	3	4	5
4. Our team evaluates different playing conditions we might confront during competition	1	2	3	4	5

The following items relate to the ways in which your team **solves performance-related challenges**.

Please rate your level of agreement for each item from 1 to 5.

1. If we are not performing well as a team, we discuss how we will improve	1	2	3	4	5
2. All team members contribute ideas for how our team's performance can get better	1	2	3	4	5
3. If we are unsuccessful as a team, members identify the reasons for this underperformance	1	2	3	4	5
4. As a team, we consider a wide variety of potential solutions to problems in team performance	1	2	3	4	5
5. Our team implements solutions that improve our team's performance	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to the ways in which your **team modifies its approaches**.

Please rate your level of agreement for each item from 1 to 5.

1. Our team uses different approaches to doing things when previous strategies are unsuccessful	1	2	3	4	5
2. We are flexible in adjusting our team strategies as necessary	1	2	3	4	5
3. If our team is not performing well, we identify innovative approaches to improve	1	2	3	4	5
4. If we are unsuccessful, our team responds quickly with adjustments in our strategies	1	2	3	4	5
5. Our team makes use of innovative tactics	1	2	3	4	5

The following items relate to the ways in which teammates **provide assistance to each other**.

Please rate your level of agreement for each item from 1 to 5.

1. Teammates help each other to improve their personal performances	1	2	3	4	5
2. Teammates go out of their way to help other members improve their performance	1	2	3	4	5
3. Members of this team openly receive assistance from teammates to improve their performances	1	2	3	4	5
4. Teammates fill in for each other whenever necessary	1	2	3	4	5
5. Team members take on teammates' responsibilities as required	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to **verbal coaching that occurs between teammates**.

Please rate your level of agreement for each item from 1 to 5.

1. Teammates provide feedback to each other about how to improve individuals' performance	1	2	3	4	5
2. Members of this team make time to provide constructive advice to their teammates	1	2	3	4	5
3. Members of this team willingly receive constructive advice from teammates	1	2	3	4	5
4. Team members discuss how to overcome individual performance errors that have been made	1	2	3	4	5

The following items relate to ways in which teammates **help each other if they are experiencing personal difficulties**, such as providing emotional support (e.g., listening or comforting), esteem support (e.g., pointing out a teammate's capabilities to improve his/her confidence), informational support (e.g., providing advice for resolving personal difficulties), and tangible support (e.g., providing rides to practice).

Please rate your level of agreement for each item from 1 to 5.

1. Members of this team provide emotional support to each other	1	2	3	4	5
2. Teammates encourage one another to feel confident about themselves	1	2	3	4	5
3. Team members provide helpful advice to each other	1	2	3	4	5
4. Teammates provide practical assistance to each other when their teammates need help	1	2	3	4	5

Use the following rating scale to answer all items:

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

The following items relate to ways in which teammates **resolve conflicts with each other**.

Please rate your level of agreement for each item from 1 to 5.

1. Our team resolves conflicts between teammates effectively	1	2	3	4	5
2. Teammates directly address disagreements with each other	1	2	3	4	5
3. Team members work through conflict openly	1	2	3	4	5
4. Conflicts between team members are managed in a respectful manner	1	2	3	4	5
5. Teammates try to find solutions to conflicts that are best for the team	1	2	3	4	5
6. Disagreements are resolved efficiently on this team	1	2	3	4	5

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

Appendix F: Version 2 of the MATS (Pre-Expert Review, Chapter 3)

In these sections, we would like you to describe the team with which you currently compete. To answer each question, please circle the number that best describes your level of agreement with each statement.

If a question is irrelevant or you are unsure of the answer, leave the answer blank.

Please be as honest as possible. None of your coaches or teammates will be able to see your personal answers to this questionnaire at any time.

A. The following items relate to your team's **overall mission/purpose for being together** (e.g., to win a league championship, to qualify for an event/tournament/playoff round, to have fun).

Please rate your level of agreement for each item from 1 to 7.

1. Our team has identified a clear overall purpose for being together	1	2	3	4	5	6	7
2. We have analyzed what our team's purpose should be	1	2	3	4	5	6	7
3. We have defined a team purpose that is appropriate to us	1	2	3	4	5	6	7
4. Our team has specified a mission on which all members agree	1	2	3	4	5	6	7
5. Our team has established a team mission to which we are all committed	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

B. The following items relate to **group goals that your team sets in order to achieve the team's overall mission/purpose** (e.g., number of runs scored and conceded in baseball, race times in rowing, percentage of legal body checks in hockey).

Please rate your level of agreement for each item from 1 to 7.

1. Our team identifies specific team goals in order to achieve our team mission	1	2	3	4	5	6	7
2. We set challenging team goals	1	2	3	4	5	6	7
3. Our team specifies goals that are appropriate to us	1	2	3	4	5	6	7
4. We set team goals that are clearly understood by all members	1	2	3	4	5	6	7
5. Our team sets goals to which all members are committed	1	2	3	4	5	6	7
6. We establish goals on which all teammates agree	1	2	3	4	5	6	7

C. The following items relate to **strategies/action plans that your team establishes in order to achieve the team goals** (e.g., tactics for an upcoming competition, drills to improve team members' skills, members' training regimens).

Please rate your level of agreement for each item from 1 to 7.

1. We make action plans for how we will achieve our team goals	1	2	3	4	5	6	7
2. Our team develops strategies on which we all agree	1	2	3	4	5	6	7
3. Our team prioritizes the most important things that need to be done to be successful	1	2	3	4	5	6	7
4. We identify specific responsibilities for each member	1	2	3	4	5	6	7
5. Our team develops action plans that are clearly understood by all members	1	2	3	4	5	6	7
6. Our team creates backup plans in case our original strategies prove unsuccessful.	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

D. The following items relate to team members' **coordination with each other WHILE PLAYING your sport** (e.g., basketball players being in the correct position on the court when completing a play, football quarterbacks being in sync with their receivers, a track team exchanging the baton with the correct timing).

Please rate your level of agreement for each item from 1 to 7.

1. Overall, team members coordinate well with each other	1	2	3	4	5	6	7
2. Team members are in the correct physical position while executing their tasks	1	2	3	4	5	6	7
3. Team members execute their jobs with the correct timing	1	2	3	4	5	6	7
4. Each team members' actions are properly sequenced with each other	1	2	3	4	5	6	7

E. The following items relate to team members' **cooperation with each other WHILE PLAYING your sport** (e.g., rugby players working together during a scrum to push the ball forward, basketball players helping a teammate defend his/her check).

Please rate your level of agreement for each item from 1 to 7.

1. In general, team members work well together	1	2	3	4	5	6	7
2. Team members work together as one unit rather than a bunch of individuals	1	2	3	4	5	6	7
3. Teammates help each other as needed	1	2	3	4	5	6	7
4. All team members execute their duties with full effort	1	2	3	4	5	6	7
5. Members do anything that is necessary for the team's benefit	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

F. The following items relate to team members' **communication with each other WHILE PLAYING your sport** (e.g., soccer players talking to each other while defending, curling skips and sweepers exchanging information during a shot).

Please rate your level of agreement for each item from 1 to 7.

1. Our team communicates well with each other	1	2	3	4	5	6	7
2. Teammates communicate the appropriate amount with each other	1	2	3	4	5	6	7
3. Teammates communicate effectively with each other	1	2	3	4	5	6	7
4. Team members communicate in a clear manner	1	2	3	4	5	6	7
5. Team members communicate in a time-efficient manner	1	2	3	4	5	6	7
6. Teammates communicate at the appropriate times	1	2	3	4	5	6	7

G. The following items relate to your team **monitoring its performance** (e.g., whether the team is on track to achieving its goals/purposes).

Please rate your level of agreement for each item from 1 to 7.

1. Our team monitors its performance	1	2	3	4	5	6	7
2. We evaluate our progression towards team goal accomplishment	1	2	3	4	5	6	7
3. We assess how we are all performing as individuals	1	2	3	4	5	6	7
4. We assess which performances have been successful	1	2	3	4	5	6	7
5. We assess which performances have been unsuccessful	1	2	3	4	5	6	7
6. Our team makes note of what we still need to do in order to accomplish our goals	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

H. The following items relate to the team's **monitoring of conditions that can affect the accomplishment of the team's purpose(s)**, such as important situations during competitions (e.g., the score, your team's present situation), personnel (e.g., player/coaching changes), and various external factors (e.g., available team resources, playing conditions).

Please rate your level of agreement for each item from 1 to 7.

1. Our team keeps track of information that can impact our performance	1	2	3	4	5	6	7
2. Our team stays aware of important situations that occur during competition	1	2	3	4	5	6	7
3. We monitor changes in personnel that occur within our team	1	2	3	4	5	6	7
4. Our team monitors external factors that may affect us	1	2	3	4	5	6	7

I. The following items relate to the ways in which your team **solves performance-related challenges** (e.g., things that are preventing the team from being successful).

Please rate your level of agreement for each item from 1 to 7.

1. If our team is not performing well, we discuss how we will improve	1	2	3	4	5	6	7
2. All team members contribute ideas for how our team's performance can get better	1	2	3	4	5	6	7
3. If we are unsuccessful as a team, members identify the reasons for this underperformance	1	2	3	4	5	6	7
4. As a team, we consider a variety of potential solutions to problems in team performance	1	2	3	4	5	6	7
5. Our team implements solutions to improve our performance	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

J. The following items relate to the ways in which your **team modifies its approaches** (e.g., making adjustments in order to be successful).

Please rate your level of agreement for each item from 1 to 7.

1. Our team modifies our strategies	1	2	3	4	5	6	7
2. We utilize new tactics when previous plans prove to be unsuccessful	1	2	3	4	5	6	7
3. Our team introduces creative approaches if we are not performing well	1	2	3	4	5	6	7
4. If we are unsuccessful as a team, we adjust our strategies at the appropriate time	1	2	3	4	5	6	7

K. The following items relate to **verbal coaching that occurs between teammates** (e.g. providing each other with helpful advice and constructive feedback).

Please rate your level of agreement for each item from 1 to 7.

1. Team members provide verbal feedback to each other about how to improve their performance	1	2	3	4	5	6	7
2. Members of this team take time to give constructive advice to their teammates	1	2	3	4	5	6	7
3. Members of this team willingly receive constructive advice from teammates	1	2	3	4	5	6	7
4. Teammates discuss with each other how they can overcome individual performance problems	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

L. The following items relate to the ways in which teammates **provide assistance to each other** (e.g., showing each other things that can be done to perform better).

Please rate your level of agreement for each item from 1 to 7.

1. Teammates help each other improve their personal performances	1	2	3	4	5	6	7
2. Teammates make time to help other members improve their performance	1	2	3	4	5	6	7
3. Members of this team willingly receive assistance from teammates to improve their performances	1	2	3	4	5	6	7
4. Teammates fill in for each other whenever necessary	1	2	3	4	5	6	7
5. Team members take on teammates' responsibilities when necessary	1	2	3	4	5	6	7

M. The following items relate to ways in which teammates **resolve conflicts with each other** (e.g., arguments, personal differences).

Please rate your level of agreement for each item from 1 to 7.

1. Our team resolves conflicts between teammates effectively	1	2	3	4	5	6	7
2. Teammates address conflicts directly with each other	1	2	3	4	5	6	7
3. Conflicts between team members are managed in a respectful manner	1	2	3	4	5	6	7
4. Teammates try to find solutions to conflicts that are best for the team	1	2	3	4	5	6	7
5. Conflicts are resolved in a time-efficient manner	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

N. The following items relate to ways in which teammates **help each other if they are having personal struggles**, such as providing emotional support (e.g., listening or comforting), esteem support (e.g., pointing out a teammate's capabilities to improve his/her confidence), informational support (e.g., providing advice for resolving personal difficulties), and practical support (e.g., providing rides to practice).

Please rate your level of agreement for each item from 1 to 7.

1. Members provide support for teammates who are in need	1	2	3	4	5	6	7
2. Members of this team provide emotional support to each other	1	2	3	4	5	6	7
3. Teammates encourage one another to feel confident about themselves	1	2	3	4	5	6	7
4. Team members provide advice to each other for how to solve personal struggles	1	2	3	4	5	6	7
5. Teammates provide practical assistance to each other when their teammates need help	1	2	3	4	5	6	7

Appendix G: Letter of Information for Study 2 – Expert Review (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Letter of Information

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan, MSc
School of Kinesiology
University of British Columbia

Project Title: Assessing the Content Validity of the Multidimensional Assessment of Teamwork in Sports (MATS)

Dear [name]:

We are writing to request your assistance in developing a questionnaire that measures a multidimensional construct of **teamwork in sports**. Specifically, this measure is for use with sports teams and measures the extent to which team members believe their team works together effectively. In spite of the potential application of a questionnaire that assesses teamwork in sport, there is presently no comprehensive measure of this construct in sport. Based on an extensive literature review of teamwork as well as an extensive series of focus groups (utilizing a think aloud validity protocol), we have identified 74 items to assess this construct.

In order to assess the content validity of the questionnaire, we would like to ask for your help. Should you choose to participate, we will provide a link to the online study. There, we have provided a working definition of teamwork in sports, followed by the specific items we have (provisionally) identified/developed. Below each item are: four 7-point scales and a comments section. Please use the 7-point scales to rate each item with regard to its relevance, representativeness, clarity, and potential item redundancy. In addition, please provide any relevant comments in the spaces provided. Your participation in this study is expected to take no more than 45-60 minutes.

We would like to thank you in advance for your help. We understand that your time is valuable, but as your input at this stage is essential, we really hope that you will be able to assist us in this process. If you agree to contribute to this graduate student project, please complete and return this document to Desi or Mark by [*one month from date that email was sent*]. If this is a tight deadline, but you are still able to assist us, please let us know by when you could return the completed document. Once again, thank you very much for your help. It is **greatly appreciated!**

Many thanks,

Desi McEwan & Mark Beauchamp

Appendix H: Letter of Information for Study 3 (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Letter of Information

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan
School of Kinesiology
University of British Columbia

Project Title: Assessment of the Multidimensional Assessment of Teamwork in Sports (MATS)

Purpose: The purpose of this study is to test the utility of a questionnaire of *teamwork in sports*.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. At least 13 years of age
2. Able to read and converse in English
3. Currently part of a sports team

Involvement: Should you choose to take part, we will first ask each player of your team to complete a survey. This should take approximately 30 minutes. The researcher (Desmond) will then provide feedback to you (over email) on the team's overall results as well as considerations for how the team's teamwork could be enhanced. Approximately six weeks later (depending on your schedule and availability), your team will be asked to complete a second survey. In total, your team's participation should involve approximately one hour of time.

Benefits: There are no explicit benefits to participating in this study, although you and your team may find it useful to receive feedback on how well your team feels it works together, as well as some general strategies for how teamwork can be enhanced.

Confidentiality: Any information that your team provides within these sessions will be made anonymous. This means that no information that can identify individual team members will be discussed in the feedback document or made available within any reports that may result from this research. Completed data (i.e., questionnaires) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310). All computer files will be kept on a secured

password-protected computer in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym).

Participation: Participation in this study is voluntary and individuals may decline to participate or answer/skip any question(s) that they choose. There are no known psychological or physical risks associated with participation. You may choose to decline or withdraw your participation at any time throughout the course of the study.

If for ANY reason, you or any of your players do not want to take part in this study, that's fine; you/they don't have to. It is up to each individual to decide if they want to take part or not. Participants are also free to withdraw at any time without having to give any reason. If participants drop out they will not experience ANY negative consequences at all.

Contact Information: Should you have any further questions concerning the study or would like to participate, please contact either Desmond McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desmond McEwan by the Social Sciences and Humanities Research Council of Canada.

Thank you for your help,

Desi McEwan, MSc & Mark Beauchamp, PhD

Appendix I: Passive Consent Forms for Athletes' Guardians of Study 3 (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Teamwork in Sport Study

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan, MSc
School of Kinesiology
University of British Columbia

December 13, 2015

Dear Parent/Guardian,

My name is Desmond McEwan and I am a PhD student at the University of British Columbia. Along with my supervisor, Dr. Mark Beauchamp, we are currently involved in a program of research that is designed to better understand teamwork in sport. Over the next month, we will be holding two sessions with your child's sports team which will include inviting the players to complete a survey on two separate occasions (separated by approximately six weeks). In this survey, we will ask the players a series of questions about their experiences within the team.

The surveys should take no more than 30 minutes for the players to complete. None of the questions that we ask are of a delicate or intrusive nature and there are no known risks associated with this study. That said, participation is entirely voluntary and even if players initially choose to take part in this study they may subsequently withdraw at any time without having to give any reason and without experiencing any negative consequences.

The answers your child provides will be combined with those of other players who are taking part in this research and any information that individuals provide will remain completely confidential. All completed questionnaires will be kept in a locked cabinet at the University of British Columbia and shall not be made available to anyone other than the researchers involved in this study.

We will also be providing feedback to the team with regard to their results on the first survey and providing suggestions of strategies that the team can consider using to improve their teamwork. This feedback will be provided over email to the team's coach approximately one week after they complete the first round of the survey. Again, no individual information will be provided to the coach—the results will be presented with regard to the group as a whole.

If you **DO NOT** wish for your child to take part in this research, all we ask you to do is complete this form and return it to your child's coach (you do not have to complete or return anything if you are OK with your child participating). Alternatively, you can email or phone Dr. Beauchamp or I using the contact details identified at the top of this letter and we will ensure that your son/daughter does not take part in this study. Individuals who decline to participate do not need to attend any of the survey sessions. Also, even if you have consented for your child to take part in this study, we will also require her/his own consent (at the first session) as well before s/he can participate.

If you have any questions or want further information about the study, please feel free to contact either of us at any point. Alternatively, if you have any concerns or complaints about your rights or the rights of your child as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

SO, IF YOU **DO NOT** WANT YOUR CHILD TO TAKE PART PLEASE SIGN THIS FORM AND RETURN THIS TO YOUR CHILD'S COACH:

I (PARENT'S NAME)
DO NOT wish for my child (CHILDS NAME)
to take part in the research examining teamwork in sport.

Signed..... Date.....

Yours sincerely,

Desmond McEwan, MSc & Mark Beauchamp, PhD

Appendix J: Consent Form for Study 3 (Chapter 3)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Consent Form

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan, MSc
School of Kinesiology
University of British Columbia

Project Title: Validation of the Multidimensional Assessment of Teamwork in Sports (MATS)

Purpose: The purpose of this study is to test the utility of a questionnaire of *teamwork in sports*.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. Able to read and converse in English
2. Currently part of a sports team
3. At least 13 years of age

Involvement: Should you choose to take part, your participation will take place at two timepoints. We will first ask you and your teammates to complete a survey. This should take approximately 30 minutes. The researcher (Desmond) will then provide feedback (via email to your coach approximately) on the team's overall results on the teamwork questionnaire. Approximately six weeks later, you will be asked to complete a second survey. Your total participation should involve approximately one hour of your time.

Benefits: There are no explicit benefits to participating in this study, although you and your team may find it useful to receive feedback on how well your team feels it works together.

Confidentiality: Any information that you provide within these sessions will be made anonymous. This means that no information that can identify you will be discussed in the feedback session or made available within any reports that may result from this research. Also, the feedback that we provide to your coach will only give the results of the team overall; your coach will not see how you answered the surveys. Completed data (i.e., questionnaires) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310). All computer

files will be kept on a secured password-protected computer in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym).

Participation: Participation in this study is voluntary and you may decline to take part or answer any question(s) that you choose. There are no known psychological or physical risks associated with participation. You may also withdraw your participation at any time throughout the course of the study.

If for ANY reason, you do not want to take part in this study, that's fine; you don't have to. It is up to you if you want to take part or not. You are also free to withdraw at any time without having to give any reason. If you decline participating or drop out, neither you nor your team will not experience ANY negative consequences at all.

Should you have any further questions concerning the study please feel free to contact either Desmond McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desmond McEwan by the Social Sciences and Humanities Research Council of Canada.

***Consent:** By signing below, I am acknowledging that the study has been explained to me, I understand what is involved, and I agree to take part in this study. It also means that I understand that my participation in this study is entirely my choice, and that I may pull out from the study at any time without having to give any reason for doing so and without experiencing any negative consequences. I understand that that if I do not wish to answer any part of the questionnaire, I may refuse to answer.*

By signing this form, you have consented to participate in this study.

SIGNED.....

NAME IN BLOCK LETTERS.....

DATE.....

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

Appendix K: Version 3 of the MATS (Post-Expert Review, Chapter 3)

In these sections, we would like you to describe the team with which you currently compete. To answer each question, please circle the number that best describes your level of agreement with each statement. If a question is irrelevant or you are unsure of the answer, leave the answer blank.

Please be as honest as possible. None of your coaches or teammates will be able to see your personal answers to this questionnaire at any time.

A. The following items relate to your team's **overall mission/purpose for being together** (e.g., to win a league championship, to qualify for an event/tournament/playoff round, to have fun).

Please rate your level of agreement for each item from 1 to 7.

1. Our team has identified an overall purpose for being together	1	2	3	4	5	6	7
2. We have analyzed what our team's purpose should be	1	2	3	4	5	6	7
3. We have defined a team purpose that is appropriate to us	1	2	3	4	5	6	7
4. Our team has specified a mission on which all members agree	1	2	3	4	5	6	7
5. Our team has established a team mission to which we are all committed	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

B. The following items relate to **group goals that your team sets in order to achieve the team's overall mission/purpose** (e.g., number of runs scored and conceded in baseball, race times in rowing, percentage of legal body checks in lacrosse).

Please rate your level of agreement for each item from 1 to 7.

1. Our team identifies specific team goals in order to achieve our team mission	1	2	3	4	5	6	7
2. We set challenging team goals	1	2	3	4	5	6	7
3. Our team specifies goals that are appropriate to us	1	2	3	4	5	6	7
4. We set team goals that are clearly understood by all members	1	2	3	4	5	6	7
5. Our team sets goals to which all members are committed	1	2	3	4	5	6	7
6. We establish goals on which all teammates agree	1	2	3	4	5	6	7

C. The following items relate to **action plans/strategies that your team establishes in order to achieve the team goals** (e.g., tactics/strategies for an upcoming competition, drills to improve team members' skills, members' training regimens).

1. We make action plans for how we will achieve our team goals	1	2	3	4	5	6	7
2. Our team develops plans on which we all agree	1	2	3	4	5	6	7
3. Our team prioritizes the most important things that need to be done to be successful	1	2	3	4	5	6	7
4. We identify responsibilities that each member has to the team	1	2	3	4	5	6	7
5. Our team develops action plans that are clearly understood by all members	1	2	3	4	5	6	7
6. Team members carry out the action plans that have been made	1	2	3	4	5	6	7
7. Our team creates backup plans in case our original plans prove unsuccessful	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

D. The following items relate to team members' **coordination with each other WHILE PLAYING your sport** (e.g., basketball players being in the correct position on the court when completing a play, football quarterbacks being in sync with their receivers, a track team exchanging the baton with the correct timing).

Please rate your level of agreement for each item from 1 to 7.

1. Overall, team members coordinate actions well with each other	1	2	3	4	5	6	7
2. Team members are in the correct physical position while executing their tasks	1	2	3	4	5	6	7
3. Team members execute their tasks with the correct timing	1	2	3	4	5	6	7
4. The actions of all team members are properly sequenced with each other	1	2	3	4	5	6	7

E. The following items relate to team members' **cooperation with each other WHILE PLAYING your sport** (e.g., rugby players working together during a scrum to advance the ball forward, basketball players helping a teammate defend his/her check, hockey players blocking an opponent's slapshot to help their team).

Please rate your level of agreement for each item from 1 to 7.

1. In general, team members work together effectively	1	2	3	4	5	6	7
2. Team members work together as one unit rather than a bunch of individuals	1	2	3	4	5	6	7
3. Teammates help each other when needed	1	2	3	4	5	6	7
4. All team members execute their tasks with full effort	1	2	3	4	5	6	7
5. Members do anything that is necessary for the team's benefit	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

F. The following items relate to team members' **communication with each other WHILE PLAYING your sport** (e.g., soccer players talking to each other while defending, curling skips and sweepers exchanging information during a shot, volleyball players calling for the ball).

Please rate your level of agreement for each item from 1 to 7.

1. Our team communicates well with each other	1	2	3	4	5	6	7
2. Teammates communicate an ideal amount with each other	1	2	3	4	5	6	7
3. Team members communicate in a clear manner	1	2	3	4	5	6	7
4. Team members communicate in a time-efficient manner	1	2	3	4	5	6	7
5. Team members communicate at the appropriate times	1	2	3	4	5	6	7

G. The following items relate to your team **monitoring its performance** (e.g., whether the team is on track to achieving its goals/purposes).

Please rate your level of agreement for each item from 1 to 7.

1. Our team monitors its performance	1	2	3	4	5	6	7
2. We evaluate our progression towards team goal accomplishment	1	2	3	4	5	6	7
3. We assess how we are all performing as individuals	1	2	3	4	5	6	7
4. We assess which performances have been successful	1	2	3	4	5	6	7
5. We assess which performances have been unsuccessful	1	2	3	4	5	6	7
6. Our team notes what we still need to do to accomplish our goals	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

H. The following items relate to your team's **monitoring of various conditions that can affect the accomplishment of its purpose(s)**, such as important situations during competitions (e.g., the score, playing conditions), personnel (e.g., player injuries/replacements, coaching changes), and various external factors (e.g., available team resources, league policy changes).

Please rate your level of agreement for each item from 1 to 7.

1. Our team monitors any information that may affect us	1	2	3	4	5	6	7
2. Our team monitors situations that occur during competitions	1	2	3	4	5	6	7
3. We keep track of changes in personnel that occur within our team	1	2	3	4	5	6	7
4. We monitor external factors that may impact our team	1	2	3	4	5	6	7

I. The following items relate to the ways in which your team **solves performance-related problems** (e.g., determining why the team has been unsuccessful, noting any mistakes that have been made, identifying how the team can perform better).

Please rate your level of agreement for each item from 1 to 7.

1. Our team problem solves when we have not performed well	1	2	3	4	5	6	7
2. All team members contribute ideas for how we can get better	1	2	3	4	5	6	7
3. If our team is unsuccessful, we identify the reasons why this has occurred	1	2	3	4	5	6	7
4. We consider a variety of potential solutions to problems in team performance	1	2	3	4	5	6	7
5. Our team implements solutions to improve our performance	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

J. The following items relate to the ways in which your **team modifies its approaches if it has been unsuccessful** (e.g., altering action plans, trying out new team strategies, employing different drills in practice/training).

Please rate your level of agreement for each item from 1 to 7.

1. Our team modifies our approaches when necessary	1	2	3	4	5	6	7
2. We utilize new tactics when previous plans prove to be unsuccessful	1	2	3	4	5	6	7
3. Our team applies creative approaches if we are not performing well	1	2	3	4	5	6	7
4. If we are unsuccessful as a team, we adjust our plans at the appropriate time	1	2	3	4	5	6	7

K. The following items relate to **verbal feedback that occurs between teammates** (e.g. providing helpful advice to each other, discussing how to improve individual performance).

Please rate your level of agreement for each item from 1 to 7.

1. Team members provide verbal feedback to each other about how to improve their individual performance	1	2	3	4	5	6	7
2. Members of this team take time to give advice to each other on their personal performance	1	2	3	4	5	6	7
3. Team members willingly receive constructive advice from their teammates on their own performance	1	2	3	4	5	6	7
4. Teammates discuss how they can overcome individual performance-related problems	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

L. The following items relate to the ways in which teammates **provide assistance to each other** (e.g., showing each other things that can be done to perform better, helping each other improve skills together in practice/training).

Please rate your level of agreement for each item from 1 to 7.

1. Teammates demonstrate to each other how they can improve their personal performance	1	2	3	4	5	6	7
2. Teammates take time to assist other members perform better	1	2	3	4	5	6	7
3. Members of this team willingly receive assistance from teammates for improving their performance	1	2	3	4	5	6	7
4. Teammates fill in for each other when needed	1	2	3	4	5	6	7
5. Team members assist teammates with their responsibilities to the team if necessary	1	2	3	4	5	6	7

M. The following items relate to ways in which teammates **resolve conflicts with each other** (e.g., disagreements, personal differences).

Please rate your level of agreement for each item from 1 to 7.

1. Teammates resolve conflicts with each other effectively if they arise	1	2	3	4	5	6	7
2. Teammates address conflicts directly with each other	1	2	3	4	5	6	7
3. Conflicts between team members are solved in a respectful manner	1	2	3	4	5	6	7
4. Teammates try to find solutions to conflicts that are best for the team	1	2	3	4	5	6	7
5. Conflicts are resolved in a time-efficient manner	1	2	3	4	5	6	7

**PLEASE USE THE FOLLOWING RATING SCALE TO ANSWER ALL ITEMS
(IF A QUESTION IS IRRELEVANT TO YOU/YOUR SPORT, LEAVE THE ANSWER BLANK):**

COMPLETELY DISAGREE	MOSTLY DISAGREE	SLIGHTLY DISAGREE	NEITHER AGREE OR DISAGREE	SLIGHTLY AGREE	MOSTLY AGREE	COMPLETELY AGREE
1	2	3	4	5	6	7

N. The following items relate to ways in which teammates **help each other if they are experiencing personal struggles**, such as providing **emotional** support (e.g., listening to or comforting each other), **esteem** support (e.g., helping improve a teammate's confidence), **informational** support (e.g., providing advice for dealing with personal issues), and **practical** support (e.g., providing rides to practice).

Please rate your level of agreement for each item from 1 to 7.

1. Members provide support to teammates who are experiencing personal struggles	1	2	3	4	5	6	7
2. Members of this team provide emotional support to each other	1	2	3	4	5	6	7
3. Teammates encourage one another to feel confident about themselves	1	2	3	4	5	6	7
4. Team members provide advice to each other for dealing with personal issues	1	2	3	4	5	6	7
5. Team members provide practical assistance to each other when their teammates need help	1	2	3	4	5	6	7

Appendix L: Summary of Items Deleted and Added to MATS Following Study 2

Five items from version 1 of the MATS were deleted as a result of the focus group discussions. In the coordination section, item 2 (“Teammates’ actions are executed in harmony with each other”) was removed as some participants felt that (a) this item was subsumed within the other items in this section (and, therefore, redundant), and/or (b) the phrase ‘in harmony’ was somewhat confusing and colloquial. Multiple participants also remarked that the second (“Teammates work together as one”) and third (“Our team performs as a united team rather than a bunch of individuals”) items of the cooperation section were alluding to the same idea; these items were, therefore, combined into a single item. Within the performance monitoring section, multiple participants (particularly coaches) suggested that the fourth item (“Teammates keep track of how other members are performing”) was inappropriate/unsuitable to sports. These participants felt that athletes should not focus on how others are performing; instead, they should focus on their own performance and allow other players to do the same. As one coach put it, “I do not want my players looking over each other’s shoulders like that.” Consequently, this item was removed. Item 5 of the innovation section, “Our team makes use of innovative tactics”, was also removed as some participants felt this question was subsumed within other items. In particular, this item appeared to be redundant with item 3 in this section (“If our team is not performing well, we identify innovative approaches to improve”). The third item of the conflict management dimension (“Team members work through conflict openly”) was also removed, as multiple participants felt it was inappropriate and/or confusing. Specifically, some participants interpreted this as denoting that any issues that occur between players should be brought up to the entire team at large, when they would be better dealt with individually. This was seen as an

ineffective way to work through conflict; in the words of one participant, “this could actually do more harm than good and just open up a ‘can of worms’.”

Multiple participants from the expert review opined that the first (“Our team communicates well with each other”) and third (“Teammates communicate effectively with each other”) items of the communication section (F) were redundant. Specifically, the only difference between these two items was the use of the word ‘well’ in the first item and ‘effectively’ in the third item. As these two words could be considered synonymous, the third item was deleted in the final version of the MATS.

One item was added to the questionnaire as a result of the focus group sessions. Several participants in the initial sessions noted that the interpersonal support section did not include a general item as with the rest of the dimensions. Therefore, the general item “Members provide support for teammates who are in need” was added to version 2 of the MATS. The question “Team members carry out the action plans that have been made” was added to the action planning dimension (section C) as a result of the expert review. This item reflects the importance of asking whether team members actually follow through with their action plans, rather than merely creating these plans. This item was added in an attempt to ensure that the representativeness of this dimension is comprehensive.

Appendix M: Follow-Up Survey for Study 4 (Chapter 4)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

[*ADULT VERSION OF THE TEAM COHESION MEASURE*]

A. The following questions are designed to assess your feelings about your personal involvement with this team. Please circle a number from 1 (strongly disagree) to 9 (strongly agree) to indicate your level of agreement with each of the statements.

	strongly disagree								strongly agree
I enjoy being part of the social activities of this team.	1	2	3	4	5	6	7	8	9
I'm happy with the amount of playing time I get.	1	2	3	4	5	6	7	8	9
I am going to miss the members of this team when the season ends.	1	2	3	4	5	6	7	8	9
I'm happy with my team's level of desire to win.	1	2	3	4	5	6	7	8	9
Some of my best friends are on this team.	1	2	3	4	5	6	7	8	9
This team gives me enough opportunities to improve my personal performance.	1	2	3	4	5	6	7	8	9
I enjoy team parties more than other parties.	1	2	3	4	5	6	7	8	9
I like the style of play on this team.	1	2	3	4	5	6	7	8	9
For me, this team is one of the most important social groups to which I belong.	1	2	3	4	5	6	7	8	9

The following questions are designed to assess your feelings about your team as a whole. Please circle a number from 1 (strongly disagree) to 9 (strongly agree) to indicate your level of agreement with each of the statements

	strongly disagree								strongly agree
Our team is united in trying to reach its goals for performance.	1	2	3	4	5	6	7	8	9
Members of our team would rather go out together than go out on their own.	1	2	3	4	5	6	7	8	9
We all take responsibility for any loss or poor performance by our team.	1	2	3	4	5	6	7	8	9
Our team members often party together.	1	2	3	4	5	6	7	8	9
Our team members have consistent aspirations for the team's performance.	1	2	3	4	5	6	7	8	9
Our team would like to spend time together in the off-season.	1	2	3	4	5	6	7	8	9
If members of our team have problems in practice, everyone wants to help them so we can get back together again.	1	2	3	4	5	6	7	8	9
Members of our team stick together outside of practices and games.	1	2	3	4	5	6	7	8	9
Our team members communicate freely about each athlete's responsibilities during competition and practice.	1	2	3	4	5	6	7	8	9

[*YOUTH VERSION OF THE TEAM COHESION MEASURE*]

A. The following questions are designed to assess your feelings about your personal involvement with this team. Please circle a number from 1 (strongly disagree) to 9 (strongly agree) to indicate your level of agreement with each of the statements.

	strongly disagree								strongly agree
We all share the same commitment to our team's goals.	1	2	3	4	5	6	7	8	9
I invite my teammates to do things with me	1	2	3	4	5	6	7	8	9
As a team, we are all on the same page.	1	2	3	4	5	6	7	8	9
Some of my best friends are on this team.	1	2	3	4	5	6	7	8	9

I like the way we work together as a team.	1	2	3	4	5	6	7	8	9
I <u>do not</u> get along with the members of my team.	1	2	3	4	5	6	7	8	9
We hang out with one another whenever possible.	1	2	3	4	5	6	7	8	9
As a team, we are united.	1	2	3	4	5	6	7	8	9
I contact my teammates often (phone, text message, internet).	1	2	3	4	5	6	7	8	9
This team gives me enough opportunities to improve my own performance.	1	2	3	4	5	6	7	8	9
I spend time with my teammates.	1	2	3	4	5	6	7	8	9
Our team <u>does not</u> work well together.	1	2	3	4	5	6	7	8	9
I am going to keep in contact with my teammates after the season ends.	1	2	3	4	5	6	7	8	9
I am happy with my team's level of desire to win.	1	2	3	4	5	6	7	8	9
We stick together outside of practice.	1	2	3	4	5	6	7	8	9
My approach to playing is the same as my teammates'.	1	2	3	4	5	6	7	8	9
We contact each other often (phone, text message, internet).	1	2	3	4	5	6	7	8	9
I like the way we work together as a team.	1	2	3	4	5	6	7	8	9

B. The following questions refer to your experience in your sport this season. Please circle a number from 1 to 5 to indicate your level of commitment with regard to each of the statements.

1=not at all 2=a little 3=sort of 4=pretty much 5=very much

How <i>dedicated</i> are you to this team?	1	2	3	4	5
How <i>hard</i> would it be for you to quit this team?	1	2	3	4	5
How <i>determined</i> are you to keep playing with this team?	1	2	3	4	5

1=nothing at all 2=a few things 3=some things 4=many things 5=a lot of things

What would you be willing to do to keep playing with this team?	1	2	3	4	5
---	---	---	---	---	---

C. The following questions refer to your experience in your sport this season. Please circle a number to indicate your level of agreement with each of the statements.

1=not at all 2=a little 3=sort of 4=pretty much 5=very much

Do you <i>enjoy</i> playing your sport this season?	1	2	3	4	5
Are you <i>happy</i> playing your sport this season?	1	2	3	4	5
Do you have <i>fun</i> playing your sport this season?	1	2	3	4	5
Do you <i>like</i> playing your sport this season?	1	2	3	4	5

D. The following questions are designed to assess your level of satisfaction with your personal and your team's performance. Please circle a number from 1 (not at all satisfied) to 7 (extremely satisfied) to indicate your level of satisfaction with each of the statements.

The degree to which I have achieved my performance goals during the season.	1	2	3	4	5	6	7
The improvement in my performance over the previous season	1	2	3	4	5	6	7
The improvement in my skill level thus far.	1	2	3	4	5	6	7
The team's win/loss record this season.	1	2	3	4	5	6	7
The team's overall performance this season.	1	2	3	4	5	6	7
The extent to which the team has met its goals for the season thus far.	1	2	3	4	5	6	7

E. Please rate your team's confidence, in terms of the upcoming game or competition, that your team has the ability to...

	Not At All Confident									Extremely Confident	
... outplay the opposing team	0	1	2	3	4	5	6	7	8	9	10
... show more ability than the other team	0	1	2	3	4	5	6	7	8	9	10
... play more skillfully than the opponent	0	1	2	3	4	5	6	7	8	9	10
... perform better than the opposing team(s)	0	1	2	3	4	5	6	7	8	9	10

Appendix N: Letter of Information for Study 6 (Chapter 6)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Letter of Information

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan
School of Kinesiology
University of British Columbia

Project Title: Teamwork Training in Sports

Purpose: To test the efficacy of a team building program focused on enhancing teamwork in sports teams.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. At least 13 years of age
2. Able to read and converse in English
3. Currently part of a sports team

Involvement: This study will take place over 10 weeks. Should you choose to take part, your team will be asked to complete a survey on three occasions—at the beginning, midway point, and end of the 10 weeks. These survey sessions will take approximately 20 minutes.

Teams in the study will also be given team building sessions (involving both players and coaches) with a focus on enhancing how effectively the team works together. Some teams will be given team building at the beginning of the study, while others will receive a session near the end. These team building sessions will last approximately one hour. We will also ask two to three players from each team to provide feedback in an interview format on this teamwork program at the end of the 10 weeks.

Benefits: Team building has been shown to be an effective means of enhancing team functioning. Thus, you and your team may find that this study is beneficial in terms of improving teamwork. There are no other explicit benefits to participating in this study.

Confidentiality: Any information that your team provides within these sessions will be made anonymous. This means that no information that can identify individual team members will be discussed or made available within any reports that may result from this research. Completed data (i.e., questionnaires) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310) at UBC. All computer files will be kept on a secured password-protected computer in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym).

Participation: Participation in this study is voluntary and individuals may decline to participate or answer/skip any question(s) that they choose. There are no known psychological or physical risks associated with participation. You may choose to decline or withdraw your participation at any time throughout the course of the study.

If for ANY reason, you do not want to take part in this study, that's fine; you don't have to. It is up to each individual on the team to decide if they want to take part or not. Participants are also free to withdraw at any time without having to give any reason. If participants drop out they will not experience ANY negative consequences at all—they will not be required to attend any of the study sessions and the rest of the team will still be able to participate in the study.

Contact Information: Should you have any further questions concerning the study or would like to participate, please contact either Desmond McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desmond McEwan by the University of British Columbia and the Social Sciences and Humanities Research Council of Canada.

Thank you for your time.

Sincerely,

Desi McEwan, MSc & Mark Beauchamp, PhD

Appendix O: Parent Letter & Passive Consent Form for Study 6 (Chapter 6)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Teamwork in Sport Study

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan, MSc
School of Kinesiology
University of British Columbia

Dear Parent/Guardian,

My name is Desmond McEwan and I am a PhD student at the University of British Columbia. Along with my supervisor, Dr. Mark Beauchamp, we are currently involved in a program of research that is designed to enhance teamwork in sport. Over the next few months, we will be inviting the players of your child's sports team to complete a survey on three separate occasions. In this survey, we will ask the players a series of questions about their experiences within the team. We will also be conducting team building sessions focused on improving how well the team works together—some teams will receive these sessions at the beginning of the study, while others will receive it at the end. Finally, we will be asking each team for 2-3 players to volunteer to provide feedback on their experiences in the program at the end of the study in a small group interview format.

The survey sessions should take approximately 20 minutes for the players to complete, while the team building sessions will last approximately one hour. None of the questions that we will ask or discussions in the team building sessions are of a delicate or intrusive nature and there are no known risks associated with this study. That said, participation is entirely voluntary and even if players initially choose to take part in this study, they may subsequently withdraw at any time without having to give any reason and without experiencing any negative consequences—they will not be required to attend any of the study sessions and the rest of the team will still be able to participate in the study.

The answers your child provides will be combined with those of other players who are taking part in this research and any information that individuals provide will remain completely confidential. All completed questionnaires will be kept in a locked cabinet at the University of British Columbia and shall not be made available to anyone other than the researchers involved in this study.

If you **DO NOT** wish for your child to take part in this research, all we ask you to do is complete this form and return it to your child's coach (you do not have to complete or return anything if you are OK with your child participating). Alternatively, you can email or phone Dr. Beauchamp or me using the contact details identified at the top of this letter and we will ensure that your son/daughter does not take part in this study. Individuals who decline to participate do not need to attend any of the survey or team building sessions. Also, even if you have consented for your child to take part in this study, we will also require her/his own consent (at the first session) as well before s/he can participate.

If you have any questions or want further information about the study, please feel free to contact either of us at any point. Alternatively, if you have any concerns or complaints about your rights or the rights of your child as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

SO, IF YOU **DO NOT** WANT YOUR CHILD TO TAKE PART PLEASE SIGN THIS FORM AND RETURN THIS TO YOUR CHILD'S COACH:

I (PARENT'S NAME)
DO NOT wish for my child(CHILD'S NAME)
to take part in the research examining teamwork in sport.

Signed..... Date.....

Yours sincerely,

Desmond McEwan, MSc & Mark Beauchamp, PhD

Appendix P: Participant Consent Form for Study 6 (Chapter 6)



Psychology of Exercise, Health, and Physical Activity Lab
War Memorial Gym (Room 122)
School of Kinesiology
The University of British Columbia
6081 University Blvd, Vancouver, BC, V6T 1Z1

Consent Form

Principal Investigator:
Mark R. Beauchamp, Ph.D.
School of Kinesiology
University of British Columbia

Co-Investigator:
Desmond McEwan
School of Kinesiology
University of British Columbia

Project Title: Teamwork Training in Sports

Purpose: To test the efficacy of a team building program focused on enhancing teamwork in sports teams.

Eligibility: The following criteria will be used to determine participant eligibility for this study:

1. At least 13 years of age
2. Able to read and converse in English
3. Currently part of a sports team

Involvement: This study will take place over 10 weeks. Should you choose to take part, you and your team will be asked to complete a survey on three occasions—at the beginning, midway point, and end of the 10 weeks. These survey sessions should take approximately 20 minutes.

Teams in the study will also be given team building sessions (involving both players and coaches) with a focus on enhancing how well the team works together. Some teams will be given team building at the beginning of the study, while others will receive a session near the end. These team building sessions will last approximately one hour. We will also ask two to three players from each team to provide feedback in an interview format on this teamwork program at the end of the 10 weeks.

Benefits: Team building has been shown to be an effective means of enhancing team functioning. Thus, you and your teammates may find that this study is beneficial in terms of improving teamwork. There are no other explicit benefits to participating in this study.

Confidentiality: Any information that your team provides within these sessions will be made anonymous. This means that no information that can identify you will be discussed or made available within any reports that may result from this research. Completed data (i.e., questionnaires) will be stored in a locked and secure storage room in the War Memorial Gym (Room 310) at UBC. All computer files will be kept on a secured password-protected computer in the Psychology of Exercise, Health, and Physical Activity Lab (Room 122, War Memorial Gym).

Participation: Participation in this study is voluntary and you may decline to take part or answer/skip any question(s) that you choose. There are no known psychological or physical risks associated with participation. You may also withdraw your participation at any time throughout the course of the study.

If for ANY reason, you do not want to take part in this study, that's fine; you don't have to. It is up to you if you want to take part or not. You are also free to withdraw at any time without having to give any reason. If you decline participating or drop out, neither you nor your team will not experience ANY negative consequences at all—you will not be required to attend any of the study sessions that your team will participate in.

Should you have any further questions concerning the study please feel free to contact either Desmond McEwan or Dr. Mark Beauchamp. Alternatively, if you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics.

Sponsorship: This graduate student research is funded by a doctoral scholarship awarded to Desmond McEwan by the University of British Columbia and the Social Sciences and Humanities Research Council of Canada.

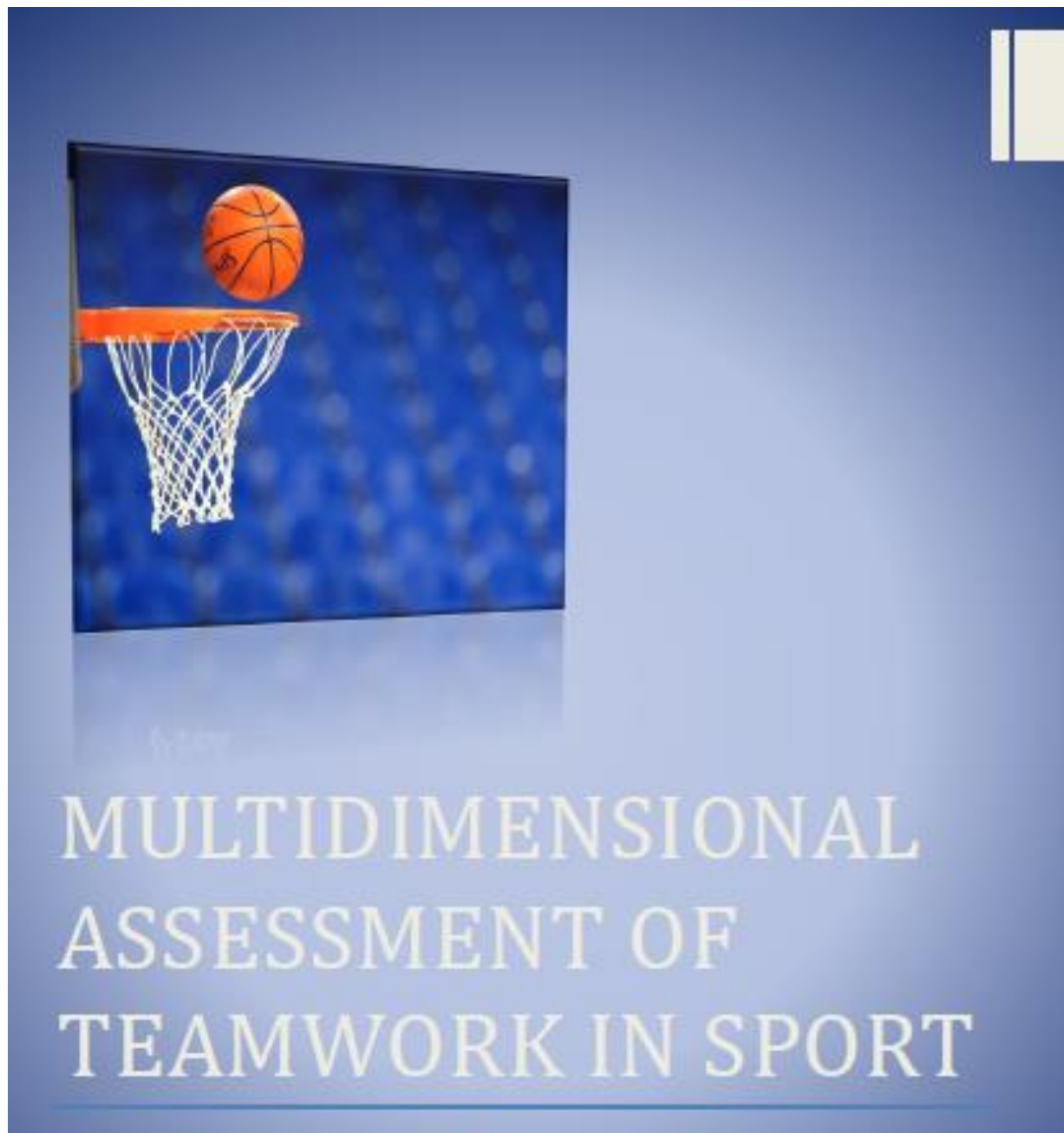
Consent: *By signing below, I am acknowledging that the study has been explained to me, I understand what is involved, and I agree to take part in this study. It also means that I understand that my participation in this study is entirely my choice, and that I may pull out from the study at any time without having to give any reason for doing so and without experiencing any negative consequences. I understand that that if I do not wish to answer any part of the questionnaire, I may refuse to answer.*

By signing this form, you have consented to participate in this study.

SIGNED.....

PRINTED NAME.....

DATE.....



Teamwork Training Handbook

Principal Investigators:

Desmond McEwan (PhD Candidate) & Mark R. Beauchamp (Professor)

University of British Columbia,
Psychology of Exercise, Health, & Physical Activity Laboratory

Funding:



THE UNIVERSITY OF BRITISH COLUMBIA



Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
sciences humaines du Canada

Canada

OVERVIEW: What is Teamwork?

Teamwork consists of 14 total dimensions—12 aspects relate to behaviours that focus on *team performance*, while the other 2 reflect *interpersonal dynamics* amongst teammates. Your results are broken down into five sections. The first section (*Preparation*) reflects behaviours that occur before/in preparation for team competitions (e.g., games/tournaments). The second section (*Execution*) focuses on behaviours that occur while you are actually competing/performing your sport. The next two sections involve reflective behaviours that occur after/in response to the team's competitions—the *Evaluation* section relates to monitoring the team's performance and any conditions that may affect the team, while the *Adjustments* section focuses on modifications the team makes in response to the team's evaluation. The final section (*Interpersonal Dynamics*) focuses on behaviours concerned with supporting one another and resolving conflicts.

PREPARATION

- A. Mission analysis: The overall purpose/mission of the team (e.g., to win a league championship, to qualify for an event/tournament/playoff round, to have fun).
- B. Goal specification: Outcome/performance goals that are set in order to fulfil the team's mission (e.g., number of runs scored and conceded in baseball, race times in rowing, percentage of legal body checks in lacrosse).
- C. Action planning: Strategies/plans of action that are created in order to achieve the team's outcome/performance goals and, in turn, the overall mission (e.g., tactics/strategies for an upcoming competition, drills to improve team members' skills, members' training regimens).

EXECUTION

- D. Coordination: The sequencing and timing of behaviours between teammates (e.g., basketball players being in the correct position on the court when completing a play, football quarterbacks being in sync with their receivers, a track team exchanging the baton with the correct timing).
- E. Cooperation: Team members working together for the team's collective benefit (e.g., rugby players working together during a scrum to advance the ball forward, basketball players helping a teammate defend his/her check, hockey players blocking an opponent's slapshot to help their team).
- F. Communication: Members sharing relevant information with each other (e.g., soccer players talking to each other while defending, curling skips and sweepers exchanging information during a shot, volleyball players calling for the ball).

EVALUATION

- G. Performance monitoring: Tracking the team's performance/progress (e.g., which performances have been successful and which have not, whether the team is on track to achieving its goals/purposes).
- H. Conditions monitoring: Monitoring any variables that can affect the team such as important situations during competitions (e.g., the score, playing conditions), personnel changes (e.g., player injuries/replacements, coaching changes), and various external factors (e.g., available team resources, league policy changes).

ADJUSTMENTS

- I. Problem solving: Collectively brainstorming and implementing solutions to problems that are preventing the team from being successful (e.g., determining why the team has been unsuccessful, noting any mistakes that have been made, identifying how the team can perform better).
- J. Innovation: Introducing novel approaches to team tasks to maintain/enhance success (e.g., altering action plans, trying out new team strategies, employing different drills in practice/training).
- K. Intrateam coaching: Verbal feedback between members on how they can improve/maintain performance (e.g. providing helpful advice to each other, discussing how to improve individual performance).
- L. Backing up behaviours: Similar to intrateam coaching but focusing on non-verbal behaviours (e.g., showing each other things that can be done to perform better, helping each other improve skills together in practice/training).

INTERPERSONAL DYNAMICS

- M. Integrative conflict management: Effectively dealing with interpersonal problems between team members (e.g., disagreements, personal differences).
- N. Psychological support: Teammates helping each other with (non-performance-related) personal problems such as providing emotional support (e.g., listening to or comforting each other), esteem support (e.g., helping improve a teammate's confidence), informational support (e.g., providing advice for dealing with personal issues), and practical support (e.g., providing rides to practice).

RESULTS: How Did We Score?

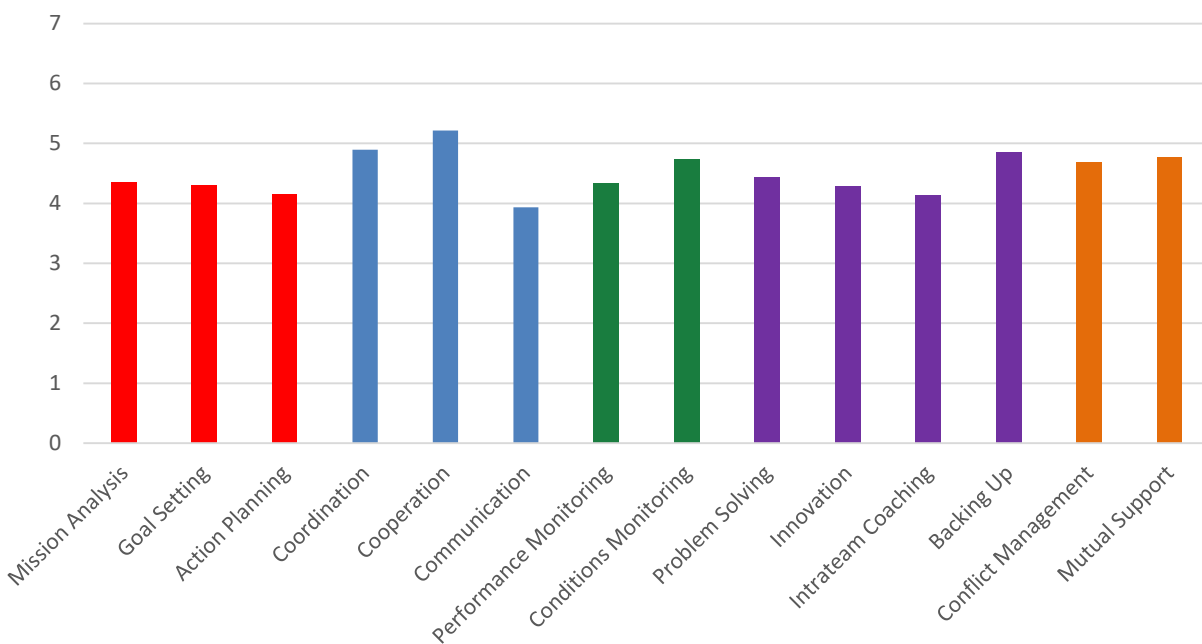
You may recall that the questionnaire asked players to respond to each item using the following scale:

- 1:** completely disagree
- 2:** mostly disagree
- 3:** slightly disagree
- 4:** neither agree nor disagree (neutral)
- 5:** slightly agree
- 6:** mostly agree
- 7:** completely agree

The results presented in the following pages reflect the averages for the team's responses on each aspect of teamwork. The higher the score, the more positive the team rated that dimension of teamwork.

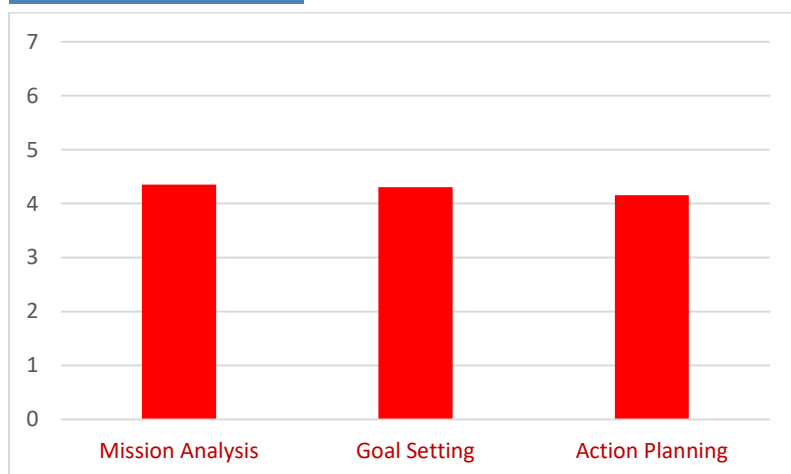
Overall

The next two figures show your team's overall teamwork "profile". Which aspects appear to be areas of strength? Which do you see as most in need of improvement?



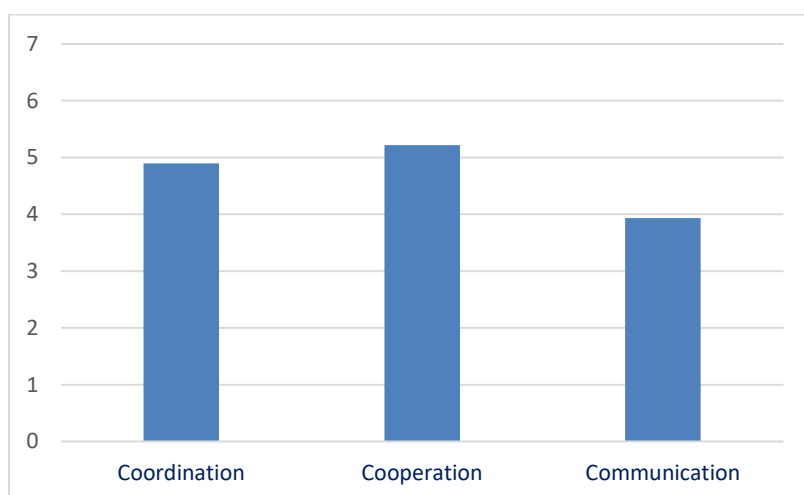
When we break things down by section, the results look like this:

PREPARATION



In terms of the team's preparation (being on the same page in terms of *what* you want to achieve and *how* you will achieve these goals), the scores were all right around the Neutral mark.

EXECUTION (ON-COURT TEAMWORK)



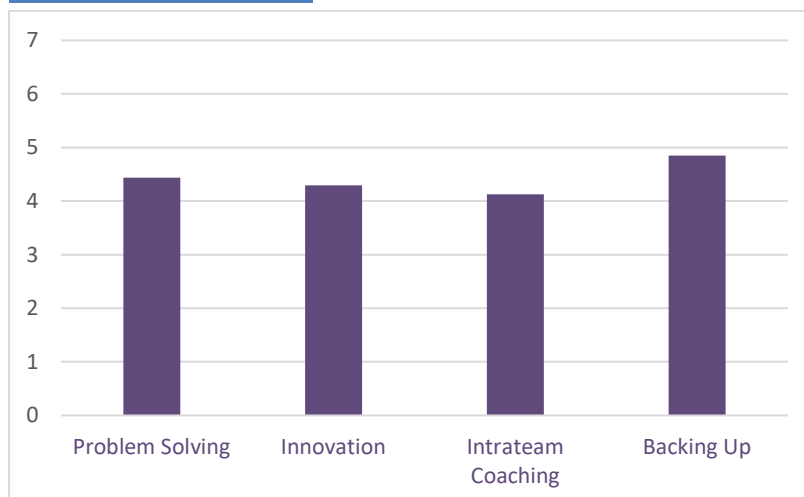
The execution behaviours—coordination, cooperation, and communication—can be thought of as the '3Cs' of teamwork. Scores for these dimensions were in the Neutral to Slightly Agree range.

EVALUATION



The evaluation phase reflects the team's monitoring of its performance (e.g., are you on the right track towards achieving your goals, which performances/games have been successful and which have not, etc.) as well as anything that may affect the team's performance (e.g., important situations in the game, changes within the team). Since you haven't played any games yet, it is not surprising that these two aspects were around the neutral mark.

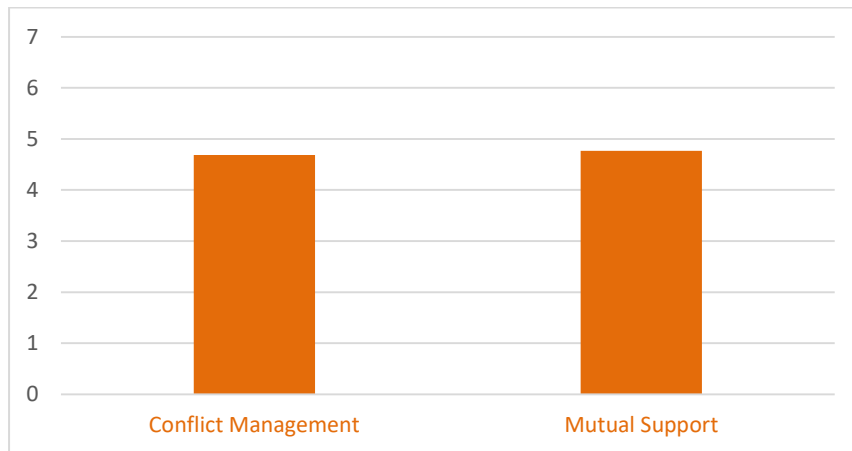
ADJUSTMENTS



The adjustments phase reflects how well the team adapts and responds information gathered in the evaluation phase. This includes problem solving to determine why you've been unsuccessful, making modifications to the team's

strategies/action plans if previous plans have proven ineffective (i.e., innovation), exchanging verbal feedback with each other, and helping each other improve your skills/performance. Scores for these dimensions were all in the Neutral to Slightly Agree mark.

INTERPERSONAL DYNAMICS



The final section concerns the interpersonal dynamics (not related to performance) of the team—managing conflict and providing interpersonal support to one another. Scores for both were in the Neutral to Slightly Agree range.

TRAINING TEAMWORK:

Where/How Can We Improve?

Six team building strategies that have been shown to enhance various aspects of teamwork are shown below. We'll go through one/a few of these together, but feel free to practise any that you think can help your team!

	Team Goal Setting	Individual Goal Setting	Team Charters	Briefs	Debriefs	Simulations
Mission Analysis	✓		✓			
Goal Specification	✓	✓		✓		
Planning	✓	✓		✓		
Coordination						✓
Cooperation						✓
Communication						✓
Performance Monitoring	✓				✓	
Systems Monitoring	✓				✓	
Problem Solving	✓				✓	
Innovation	✓				✓	
Intrateam Coaching		✓				
Backing Up		✓				
Mutual Support			✓			
Conflict Management			✓			

Team Goal Setting

Thinking about this season as a whole, address various questions such as:

- What is our reason for being together as a team?
- What are some specific team goals that we have?
- What are some of the key indicators of successful performance for our team?
- How will we achieve these goals? (i.e., team strategies, action plans)
- What are our strengths as a team? How can we best utilize these strengths in order to be successful?
- What areas do we need to work on in order to reach our goals?
- What does each individual commit to doing in order to help the team be successful?

Come up with a list of questions that are most appropriate for your team. All players should take time to reflect on these questions individually or in small groups (i.e., 3-4 players), thinking about what the team needs to do as a whole as well as what they need to do as individuals.

Once everyone has gone through these questions, come up with a master list consisting of your mission, goals, and action plans. Have this document available in a conspicuous space (e.g., as a poster in your locker room or in a team journal) so that you can monitor your progress throughout the season.

Sample Goal Setting Sheet

Team Mission – What is our reason for being together this season?

Team Goals – What are some specific team goals/indicators of performance that we are striving to obtain this season?

Action Plans – What specifically do we need to do as a team and as individuals to reach our goals/mission and be successful this season?

Strengths – What are our strengths as a team and how can we best utilize these strengths to be successful?

Areas for improvement – What specifically do we need to improve on in order to be successful this season?

Individual Goal Setting

This exercise is similar to the team goal setting but focuses on individuals' goals. Looking ahead this season, each player should identify a few personal goals that they have, taking into consideration:

- The team's goals—ensure that your personal goals fit within your team's goals
- What your role is within this team
- What your strengths are as a player and where you see areas for improvement
- How you will achieve this goal (i.e., your personal action plan)
- Where you could use help from teammates to help you improve

In addition, try to ensure that at least one of your goals focuses on teamwork. How can you help your team work well together? For example, what do you need to do in order to communicate well with your teammates while competing? Think of this as your commitment to helping your team work effectively together.

Once players have created their goals, they should share them with their teammates and coaches. Then, identify how teammates can help support each player in reaching their goals. If a hockey player, for instance, wanted to improve his/her faceoff skills, another player should volunteer to help this player during free time in practice (e.g., by practising faceoffs together). This will allow players time to improve their skills and also provides teammates with the opportunity to give advice to each other and show each other ways in which they can execute a skill effectively. This type of support is key as teammates pursue their individual goals!

Once everyone has written down their goals, sign this sheet as an indication of your commitment to this goal and to the team. Have a teammate or coach sign this as well as your “witness”. Keep this document in a conspicuous place for yourself (e.g., your locker).

Sample Individual Goal Setting Sheet

Goals – What are some specific goals that I have for this season that will help my team be successful?

Action Plans – What specifically do I need to do to achieve my goals?

Teamwork – What do I commit to doing as an individual to help my team work well together this season?

Teammate Support – Which teammates(s) will help me achieve my goal and how?

Player Signature

Teammate Signature

Team Charters

Team charters are similar to the two goal setting exercises highlighted above. However, rather than focusing on team *performance* goals, team charters provide an opportunity for teams to discuss, and ultimately agree on, members' expectations related to interpersonal dynamics.

Although not directly focused on performance, these behaviours can impact the functioning of a team. For example, players from the famous British & Irish Lions rugby union team have created 'The Lions Laws', which lays out a code of conduct and standards by which team members carry themselves (e.g., how they will support one another when players are in need, the most effective and respectful ways for resolving conflict, etc.).

When players take the time to get on the same page with regard to these types of behaviours, it helps to build team trust and open channels of communication. Every team is different so think about what types of behaviours are important for *your* team.

As with the team goal setting exercise, break into small groups (i.e., 3-4 players) to discuss these questions. Once everyone has gone through these questions, come up with a master Team Charter. Have this document available in a conspicuous space (e.g., as a poster in your locker room or in a team journal) as a reminder of these commitments that players have made.

Sample Team Charter Sheet

Team Mission – What is our team’s purpose/reason for being together this season?

Team Conduct – How do I/we commit to conducting ourselves as members of this team (e.g., at team meetings, before/after games, in the community)?

Teammate Support – What can I/we do to help support teammates?

Interpersonal Conflict – If conflicts ever arise within the team, what will I/we do to resolve these issues?

Player Signature

Team Briefs

Team briefs are similar to the team goal setting activities highlighted above but instead of looking at the season as a whole, these briefs occur prior to a game/tournament. Essentially, this involves discussing team goals and action plans for the competition as a group. Some questions that can help facilitate these briefs include:

- What are our goals for this game?
- How will we achieve these goals?
- What are our strengths as a team?
- How can we use these strengths in our gameplan against the opposing team? Do they have any tendencies or holes in their game that we could take advantage of when we play them?
- What does effective communication, coordination, and cooperation look like for us?
- Should we have a backup plan in case the original strategies aren't working?

Think about some of the things that have worked for the team in the past and how they could be utilized now. Also, it's important that all players are involved in these conversations. These interactive discussions can help team members all get on the same page going into a tournament/game and buy in to the team concepts and strategies.

These conversations lay the foundation for the competition and provides something to come back to during the game, such as between ends (what worked in that end? did we stick to the gameplan? what should we do next end?)—we'll revisit this in the Debriefs section below.

Sample Team Brief

Team Goals – What are our main goals for this game/competition?

Opposition – How can we use our strengths against the opposing team? Do they have any tendencies or holes in their game that we could take advantage of when we play them?

Action Plans – What do we need to focus on in order to achieve these goals?

Contingencies – Should we have a backup plan in case the original strategies aren't working?

The 3Cs of Teamwork – What does effective communication, coordination, and cooperation look like for us?

Team Debriefs

Most teams will have some sort of team meeting after a game/competition. Sometimes it is easy to be flippant about these meetings (especially after emotional games). But a common theme of high-performance teams involves approaching these debriefs in a more structured/systematic way (i.e., having a specific set of questions to reflect on).

You can probably see how these debriefs coincide with the team briefs that occur during the preparation stage—you created goals/plans of action before the game; after the game is completed, reflect on the team briefs and resulting performance. Some queries that can help guide these conversations include:

- How well did we perform as a team?
- Did we stick to our gameplan?
- Did we each perform our roles effectively?
- How well were we communicating?
- Did we support each other?
- Did we coordinate well with each other?
- If/when we were unsuccessful in certain situations, what sorts of things caused this?

These types of questions and subsequent feedback/discussions can help guide the team in the transition from reflecting on ‘where we are’ to ‘where we want to go’. In other words, this can provide a blueprint for addressing (a) what we need to keep doing (i.e., the things that went well) and (b) what needs improvement (i.e., the things that did not go so well).

Again, it is important that all team members get involved in these conversations rather than the coach or one or two players dictating these conversations. Differing opinions can actually be a good thing, as it can help the team be comprehensive and consider a full range of perspectives. Everyone’s voice is important!

By monitoring the team's progress and the various conditions that may be impacting its performance, the team can then start talking about the goals and action plans again for the next competition, taking into account its recent performance(s). For instance:

- If there are certain things that caused you to underperform (e.g., anything from poor preparation to miscommunications during competition to players struggling to execute their individual roles, etc.), how can you overcome these things going forward?
- What specifically do we need to do in order to be more effective as a team?
- Are there any innovative changes the team should make to the action plans (e.g., creative strategies) or should you stick with what you are currently doing?
- If a team member is struggling, what could they do to get back on track and—just as importantly—how can teammates help support this player?

As you go through these discussions, it's important to keep in mind that the purpose of these conversations is to help each other—thus helping the team be successful—as opposed to “calling each other out” or making one another feel bad/taking this feedback as a personal insult. Honest, open, and effective feedback is key in order for the team to continually grow. Come back to your team's mission and goals for the season and remember that you're all in this together.

Sample Team Debrief Sheet

Performance Monitoring – How well did we perform as a team?

Team Execution – Did we stick to our gameplan? Did we perform our roles effectively?

The 3Cs – Did we communicate well with each other? Were we well-coordinated? Did we support each other well and work as ‘one’ (as opposed to a bunch of individuals)?

Reflection – If there were situations when we didn’t perform well, what caused this?

Looking Ahead – What does the team need to do to be successful in future competitions?
What do we need to work on in practice as a team/individuals?

Simulations

Just as you would practise various skills, consistently take care of your nutrition, and get into the gym regularly to ensure that you are performing at your optimal level, it is also critical that you make time to practise these teamwork behaviours on a regular basis. So when you are doing various drills or scrimmages, don't just focus on the technical aspects of your performance but also be mindful of the 3Cs of teamwork execution.

But the question that teams need to first reflect on is:

What exactly does effective communication, coordination, and cooperation look like for our team?

Thus, as a first step, teams should take time to discuss these 3Cs in order to (a) ensure that the team is all on the same page in terms of what effective teamwork execution looks like, and (b) what each individual commits to doing in order to help the team work well together.

Then during practice, try to simulate various situations that may occur during games as best you can. As you practise working through these situations, be cognisant of the 3Cs and the markers of effective teamwork that your team has laid out. Reflect on these team behaviours as a coach and as a team. For example:

- Is the team working together effectively? Why or why not?
- How is the team communicating during these simulations (e.g., clearly; an ideal amount—not too much not too little; at the appropriate times; etc)?
- Is each individual completing their role appropriately (i.e., in a way that helps the team be successful)?
- Is the position of and timing between members during shots correct?

Making time to practise/be mindful of these three aspects that are necessary for the team to be successful will make you better prepared when the actual situations arise in competition.

Sample Teamwork Execution Exercise & Simulation Sheet

Reflection – What does effective communication/coordination/cooperation look like? What specific teamwork behaviours do the best teams execute while playing our sport? Which of these are strengths of our teams and which require improvement?

Team Action Planning – HOW, specifically, can our team get improve our teamwork execution behaviours? What will we do in practice to get better at these areas?

My Commitments – HOW, specifically, will I as an individual help improve our team's coordination/cooperation/communication? Considering my roles on this team, what commitments do I make to my team to help us work better together?

Further Support & Contact Info

“Learning is defined as a change in behaviour. We haven’t learned a thing until we can take action and use it.”

If you have any questions or if we can provide your team with any further support, please feel free to contact us at any point!

Principal Investigators:

Desmond McEwan
Mark R. Beauchamp

Mailing Address:

Psychology of Exercise, Health, and Physical Activity Laboratory
School of Kinesiology
The University of British Columbia
210-6081 University Blvd.
Vancouver, British Columbia
V6T 1Z1, Canada

Appendix R: Summary of Secondary Training Strategies for Study 6 (Chapter 6)

Team Goal Setting

The team goal setting activity was guided by recommendations from Eys et al. (2006), as outlined previously. Specifically, in the first consulting session (i.e., week 2), team members were provided with an overview of the session. They were then divided into subgroups of approximately four players each where they discussed each of the questions presented to them as a small group. This was done in order to ensure that all members on the team had an opportunity to contribute their ideas. Three main questions were presented (one targeting each dimension of the preparation aspect of teamwork – see below). After answering each question, the groups were brought back together to present their answers to the rest of the team. Coaches were also given an opportunity to offer suggestions and their own perspectives on each question. To target mission analysis, team members were asked what they feel their overall team purposes/objectives are for the season (e.g., to win a league championship, to have fun together). To target goal specification, the players were asked what they need to do throughout the season in order to achieve their purposes; specifically, members created a list of performance goals (e.g., in hockey, the average number of goals scored or penalty minutes per game). To target the planning dimension, members were asked to create specific action plans of what they need to do to achieve their performance goals (and, in turn, their overall objectives). For example, if a basketball team felt they needed to get better at shooting, they were encouraged to think about how these improvements could be made (e.g., spending a certain amount of time during practice to work on shooting, creating offensive plays that result in more quality “high-percentage” opportunities).

The team's responses to all questions were then be compiled into a document which was sent to the team. Specifically, this document included the team's purposes, performance goals, and action plans that they had created. The players were each given a copy of this document, which they added to their individual workbook. The purpose of providing the team with these handouts was to foster teamwork on an ongoing basis after the consulting sessions, and to facilitate monitoring of the team's goals. The team mission, goals, and action plans were also revisited at the follow-up training session (week 6) to determine the team's perceived progress. These sessions were carried out in a manner similar to the initial training sessions, whereby players first discussed their responses to questions in subgroups and then with the team as a whole. At these sessions, the team was asked whether it felt it was on track towards achieving its goals/purposes (i.e., performance monitoring) and whether there are certain environmental factors affecting their progression (i.e., systems monitoring). If the team felt it had not progressed well towards achieving its goals/purposes, members were asked to identify specific reasons why this had occurred (i.e., problem solving) and if any modifications to the team's approaches (e.g., goals, action plans) needed to be made (i.e., innovation). Hence, this booster session targeted the monitoring and adjustments aspects of teamwork as well as the preparation aspect. As with the initial team goal setting session, teams were sent a document that reflected any updates to the team's goals and/or action plans for achieving the team's mission.

Team Briefs and Debriefs

As previously mentioned, the team goal setting technique targets preparation aspect of teamwork (at the initial consulting sessions) as well as the evaluation and adjustment aspects (at the follow up sessions) from a "broad" perspective (i.e., the team's season as a whole). To target these aspects from a game to game perspective, the interventionist introduced the concepts of

briefing and debriefing at the training session, following the goal setting activity. Essentially, the purpose of briefs and debriefs is similar to goal setting in that it is meant to foster preparation, evaluation, and adjustments. The difference between these techniques is that the goal setting strategy highlighted above is meant to enhance preparation, evaluation, and adjustments over the course of a season, whereas briefs before a competition and debriefs after a game are meant to enhance these aspects on a more short-term, game to game basis.

Teams were encouraged to build these briefings and debriefings into their pre- and post-game meetings, respectively. While it was likely that most teams were already conducting these meetings to some extent, briefs and debriefs provide a more structured approach to these reviews. The importance of involving all members of the team in these meetings (rather than just the coaches and certain players) was reiterated. Specifically, during the pre-competition briefs, teams were encouraged to discuss *what* needed to be done in order for them to be successful in the competition (i.e., goal setting) and *how* the team would achieve these goals (i.e., action planning). As previously mentioned, some points that could guide the conversations in these briefs included: reinforcing the team's strengths; noting the strengths, tendencies, and weaknesses of the opposing team and how the team could use these points of information to their advantage; and reiterating the importance of coordinating, cooperating, and communicating in the upcoming team task. Then, during the debriefs following the competition, teams were encouraged to address: whether their goals for the team's game/competition had been met (i.e., performance monitoring); the reasons why they were or were not successful in achieving each goal (i.e., problem solving), with consideration for any environmental conditions that influenced performance (i.e., systems monitoring); the quality of teamwork execution behaviours and how these affected the team's performance; and preliminary goals and plans of action for subsequent

team tasks, including what they needed to continue to do and/or what needed to change (i.e., innovation).

Individual Goal Setting

To enhance preparation at the individual member level and to foster intrateam coaching and backing up behaviours, the individual goal setting technique was employed. Specifically, team members were encouraged to identify one or two personal performance-related goals they had for the season. When creating these goals, members were instructed to take into consideration the team's goals, their own strengths/limitations as an individual athlete, and their role within the team. Players were asked to set at least one interdependent teamwork skill that they can work on with a teammate during practices. Members first set their goals individually and then presented them to the entire team. Having members declare their goals to their teammates was meant to facilitate support among teammates and to help players finalize their goals by obtaining feedback from their teammates. After all members presented their individual goals to the team, they were asked to pair up with a teammate or a small group of teammates who would help them work on their goals during team practices (and outside of practices, if applicable). These goals were written down directly into the players' workbooks and signed by themselves as well as a teammate who served as a "witness" to the player's goals and commitments. Coaches were then encouraged to provide specific times during team practices/training to allow players to work on their individual goals together. They were revisited at the follow-up training session to ensure that players follow through with the commitments that they set in terms of providing intrateam coaching and backing up behaviours.

Team Charter

To target the management of team maintenance aspect of teamwork, teams created a team charter. The process by which this strategy was carried out was similar to that of the team goal setting sessions; that is, players first discussed their responses to questions in subgroups and then with the team as a whole. First, members discussed what their team objectives were for the season (mission analysis). They then discussed how they would conduct themselves in various situations (e.g., at team meetings, around competitions), their commitments to their teammates in terms of providing interpersonal support to each other (e.g., encouraging one another, players asking for and providing practical assistance), and how they would resolve interpersonal conflicts if they emerged (e.g., being honest and respectful, striving to find solutions that will help the team achieve its goals). As with team goal setting, a document of the team charter was created for each player to add to their individual workbook. As with the team goal setting exercise, these charters were revisited at the follow-up training session to ensure that team members were following through with the commitments that they established during the initial consulting session.

Simulation-Based Teamwork Training (SBTT)

To target teamwork execution behaviours, training began with a discussion of members' perceptions of what makes for effective communication, coordination, and cooperation. Similar to the team goal setting and team charter activities described above, we first had team members discuss three main questions (one devoted to each of the dimensions of teamwork execution – see below) in subgroups of three to four players. Groups then presented their answers to the entire team. While the exact questions given to players to reflect upon obviously depended on the team's sport, the essence of these questions was to have players examine what ideal coordination

looks like, how they can best support each other/cooperate, and what comprises effective communication. Members were encouraged to focus on specific behaviours that they can implement while playing their sport (e.g., communicating certain keywords during specific circumstances) rather than providing clichés or vague responses (e.g., “we need to make sure we talk to each other”). Once the list of key behaviours was made for each dimension, a synthesized document was sent to each player to add to their workbook.

The team was then instructed to work on these specific behaviours during team practices via the coach’s direction. As previously mentioned, it is likely that most teams already engage in simulation-type activities (e.g., scrimmages against scout teams, mock races). Therefore, to make this technique feasible to teams, we suggested that teams integrate SBTT into their existing practice activities (as opposed to creating an entirely separate team activity). It was emphasized to teams that these specific teamwork behaviours must be practised regularly in order to translate what they discussed in the training sessions into actual competition, just as the team would do to enhance technical task performance. It was also suggested (in accordance with the respective coach) that the team aim to mimic the competition environment as closely as possible when carrying out these simulation activities.