THE ROLE OF RELATEDNESS IN PHYSICAL ACTIVITY MOTIVATION, BEHAVIOUR, AND AFFECTIVE EXPERIENCES: A SELF-DETERMINATION THEORY PERSPECTIVE

by

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ABSTRACT

Self-Determination Theory (Deci & Ryan, 1985, 1991) suggests that meeting needs for autonomy, competence, and relatedness will affect the type of motivation (from amotivation to intrinsic motivation) experienced, along with cognitive, affective, and behavioural outcomes. Although relatedness should play an important role in motivation, limited research has examined the role of social constructs in this process. This project investigated antecedents and outcomes of relatedness and explored whether learning structure interventions facilitate relatedness and self-determination among adult dragon boaters. These aims were addressed in two studies. The first study involved a passive observation of 558 dragon boaters aged 19-83. Friendship quality, peer acceptance, social support, and age predicted relatedness. Autonomy, competence, relatedness, age, and gender significantly predicted self-determined motivation. Age and gender did not moderate these relationships. Self-determined motivation partially mediated the relationship between psychological needs (autonomy, competence, and relatedness) and positive and negative affect, while competence alone predicted physical self-worth, and physical activity. The second study was an 8-week intervention involving 210 paddlers from 12 dragon boat teams. Teams were randomly assigned to a cooperative or an individualistic learning intervention, and coaches were trained to conduct the intervention with their teams. Paddlers completed questionnaires at the beginning and end of the intervention period. Peer acceptance and psychological need fulfillment increased over the course of the 8 weeks similarly in both conditions. The only intervention effect was that autonomy was facilitated by the individualistic intervention. While expectations that the cooperative intervention would enhance social relationships and relatedness were not

supported, mixed effects modeling analyses demonstrated a substantial within-team clustering effect, and found that changes in relatedness perceptions predicted changes in self-determined motivation. A replication of the mediator model test in Study 1 confirmed the role of self-determination as a partial mediator. Together these studies demonstrate the importance of relatedness in adult activity motivation, link social relationship constructs to relatedness and self-determination theory, and provide evidence that within-team clustering on social and motivational variables should be considered in research with in tact teams.

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CHAPTER I

1.1 Introduction

Despite the overwhelming evidence that physical activity is critical for health and the widespread dissemination of this message in the popular press, only 39% of Canadian adults are active enough to take advantage of the health benefits of physical activity (Craig, Cameron, Russell, & Beaulieu, 2001). Much of the research aimed at identifying predictors of physical activity behaviour focuses on either individual cognitive factors such as perceptions of competence in physical activity, or broad social determinants such as socio-economic status. These approaches do not adequately address "micro-environmental" influences, including interpersonal relationships (King, Stokols, Talen, & Brassington, 2002). Social relationship influences are included in multiple theories of motivation (e.g., Deci & Ryan, 1985; Fredricks & Eccles, 2004; e.g., Harter, 1999), but have not been a prominent focus in physical activity motivation research to date. Self-determination theory (SDT; Deci & Ryan, 1985; SDT, 1991) suggests that social factors, specifically feelings of social connection, or relatedness with others, along with perceptions of competence and autonomy within a specific activity context, play a key role in influencing motivated behaviour and affective experiences. Even within the SDT framework, the focus of most physical activity research has been on the role of perceptions of competence and autonomy rather than relatedness (Frederick-Recascino, 2002). There is a need for further work on relatedness in physical activity and to link that knowledge to social relationship constructs from other theoretical perspectives that may provide insight into how relatedness develops. Further, there is a need to explore how relatedness perceptions can be enhanced in a physical activity setting to positively influence motivation, affective experiences, and behaviour.

1.2 Aim of Research

The purpose of this project is to (1) examine how social relationships in physical activity contribute to perceptions of relatedness; (2) explore the role that relatedness plays in predicting physical activity motivation, behaviour, and affective experience; (3) examine how these process are moderated by gender and age across the adult lifespan; and (4) test whether a coach-based intervention can effectively enhance social relationships, motivation, affect, and behaviour in an adult physical activity setting.

CHAPTER II: REVIEW OF LITERATURE

2.1 Self-Determination Theory

Self-Determination Theory (Deci & Ryan, 1985, 1991; Ryan & Deci, 2002) provides a framework through which physical activity motivation, behaviour, and affective experiences can be understood. The theory has two main concepts that work together to explain motivated behaviour: (1) that motivation is a multidimensional construct, and that different types of motivation will have different effects on cognitive, affective, and behavioural outcomes; and (2) that the type of motivation in a particular context is determined by how well factors within that context meet a person's basic psychological needs for autonomy, competence, and relatedness (Deci & Ryan, 1991). These concepts can be combined to create a motivational sequence with social factors influencing perceptions of psychological need fulfillment, which influence motivation and cognitive, affective, and behavioural consequences (see Figure 2.1; Vallerand & Losier, 1999).

2.1.1 The Motivational Continuum

SDT suggests that people are not simply motivated or unmotivated to perform a given behaviour, but rather that there are six types of motivation lying on a continuum from least self-determined or externally controlled, to most self-determined or internally controlled (see Figure 2.2; Deci & Ryan, 1985). *Amotivation*, or the absence of motivation, occurs when one perceives that there is no connection between one's actions and outcomes. *External regulation* is when behaviours are performed to fulfill an external demand, achieve a reward, or avoid punishment. *Introjected regulation* happens when an individual acts to avoid negative emotions such as guilt or to enhance positive

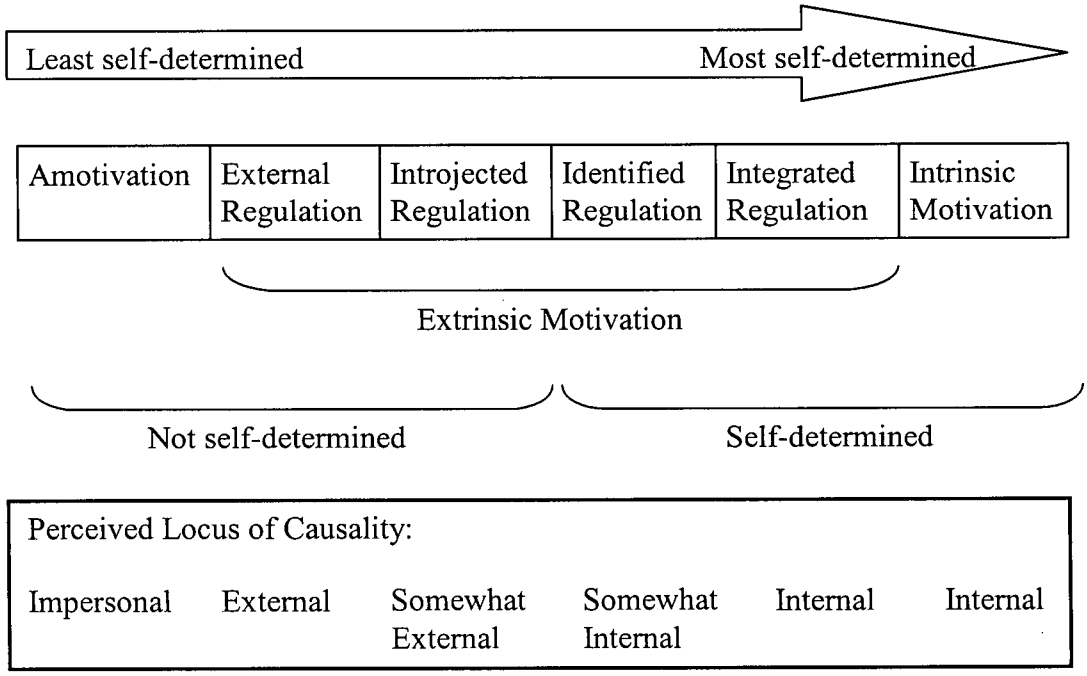
Figure 2.1: Model of the Motivational Sequence Based on Self-Determination Theory (adapted from Vallerand & Losier, 1999)

Social Factors ⇨ **Psychological Mediators**
- Autonomy
- Competence
- Relatedness

⇨ **Motivation**
- Amotivation
- External Regulation
- Introjected Regulation
- Identified Regulation
- Integrated Regulation
- Intrinsic Motivation

⇨ **Outcomes**
- Cognitive
- Affective
- Behavioural

Figure 2.2: The Motivational Continuum (adapted from Ryan & Deci, 2000b)



emotions such as pride. Introjection happens when an individual internalizes external demands and rewards and punishes his or her own behaviour in accordance with those learned demands. In *identification,* behaviours are performed because they are seen to be of personal importance and value. *Integrated regulation* occurs when behaviours are considered part of the self, but are still performed for some instrumental value. *Intrinsic motivation* refers to performing behaviour because it is inherently satisfying, interesting, or enjoyable. It is distinguished from the four types of extrinsic motivation because those behaviours are done as a means to an end that is not part of the performance of the behaviour (Deci & Ryan, 1991; Ryan & Deci, 2000b).

Some authors have subdivided intrinsic regulation into three types: intrinsic regulation to know (performing a behaviour for the sake of learning, exploring, or understanding something new), intrinsic motivation to accomplish (participating for the satisfaction of striving to improve upon one's personal best performances and achieve new personal objectives), and intrinsic motivation to experience stimulation (engaging in an activity to experience sensations such as sensory pleasure, aesthtic experience, fun, excitement, etc.; e.g., Pelletier et al., 1995). For the purposes of this study, intrinsic motivation is operationalized as one-dimensional, because SDT theory does not suggest that intrinsic motivation is necessarily multidimensional nor is there any theoretical suggestion or empirical evidence that different types of intrinsic motivation have unique predictors or differentially predict outcomes (Deci & Ryan, 1985; Deci, Vallerand, Pelletier, & Ryan, 1991).

An important distinction on the continuum is between self-determined and non-self-determined forms of motivation. Self-determined forms of motivation are those that are internally regulated by the self and therefore include intrinsic motivation, internalized regulation and integrated regulation (Ryan & Deci, 2000b). Because self-determined types of motivation are internally controlled and are performed because they are in line with the self,

more self-determined forms of regulation are associated with more positive cognitive, behavioural, and affective outcomes. Research in physical activity supports this contention, and has found that more self-determined forms of motivation are associated with higher levels of effort, future intentions to participate, persistence, exercise behaviour, fair play, attitudes towards exercise, fitness, physical activity, positive affect, physical self-worth, optimism, perceived behavioural control, flow, and lower levels of distraction, boredom, and dropout (Kowal & Fortier, 1999, 2000; Lutz, Lochbaum, & Turnbow, 2003; Ntoumanis, 2001; Pelletier et al., 1995; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Standage, Duda, & Ntoumanis, 2003; Vallerand & Losier, 1999; Vlachopoulos, Karageorghis, & Terry, 2000; Wilson & Rodgers, 2002a, 2004; Wilson, Rodgers, Blanchard, & Gessell, 2003; Wilson, Rodgers, & Fraser, 2002).

2.1.2 The Three Psychological Needs

SDT proposes that the types of motivation displayed for a particular task are influenced by how well three basic needs for autonomy, competence, and relatedness are fulfilled in that context (Deci & Ryan, 1985; Ryan & Deci, 2002). The need for autonomy is met when people feel agentic: that they have choice and are in control of their own behaviour. Feelings of competence arise when people feel effective at interacting with the social environment and achieving desired outcomes. Feelings of relatedness develop when people can authentically connect with others and feel involved in the social context (Deci & Ryan, 1991). Autonomy, competence, and relatedness are considered basic psychological needs because they are universally necessary for psychological well-being, and for the growth and development of personality and cognitive structures (Ryan & Deci, 2002).

2.1.2.1 Integration and Internalization

The fulfillment of the three psychological needs for autonomy, competence, and relatedness influence self-determined motivation via their effect on the processes of integration and internalization. Integration is the process by which people try to assimilate new experiences into the self in order to maintain a unified sense of self, and to connect in a meaningful way with other people (Deci & Ryan, 1985, 1991). Internalization is the process via which attitudes, beliefs, and behavioural regulations are acquired and develop into values, goals, or organizational structures (Deci & Ryan, 1985). Experiences are only integrated if they are consistent with meeting the person's needs for autonomy, competence, and relatedness (Deci & Ryan, 1991). If these needs are met, the individual will tend to internalize the regulation of the behaviour, as performing the behaviour becomes more important to the self. Therefore, the individual can move along the motivational continuum from less self-determined to more self-determined forms of motivation (Deci & Ryan, 1991). Integration and internalization involve a person-environment transaction, and so influences from the social milieu interact with the person to facilitate or antagonize integration (Deci & Ryan, 1991).

Integration and internalization of regulation do not necessarily progress in a single direction from less to more self-determined. Aspects of the person-environment transaction can cause this process to move in either direction. When new activities are introduced, the regulation of those behaviours can start at any point on the continuum (Ryan & Deci, 2002). For example, an individual's initial attempts at participating in skiing do not have to begin by being amotivated or externally regulated, and then progress up the continuum to intrinsic motivation. Initial attempts could be intrinsically motivated, perhaps to experience the exhilaration of hurtling down the hill. Regulation of a behaviour is dynamic, and can move along the continuum. In other words, regulation for a given behaviour can become more or less

self-determined over time as the social environment affects internalization and sense of self (Deci & Ryan, 1991).

2.1.2.2 Autonomy

Autonomy is considered a basic psychological need because of its adaptive functions that facilitate development and effective functioning. Individuals who feel autonomous are better able to coordinate their actions to maintain their own well-being (Deci & Ryan, 2000), are more persistent, and have more positive affective experiences (Connell & Wellborn, 1991). SDT suggests that social contexts that facilitate perceptions of competence, relatedness, or autonomy enhance motivation in general, but perceptions of autonomy specifically are necessary for an individual to feel self-determined. People must feel that they have a degree of control and choice in an activity in order to feel that the regulation of that behaviour is coming from within themselves (Deci & Ryan, 1985, 1991). While competence and relatedness also contribute to self-determined regulation of behaviour, autonomy is argued to be essential for fostering feelings of internal control and self-determination (Deci & Ryan, 1985).

Because SDT suggests that autonomy is the necessary condition for self-determined forms of motivation, a great deal of the research using SDT has focused on the role of autonomy. For example, several studies have explored the phenomenon that if an activity is internally regulated and the environment is manipulated such that the person perceives that an external force is now controlling the behaviour, self-determination can be undermined (for a review see Deci & Ryan, 1991). Numerous studies in the physical activity context support the link between autonomy and self-determined regulation (Gagne, Ryan, & Bargmann, 2003; Kowal & Fortier, 1999, 2000; Sarrazin et al., 2002; Wilson et al., 2002).

2.1.2.3 Competence

The identification of competence as a basic psychological need is based on theory and evidence suggesting that people need to feel effective, to see a connection between their behaviours and outcomes, and to have the ability to consistently achieve those outcomes (Deci & Ryan, 1991). There is substantial empirical support for the link between competence and motivated behaviour in the physical activity context from both studies employing a SDT framework (Gagne et al., 2003; Kowal & Fortier, 1999; Kowal & Fortier, 2000; Sarrazin et al., 2002; Wilson et al., 2002) and work guided by other competence based theories such as Harter's (1978, 1999) competence motivation theory (see Weiss & Williams, 2004).

2.1.2.4 Relatedness

The basic assumption underlying the need for relatedness is that in order to experience optimal psychosocial adaptation, human beings require frequent and pleasant contact with other people in the context of stable, mutual relationships (Baumeister & Leary, 1995). This need has been incorporated in theories of motivated behaviour including the relatedness concept in SDT (Deci et al., 1991), social support, peer approval, friendship, and social competence in Harter's (1978, 1982, 1987, 1999) competence motivation theory, and social inclusion in Leary and colleagues' (Leary, Haupt, Strausser, & Chokel, 1998; Leary, Tambor, Terdal, & Downs, 1995) sociometer theory.

Relatedness is defined as "developing secure and satisfying connections with others in one's social milieu" (Deci et al., 1991, p. 327). It is not concerned with the attainment of particular outcomes associated with interpersonal interactions such as status or power, but rather with the sense of being connected to others (Ryan & Deci, 2002). Relatedness has been conceptualized as being somewhat less important than autonomy and competence because the latter are theorized to enhance self-determined forms of motivation specifically, while

relatedness is proposed to enhance motivation in general (Deci et al., 1991). In addition, people can maintain intrinsic motivation for many solitary endeavours despite not feeling connected to others while doing them (Ryan & Deci, 2002). As a result, the role of relatedness has not been explored as extensively as those of autonomy and competence, but its potential for making a unique contribution to motivation suggest this construct merits more study (Deci et al., 1991; Frederick-Recascino, 2002).

The ability of relatedness to enhance motivation may be of great importance in research on health behaviours such as physical activity that are not always perceived to be inherently interesting and are often externally prompted, at least in the beginning stages of participation. Individuals are likely to initiate or continue such behaviours if they are plied with extrinsic rewards or punishments, or if the tasks are valued by significant others with whom they feel related, or would like to feel that they belong (Ryan & Deci, 2000a). Externally controlled regulations are, however, associated with negative affective and behavioural outcomes, including inconsistency and discontinuation of behaviour (Deci et al., 1991). Providing a social context that facilitates relatedness can help individuals initiate and continue to participate in an activity, providing an opportunity to foster self-determination by facilitating perceptions of competence and autonomy rather than undermining it with the use of extrinsic rewards (Ryan & Deci, 2002). In order for the behaviour to become self-determined (i.e., progress beyond introjection, or the internalization of rewards and punishments imposed by others) SDT suggests it is necessary to have autonomy in addition to relatedness, otherwise the effect of relatedness would be controlling, not self-determined (Ryan & Deci, 2002). Relatedness can play a critical role in socializing people into physical activity behaviours that may not initially be internally regulated, thus promoting the development of self-determination (Frederick-Recascino, 2002).

Research in physical activity contexts supports the SDT proposition that the degree to which relatedness needs are met will influence the type of motivation experienced in that context, with greater degree of need satisfaction associated with more self-determined forms of motivation (e.g. Kowal & Fortier, 2000; Sarrazin et al., 2002; Wilson et al., 2002). However, the question of whether relatedness is as important as autonomy and competence in influencing self-determined forms of motivation is unclear. Research with adolescents in the sport context has typically found that relatedness is either a weak predictor of self-determined motivation (e.g., Ntoumanis, 2001; e.g., Sarrazin et al., 2002), or is not a significant predictor at all (Reinboth, Duda, & Ntoumanis, 2004). Similarly, work with adults in exercise classes has found that relatedness is the weakest predictor of self-determined motivation of the three needs (Li, 1999; Wilson et al., 2002), or is not associated with motivation (Wilson et al., 2003). In contrast, work with masters age swimmers (Kowal & Fortier, 2000) and physical education students (Standage et al., 2003) found that competence and relatedness are stronger predictors of self-determined motivation than autonomy. Qualitative work with Special Olympics athletes also found that relatedness may play a particularly important role with some populations for whom relatedness needs are particularly salient (Farrell, Crocker, McDonough, & Sedgwick, 2004). Relatedness may also play a particularly important role in activities that inherently social in nature such as team sports (Vallerand, 2000). Although these studies are only the first evidence in an emerging body of literature, they do suggest that the importance of relatedness in the self-determination process may vary depending on the characteristics of the activity and the participants.

Relatedness may be particularly important in physical activity settings involving adult populations because adults may be especially likely to participate in physical activity for externally prompted reasons such as concern with health and appearance. People often have

multiple goals for engaging in physical activity. Adults, particularly adult females, often identify external reasons for initiating participation in physical activity such as weight loss and health concerns. These people are therefore more susceptible to having less self-determined motivation for physical activity (Frederick & Ryan, 1993). In these and other similar scenarios, regulation of physical activity is somewhat externally controlled, theoretically leading to less self-determined types of motivation, lower levels of persistence, and less positive affective experiences for the participant. SDT suggests that an exercise context promoting relatedness would be particularly beneficial for people who may otherwise be regulated by external or introjected means. For this reason, adult participants in a physical activity context may benefit from having their relatedness needs met.

2.1.3 The Social Context

How well the needs for autonomy, competence, and relatedness are satisfied is dependent upon elements of the social context. Work with SDT theory suggests that autonomy is supported by opportunities for choice, low levels of pressure, and encouragement to initiate activities. Competence is enhanced by structural elements of the activity whereby the contingencies of performing certain behaviours are clear, and feedback is provided. Relatedness is enhanced by the involvement of others, and feelings that significant others are interested in and devote time to the relationship (Deci & Ryan, 1991). Somewhat less work has explored the role of the social context in physical activity, as compared to research on regulation types and their link to outcomes. An emerging body of work has begun exploring the role of autonomy support in physical activity (e.g., Gagne et al., 2003; Wilson & Rodgers, 2004), and linking the concepts of mastery climate (a social context that encourages evaluating success based on effort and individual improvement) from Achievement Goal theory (Nicholls, 1984) to explain the fulfillment of the psychological needs in the physical activity context.

Work exploring the links between motivational climate and psychological need fulfillment has often excluded relatedness needs, and work including relatedness has produced equivocal results. Some studies have found positive relationships between mastery climate and relatedness (Kowal & Fortier, 2000; Sarrazin et al., 2002), and some studies have found no link (Standage et al., 2003), although performance or ego oriented climates are consistently found to not be associated with relatedness (Kowal & Fortier, 2000; Sarrazin et al., 2002; Standage et al., 2003). One study with adolescents in a physical education setting found that cooperative learning aspects of a mastery motivational climate significantly predicted relatedness (Ntoumanis, 2001). While these findings provide some preliminary suggestion that a mastery climate might promote relatedness, they say little about what social interactions specifically contribute to fulfilling relatedness needs in physical activity.

One study has examined how specific social interaction variables contributed to relatedness using the SDT framework (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000), although this work was not done in a physical activity context. Five specific types of interactions significantly predicted relatedness: (1) talking about meaningful matters; (2) feeling understood and appreciated; (3) hanging out with others; (4) doing fun or pleasant things together; and (5) feeling self conscious, judged or insecure (negative relationship). Simply participating in the same task together and arguing or having conflict were unrelated to the fulfillment of relatedness needs. While this study provides some preliminary evidence on specific candidate social interactions, this research was not done in a physical activity context, and the specific interactions were not chosen based on a theoretical framework, so it is difficult to determine whether key candidate social interactions were included. Overall, initial research exists to suggest that elements of the social context pertaining to social relationships and interactions in

the physical activity context and aspects of a mastery motivational climate may promote relatedness, but very little work has been done to date that incorporates these ideas.

2.2 Links to Other Motivational Theories

While it is clear that SDT provides an appropriate framework in which to study social relationships and motivation in the adult physical activity context, there are many competing theories of physical activity motivation in the sport and exercise psychology field. These competing theories must be considered both in terms of why it is most appropriate to frame the present research questions from a SDT perspective, and in terms of what knowledge and empirical evidence exists in those traditions that may inform the present study. While a full review of all motivational theories in the field is beyond the scope of this paper, four theories (self-efficacy, expectancy-value, competence motivation, and achievement goal theories) will be briefly considered in this regard. These four theories are prominent motivational theories in the sport and exercise literature that incorporate some aspect of social relationships or social influence that is pertinent to the current project. All of the theories discussed espouse a one-dimensional model of motivation, in contrast to the multidimensional conceptualization of motivation in SDT. The multidimensional approach is considered a unique advantage of using SDT, given the substantial evidence demonstrating that the different types of motivation are predictive of different outcomes. The degree to which the following theories conceptualize social relationships and influences varies, however, and provide unique insights to build on the SDT framework.

2.2.1 Self-efficacy Theory

Self-efficacy theory (Bandura, 1997) proposes that motivated behaviour occurs when an individual believes he or she can effectively perform a desired task. Perceptions of self-efficacy are influenced by previous performance experiences, vicarious experience, verbal

persuasion, and physiological states (Bandura, 1997). Social processes work to affect the predictors of self-efficacy in that significant others such as coaches can contribute to creating successful attempts at a task to build a positive performance history, modeling behaviour of similar peers works to create vicarious experience, and a range of significant others can employ verbal persuasion methods to affect efficacy beliefs. Self-efficacy theory does not endorse the SDT concept that fulfillment of universal needs, including making meaningful interpersonal connections with others in the activity environment, predict motivated behaviour. Rather, it focuses on the socializing influences of significant others as they directly relate to the specific behaviour at hand. In this way, self-efficacy theory is more focused on influences relevant to specific behavioural responses, while SDT considers how motivation may be influenced by how well particular contexts nurture a participant as a person.

2.2.2 Expectancy-value Theory

Expectancy-value theory (Fredricks & Eccles, 2004) also incorporates social influences in predicting motivation. The theory is a very complex, comprehensive theory, but it essentially suggests that a host of social environmental constructs (the cultural milieu; socializing agents' beliefs and behaviours; stable individual characteristics; previous achievement-related experience; an individual's interpretation of their previous experience; an individual's perceptions of socializing agents' beliefs, gender roles, activity stereotypes and task demands; goals and general self-schema; and affective reactions and memories) influence an individual's expectations for success and perceived value of the task, which in turn predict achievement related behaviour (Fredricks & Eccles, 2004). The focus of this theory is on how socializing agents (who could be parents, peers, coaches, etc.) contribute to the socialization process, rather than being specifically concerned with the role of building authentic

interpersonal connections. The role of socializing agents is particularly important in understanding effects such as gender differences in physical activity motivation and behaviour.

2.2.3 Competence Motivation Theory

Competence motivation theory (Harter, 1978, 1982, 1987; Harter, 1999) suggests that motivation is predicted by competence perceptions and perceptions of social support and regard via the mediating effect of self-esteem and affect. Harter's (1999) model considers cognitive and social development in its conceptualization of relevant domains of the self at different developmental levels. As such, the theory suggests that perceptions of social acceptance and close friendship are pertinent from adolescence onwards (Harter, 1999). This model has been adapted to the physical activity context by Weiss and her colleagues (Weiss, 2000; Weiss & Ebbeck, 1996), who suggest that social acceptance, friendship, and social support in physical activity contribute to self-esteem and subsequently sport-related affect, motivation, and behaviour. The mediating effect of global self-esteem has not always proven viable in predicting motivation in physical activity (McDonough & Crocker, 2005). However, research using this theory, particularly in the youth sport context, has fostered the development of much of the present knowledge about social relationships in activity. In particular, when multiple peer relationship elements have been examined together, they have been found to be unique predictors of motivation (e.g., Smith, 1999). Recent research in the youth sport domain has found links between peer relationship constructs based on competence motivation theory and SDT by demonstrating that peer acceptance and friendship uniquely predict intrinsic motivation (Ullrich-French & Smith, 2006). Competence motivation theory, although distinct from SDT, provides a unique, complementary view of the role of social relationships in human motivation that can contribute to the development of SDT theory and research into elements of social interaction that contribute to fulfilling the need for relatedness in physical activity contexts.

Specifically, the number of social partners, and the quality of those relationships reflected in perceptions of social acceptance, close friendship, and social support in the physical activity context are worthy of investigating in terms of their contribution to fulfilling relatedness needs and enhancing self-determined motivation.

2.2.4 Achievement Goal Theory

Achievement goal theory suggests that more positive motivational outcomes result when an individual uses task/mastery (personally referenced) as compared to outcome/performance (normatively referenced) criteria in assessing their performance in an achievement domain (Nicholls, 1984; Roberts, 2001). The use of task/mastery versus outcome/performance criteria is influenced by an individual's goal orientation, ability to differentiate between ability and effort, and motivational climate (Roberts, 2001). Goal orientation is an individual's dispositional orientation toward using task/mastery versus outcome/performance criteria. Motivational climate is an individual's perception of whether significant others in the environment encourage the use of task/mastery or outcome/performance criteria.

In contrast to SDT, achievement goal theory does not explicitly consider the role of having authentic connections with other people in the motivational process. The concept of mastery motivational climate in achievement goal theory is, however, compatible with the concept of the social context in SDT. A handful of studies linking these theories have found that mastery motivational climates, and particularly cooperative learning aspects of the motivational climate, may promote relatedness perceptions in the physical activity context (Kowal & Fortier, 2000; Ntoumanis, 2001; Sarrazin et al., 2002).

2.3 Links to Learning Structure Research and Cooperative Learning

Research linking SDT and achievement goal theory and specifically work that has explored the role of the motivational climate has suggested additional links between these theories and the concept of learning structures in the educational literature that may have specific relevance to the understanding and facilitation of relatedness. Work by Ntoumanis (2001) linking SDT with an achievement goal theory perspective found that among youth in a physical activity context, perceptions of cooperative learning were associated with relatedness. Although this study was correlational, the results suggest that cooperative learning interventions in a physical activity context may enhance relatedness. This idea is also supported by work in education indicating that cooperative learning environments both enhance learning and interpersonal relationships within the learning context (Dudley, Johnson, & Johnson, 1997; Hymel, Zink, & Ditner, 1993; Slavin, 1991). If properly designed, cooperative learning structures encourage face-to-face interaction and prosocial behaviours (Hymel et al., 1993).

A key component of coached physical activity programs are learning and honing skills through instructional activities structured by coaches. Research in education has identified three types of learning structures that are also relevant to the physical activity context: competitive (success is defined based on an individual's performance relative to others), individualistic (participants are evaluated and rewarded based on their effort and progress) and cooperative (participants work in collaboration to achieve learning goals, and are rewarded and evaluated as a group; Hymel et al., 1993). Both individualistic and cooperative learning structures facilitate task-involvement and intrinsic motivation by focusing on the process (effort) rather than outcomes (winning). Cooperative learning specifically has been shown to enhance learning, interpersonal relations, ability perceptions, intrinsic motivation, perceptions

of personal control, self-esteem, and persistence in on-task behaviours (see Hymel et al., 1993 for a review).

To successfully attain positive outcomes, cooperative learning programs must include five key components: positive interdependence, face-to-face interaction, individual accountability, social skills training, and opportunities for group evaluation (Johnson & Johnson, 1990; see Hymel et al, 1993 for a review). Positive interdependence requires that each person can only attain the goal if everyone succeeds, and that every participant's efforts benefit everyone in the group. This can be created through interdependent goals, tasks, resources, roles, and/or rewards. Face-to-face interaction implies that group members must participate in direct verbal interaction. Individual accountability requires that the work done to achieve the goal must be equitably distributed among group members, and individual group members must be evaluated individually on their efforts and contributions to the group. Specific training in positive social interaction and collaborative skills is required prior to cooperative tasks being assigned so that participants are equipped to work together in a positive manner. Finally, participants must be given the opportunity to evaluate and discuss among themselves how the group is functioning. All of these components are required if the positive learning and social benefits of cooperative learning are to be sustained. Incorporating these five elements into a physical activity environment may help facilitate learning and enhance relatedness perceptions among participants.

2.4 Age and Gender

SDT proposes that autonomy, competence, and relatedness needs are universal, and are expected to play an important role in motivation regardless of gender, age, culture, or context. It has been argued, however, that socialization can lead to differences in the relative importance or strength of the three needs in predicting self-determined motivation (Chirkov, Ryan, Kim, &

Kaplan, 2003; Ryan, La Guardia, Solky-Butzel, Chirkov, & Kim, 2005). Age and gender differences in physical activity participation and social relationships are well documented. Activity varies with gender and age, with women being consistently less active than men throughout the lifespan, and activity levels decreasing with age throughout adulthood (Craig et al., 2001). Consistent gender differences in social relationship variables have been documented, with women typically reporting that they rely on others more for emotional support than men (Ryan et al., 2005). As early as adolescence, female relationships tend to be characterized more by intimacy and smaller peer group size than males (Berndt, 1982).

Theoretical explanations for gender differences typically discuss how socialization and gender role differences influence affect, cognition, and behaviour. These theories typically explain gender differences in behaviours by suggesting that there are differences in how maleness and femaleness are constructed by society and in how individuals are taught or encouraged to fulfil gender roles (e.g., Bem, 1981; Bussey & Bandura, 1999; Deaux & Kite, 1987). Males and females tend to be treated differently in childhood and throughout their lives (Greendorfer, 1992), teaching gender stereotypes and reinforcing adherence to gender roles. These theories are consistent with SDT in that differences in how individuals are socialized into gender roles are similar to the concepts of integration and internalization of values in SDT. When an individual performs a behaviour, and their needs for relatedness, competence, and autonomy are met, the motivation for that behaviour becomes more internalized (self-determined) and integrated or assimilated into the individual's sense of self (Deci & Ryan, 1985, 1991). In so far as the provisions for relatedness, competence, and autonomy needs are associated with gender in that context, this process could lead to gender differences. For example, social acceptance and encouragement for participation in physical activity could be provided more readily and positively for men than women, leading to greater participation rates

among men. Or, women could tend to be socialized to place more importance on social relationships than men, resulting in an increased salience of relatedness in predicting motivation. The latter would suggest that gender may moderate the prediction of relatedness and motivation if men and women vary in the most salient aspects of their social relationships and the importance they place on social connectedness in their leisure activities.

While much less work has explored age and development differences in adults' motivation, recommendations have been made to test the role of age and development in these processes (Ryan et al., 2005). Developmental changes in adults are typically linked to important life events rather than maturity, so developmental processes in adulthood do not match with age as clearly as they do in childhood, and variations can only be examined within broad age-related phases (Brustad & Babkes, 2004). Age differences in social aspects of physical activity motivation processes may be linked to differences in life phases, as people are continuously being socialized during adulthood (Andersen, Chen, & Carter, 2000). Work on psychological and social development through the adult years suggests that adults in certain developmental periods, such as older adults, may benefit from activities that enhance their opportunities for social connections with others (Whaley, 2004). Relatedness may also vary in importance across the adult lifespan, due to changes in reasons for exercise and social factors that occur throughout the adult lifespan (Frederick-Recascino, 2002). For example, social support has been found to change over the lifespan, and seems to be an important predictor of exercise behaviour among older adults (Brustad & Babkes, 2004; Landry & Solmon, 2002; Resnick, Orwig, Magaziner, & Wynne, 2002). Given the growing emphasis on employing a developmental perspective in activity research (Weiss, 2004) and the known shifts in activity and social relationships that occur during adulthood, it is important to consider age-related influences in motivational processes in this study.

2.5 Summary

The understanding of physical activity motivation and participation could be substantially enhanced through a better theoretical and practical understanding of how interpersonal relationships and social interactions contribute to feelings of relatedness, and how relatedness impacts motivation and cognitive, behavioural, and affective outcomes in physical activity among adults. Previous research with SDT has not focused on relatedness. This might be because relatedness was not considered as important as autonomy and competence in the motivation process, and also likely because of the difficulty of assessing the complexity of social interactions and relationships. In research on physical activity among adults, a better understanding of relatedness may prove valuable because of its role in increasing motivation for health behaviours such as physical activity that may not be entirely internally motivated. Relatedness may therefore facilitate the processes of integration and internalization that can lead to positive affective experiences and persistence in physical activity.

The importance of various types of social relationships and interactions in predicting relatedness is not known. Research has not directly examined the relative importance of relatedness as compared to the other three needs. There are also suggestions that the importance of relatedness may vary with age and gender but this question has not been directly examined. Finally, there is reason to believe that learning structure interventions may have a positive impact on relatedness perceptions and self-determined motivation. Research that can address these issues would provide a unique contribution to the theoretical understanding of social relationships and motivation from a SDT perspective, as well as potentially provide practical strategies to enhance motivation via the facilitation of relatedness in physical activity.

2.5 Purpose

The general purpose of this project is to examine antecedents and outcomes of relatedness in a physical activity context among adults, and to examine whether key social relationship factors can be facilitated to enhance relatedness and self-determination among adults in a physical activity context. This purpose will be addressed through two separate studies.

CHAPTER III: STUDY 1

3.1 Purpose

The purpose of the first study was to examine (1) how social relationship factors (social support network size, perceived social support, peer acceptance, and friendship quality) influence perceptions of relatedness; (2) how relatedness, autonomy and competence predict the types motivation on the SDT continuum and affective and behavioural outcomes (positive and negative affect, physical self-worth, and physical activity); (3) and whether age and gender moderate these processes among adult dragon boat participants.

Dragon boat participants were chosen as the target population for this study because dragon boat is a large group recreational physical activity popular among adults in British Columbia. A dragon boat is essentially a very stable 20-person canoe. The sport is accessible to participants of various skill levels and physical abilities, as it is a non weight-bearing activity, with workouts easily adjusted to the level of the individual (McKenzie, 1998). Given the accessibility of the activity and its historical roots in Asian culture (Barker, 1996), the sport attracts a range of participants diverse in culture, age, and ability. Racing categories exist for a range of ages (junior-18 and under; open-any age; masters-40 and over; and senior-55 and over) and gender divisions (men's, women's and mixed). Dragon boat is an appropriate activity in which to study social interactions, as it requires that a large group of people work together in a confined space at a common task in order to effectively paddle the boat. In this way, it provides an ideal context in which to conduct research on social interactions in physical activity.

3.2 Hypotheses

In order to meet the purposes of this study, a series of hypotheses and exploratory research questions were proposed:

1. No specific hypotheses were proposed concerning which social relationship factors (social support network size, perceived social support, peer acceptance, and friendship quality) would predict relatedness, or whether age or gender would moderate these relationships, as insufficient prior work linking these constructs exists on which to develop firm hypotheses. Instead, two exploratory research questions were posed:
   a. Do social support network size, perceived social support, peer acceptance, and friendship quality predict relatedness?
   b. Do age and gender moderate these relationships?
2. Autonomy, competence, and relatedness will all be predictors of self-determined motivation, with autonomy being the strongest predictor, followed by competence and then relatedness.
3. Age will moderate the relationship between relatedness and self-determined motivation in that relatedness will be a stronger predictor for older participants than for younger participants.
4. Gender will moderate the relationship between relatedness and self-determined motivation in that relatedness will be a stronger predictor for women than for men.
5. Self-determined motivation will mediate the relationship between psychological needs (autonomy, competence, and relatedness) and affective and behavioural outcomes (positive and negative affect, physical self-worth, and physical activity).

3.3 Methodology

3.3.1 Participants

In total, 558 adults aged 19 years and older who were actively participating in a dragon boat program and were able to read and write in English took part in this study. Participants ranged in age from 19 to 83 (*M* age = 45.09, *SD* = *14.74*). The majority of participants (n =

400, 72%) were female, with 70% of participants reporting their ethnicity as Caucasian, 24% reporting Asian descent, and the remaining 6% reporting their ethnicity as Hispanic, First Nations or Aboriginal, African, Jamaican, East Indian, or mixed ethnicity. Participants tended to be highly educated, with 88% of the sample having at least some post-secondary education, and 54% having at least an undergraduate degree. Based on estimates from participants' postal codes and the 2002 British Columbia Statistics from the Canada Customs and Revenue Agency, participants were classified as having median incomes 4% above the provincial median (which was just over $22,000 for the 2002 tax year). Fourteen percent of the sample had estimated incomes below 80% of the provincial median and 29% had estimated incomes above 120% of the provincial median.

The participants represented 75 different dragon boat teams. On average, participants had been involved in dragon boating for 3.62 years (SD = 3.46), and 20% of the sample were in their first year of dragon boating. They had been on their current team for an average of 2.54 years (SD = 2.23), with 25% in their first year on their current team. Participants reported practicing 1-5 times per week (M = 1.93, SD = .66), an average of 6.77 (SD = 2.77) months per year.

The required sample size was estimated based on the multiple regression moderator effects analysis because it required the largest number of participants of all analyses methods employed in this study. These calculations were based on the assumption that with a moderate effect size of .50, adequate power (80%) with an alpha of .05 would be achieved with 15-20 participants per predictor (Pedhazur, 1997; Stevens, 1996). For the moderator test of social relationship factors predicting relatedness, moderated by age and gender, 29 predictors were anticipated for the regression equation (9 social relationship factors, age, gender, 9 age

moderator terms, and 9 gender moderator terms), yielding a predicted adequate sample size of 435-580.

3.3.2 Procedures

Following approval by The University of British Columbia Behavioural Ethics Research Board, initial contact was made with coaches or managers of teams by email letter (see Appendix A) to briefly explain the study and ask for their permission to recruit participants from their teams. If permission was granted, arrangements were made for the researcher to go to a team practice or meeting to provide a brief description to the project, and distribute consent forms (see Appendix B), questionnaires, and pre-stamped envelopes to interested participants. Consenting participants completed the questionnaires at their leisure and returned them to the researcher by mail. Questionnaires took approximately 30-40 minutes to complete. The researcher or a trained assistant was available to answer questions raised by the participants at the meeting, and participants could contact the researcher with questions via phone or email information provided with the questionnaire. Participants were asked not to put their names on the questionnaire to protect their anonymity. In total, 1255 questionnaires were distributed and 558 were returned, representing a 45% response rate.

3.3.3 Measures

The questionnaire package for this study contained previously validated instruments assessing social support, peer acceptance, friendship quality, psychological need fulfillment, self-determined motivation, positive and negative affect, physical self-worth, and physical activity, along with a series of questions on participants' demographic information and dragon boat history (see Appendix C).

3.3.3.1 Social Support

Social support for dragon boat participation was measured using Richman, Rosenfeld, and Hardy's (1993) Social Support Survey modified based on work by Rees and Hardy (2000) to assess four types of social support identified as pertinent in physical activity: informational, emotional, esteem, and tangible (see Appendix C-1). Informational support refers to the provision of advice, guidance, or information; emotional support includes providing comfort and security; esteem support is bolstering one's sense of ability and recognizing one's efforts; and tangible support is providing resources to help manage stresses and challenges. The questionnaire is divided into four components addressing each of the four types of support. In each section, participants were provided with a definition of the type of support, and were asked to write the initials of each person who provides them with that type of support for dragon boating. They then indicated their relationship to that person (e.g., team-mate, friend, coach, etc.), and indicated how much of that type of support that person provides to them. Space is provided for respondents to indicate up to eight people who provide support for each of the four types of support. Finally, participants provided an overall indication of how much of that type of support they received. Questions about amount of support received are scored on a five point Likert scale with the labels *receive very little, receive a little, receive some, receive quite a bit,* and *receive very much.*. Participants were asked to respond to each section with respect to the support that they received for their dragon boat participation.

Social support network size was derived by counting the number of distinct individuals identified as providing social support amalgamated across all four dimensions. Amount of social support for each dimension was indicated by the overall rating of support in each dimension. The scale can also be scored to yield values for the size of an individual's social support network for each type of support (e.g., information support network size) and the

amount of support received by people in various types of relationships (e.g., friend support, team-mate support, etc.). Given that overall network size and overall amount of social support were the variables of primary interest in this study, the analyses were limited to these variables. Richman and colleagues (1993) provided evidence that the original version of the scale had adequate test-retest reliability, and content, structural, and concurrent validity. A modified version of this scale similar to the one used in this study has been used with adolescents (Hoar, 2003) and adult female dragon boat participants (Sabiston, McDonough, Sedgwick, & Crocker, 2005). With adolescents, it has been found to have acceptable internal consistency ($\alpha = .76$) and a confirmatory factor analysis suggested that the amount of support and network size items load on separate factors (Hoar, 2003).

3.3.3.2 Peer Acceptance

Peer acceptance was assessed using the social acceptance subscale from the Self-Perception Profile for College Students (Neeman & Harter, 1986), modified to ask participants to indicate the level of acceptance they felt in dragon boat (see Appendix C-2). This scale contained four items assessed on a structured alternative format scale. In this type of scale, participants are asked to identify which of two opposing statements best describes them, and then indicate whether the statement is *sort of true for me* or *really true for me*. The scale was developed with college-aged students (Neeman & Harter, 1986). Research using this scale has demonstrated acceptable internal consistency ($\alpha = .80$), and principal components analysis found all four items load on one factor (Neeman & Harter, 1986). Construct validity is supported by evidence that of the 13 self-perception domains social acceptance is most strongly correlated with the other social relationship subscale, close friendships ($r = .55$), and self-worth ($r = .56$; Neeman & Harter, 1986), which has been theoretically linked to perceptions of social acceptance (Leary et al., 1998).

3.3.3.3 Friendship Quality

Perceptions of friendship quality were assessed using Weiss and Smith's (1999) Sport Friendship Quality Scale (SFQS), modified to ask participants about their friendship quality in the dragon boat context (see Appendix C-3). This scale contains 22 items and assesses perceptions of friendship quality on six dimensions: self-esteem enhancement and supportiveness, loyalty and intimacy, companionship and pleasant play, things in common, conflict resolution, and conflict. Participants are instructed to first think of their closest friend in their dragon boat group, and to write that person's initials at the top of the page. They then respond to each of the items, thinking about their relationship with that person. Each item is measured on a five-point Likert scale with the labels *not at all true, a little true, somewhat true, pretty true,* and *really true.* The scale was developed with young adolescents, and has been validated with participants up to age 18 (Weiss & Smith, 2002). Research using this scale has found that all six subscales have acceptable reliability with alphas ranging from .70-.92 (McDonough & Crocker, 2005; Weiss & Smith, 1999, 2002). Validity has been supported by a demonstration that the scale can distinguish between best and third-best friends (Weiss & Smith, 1999). In the original construction of the scale, confirmatory factor analyses yielded a reasonably good fit to the six-factor model (Weiss & Smith, 2002), but subsequent work has found problems with the six-factor structure, with some work finding that a seven-factor solution provided an improved fit (McDonough & Crocker, 2005), and other work finding that a six-factor model fit if error terms were allowed to correlate in the model (Weiss & Smith, 2002). Some authors have overcome this problem by combining all of the items except conflict items into a single "positive friendship quality" factor (e.g., Ullrich-French & Smith, 2006). While this scale has not been validated with adults, it was chosen as the most appropriate measure of friendship in a sport or physical activity context currently available. To address the

lack of information regarding the psychometric properties of this scale in this population, and the previous contradictory findings regarding the factor structure of the SFQS, a confirmatory factor analyses was conducted on the scale and is reported in the results section.

3.3.3.4 Autonomy, Competence, and Relatedness

The Psychological Need Satisfaction in Exercise (PNSE; Wilson, 2003; Wilson, Rogers, Rodgers, & Wild, in press) scale was used to assess participants' perceptions of how well their needs for autonomy, competence, and relatedness were satisfied in the dragon boat context (see Appendix C-4). The PNSE was developed within the SDT framework for use in exercise contexts. The scale has 18 items, with 6 items assessing each of the three psychological needs. Examples of items from each of the three scales include: *I feel free to choose which dragon boat activities I participate in* (autonomy), *I feel that I am able to complete dragon boat activities that are personally challenging* (competence), and *I feel connected to the people who I interact with while we dragon boat together* (relatedness). Participants respond to each question on a 6-point Likert scale with the labels *false, mostly false, more false than true, more true than false, mostly true,* and *true.* The scale is scored by computing the mean value for the items within each of the three scales to arrive at a scale score. Each of the three scales has demonstrated acceptable reliability (α = .90-.91) in studies with exercising adults (Wilson et al., in press). The three-factor structure of the PNSE has been supported with both exploratory and confirmatory factor analyses on separate samples, and support has been found for the convergent and divergent validity of the PNSE subscales (Wilson et al., in press). Wilson (2003) also demonstrated construct validity of the PNSE subscales by demonstrating that higher scores on the PNSE predicted more self-determined exercise regulations and more positive behavioural and psychological consequences. Given that this scale is relatively new, and that previous studies have been conducted with somewhat

younger adult samples than the present study, a confirmatory factor analyses was conducted to provide additional psychometric evidence for using this measure with this population. The results of this analysis are reported in the results section.

3.3.3.5 Physical Activity Motivation

The Behavioural Regulation in Exercise Questionnaire (BREQ; Mullan, Markland, & Ingledew, 1997) was used to assess motivation as it is conceptualized by SDT in the dragon boat context (see Appendix C-5). The BREQ contains 15 items measuring four types of motivation: external regulation, introjected regulation, identified regulation, and intrinsic motivation. The BREQ does not contain a scale measuring amotivation, as it was found that amotivation for exercise is not a relevant construct for most exercise participants, so the distribution of responses on this scale tends to be highly skewed (Mullan et al., 1997). The BREQ also does not contain a scale assessing integrated regulation. While integrated regulation is a component of SDT, it has proven difficult to develop items that distinguish it from both identified regulation and intrinsic motivation, so it is typically not included (e.g., Mullan et al., 1997; Pelletier et al., 1995). Participants responded to each question on a 5-point Likert scale with the labels *not true for me, sometimes true for me, moderately true for me, often true for me,* and *very true for me.* Acceptable internal consistencies have been found for all subscales (α = .76-.90), confirmatory factor analyses have found support for the four-factor model with adult exercisers, and assessments of the model invariance suggest that the scale operates similarly for males and females (Mullan et al., 1997). Construct validity for the scale has been supported with evidence that BREQ scores discriminate between physically active and inactive groups (Mullan & Markland, 1997) and exercisers with high versus low physical self-esteem (Wilson & Rodgers, 2002b).

As a composite index of self-determined motivation, the relative autonomy index (RAI; Grolnick & Ryan, 1987) was calculated to facilitate testing the hypotheses regarding self-determined motivation with a single index of motivation. The RAI is based on the theoretical tenets of the motivational continuum, that self-determined and non-self-determined forms of motivation will have positive and negative effects, respectively, on cognitive, affective, and behavioural outcomes, with more self-determined forms of motivation having more positive effects, and less self-determined forms having more negative effects (Deci & Ryan, 1985). The RAI is therefore calculated by calculating a weighted sum of the four types of motivation as follows:

$$\text{RAI} = (2 \times \text{Intrinsic}) + \text{Identified} - \text{Introjected} - (2 \times \text{External})$$

The RAI has been recommended as a valid means of scoring the BREQ (Mullan et al., 1997) and has been used frequently in physical activity research (e.g., Gagne et al., 2003; Ingledew, Markland, & Sheppard, 2004; Kowal & Fortier, 2000; Rose, Parfitt, & Williams, 2005).

3.3.3.6 Positive and Negative Affect

Positive and negative affect typically experienced during dragon boating was assessed using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The complete scale is found in Appendix C-6, and contains 20 items measuring two separate factors, positive and negative affect, on a 5-point Likert scale with the labels *not at all, a little, moderately, quite a bit,* and *extremely*. This scale has been used extensively in psychological research with adults across the lifespan (Mackinnon et al., 1999), demonstrates acceptable internal consistency (Watson et al., 1988), and it is reliable and valid based on evidence that the two factors are distinct, and that they have expected relationships with measures of depression, anxiety, and psychological distress (Watson et al., 1988).

3.3.3.7 Physical Self-Worth

The physical self-worth subscale of the Physical Self-Description Questionnaire (PSDQ; Marsh, Richards, Johnson, Roche, & Tremayne, 1994) was used to assess physical self-perceptions (see Appendix C-7). Physical self-worth was included in this study as a measure of global physical affective evaluations of the self. The PSDQ was originally developed and validated with adolescents (Marsh et al., 1994), but has since been employed successfully with adult populations (e.g. Marsh, Asci, & Tomas, 2002; Wilson & Rodgers, 2002b). The scale contains six items scored on a six-point Likert scale with the labels *false, mostly false, more false than true, more true than false, mostly true,* and *true.* Research using the PSDQ with adult populations has demonstrated acceptable internal consistency ($\alpha = .89$), and convergent validity when compared to other measures of physical self worth (Marsh et al., 2002).

3.3.3.9 Physical Activity Behaviour

The Leisure Time Exercise Questionnaire (LTEQ; Godin & Shepherd, 1985) was used to assess physical activity behaviour (see Appendix C-8). The scale contains four items. The first three items assess the number of times in the last week that participants engaged in more than 15 minutes of mild, moderate, and strenuous exercise, respectively. Total exercise is calculated by multiplying the frequency of exercise at each intensity by its associated metabolic equivalent of exercise (MET) value of 3 (mild), 5 (moderate), and 9 (strenuous) and summing the products to yield a total MET score. A fourth item asks participants to indicate on a three-point Likert scale how often they exercise enough to work up a sweat (*often, sometimes, or never/rarely*). Previous research using this scale has demonstrated that (a) it is easy for participants to understand and complete; (b) it can detect changes in exercise behaviour; and (c) it has acceptable construct validity as evidenced by expected relationships with other measures

of physical activity and physical fitness (Jacobs, Ainsworth, Hartman, & Leon, 1993). The LTEQ has been used extensively in research with a range of populations including active adults, although most current research reports only the MET score, and omits the single-item question of frequency of working up a sweat (e.g., Levy & Cardinal, 2004; Markland & Tobin, 2004; Wilson et al., 2003; Wilson et al., 2002). In order to aid comparability to other research, only the METS score of physical activity was included in analyses for this study

3.3.4 Data Analysis

3.3.4.1 Data Screening

The data were analyzed by first screening the data for accuracy of entry, patterns of missing data, and the assumptions of multivariate analysis (normality, linearity, homoscedasticity, and independence). Scores that appeared deviant or out of range were checked with the questionnaire and corrected if warranted. The frequency of missing data on each scale was examined to determine the percentage of missing data overall and in each variable. Patterns of missing data were examined to determine whether missing data was related to any of the variables in the data set (missing at random; MAR) or not (missing completely at random; MCAR; de Leeuw, 2001). This analysis was achieved by creating a dummy code for each variable with missing data coded as 0 and all present values coded as 1. Then, a series of ANOVAs were calculated to examine whether there were differences between individuals who were missing items on a particular variable versus those who had complete data (Tabachnick & Fidell, 2001). Given that these analyses involved conducting numerous significance tests that were not guided by any specific hypotheses, only those group differences with $p < .001$ were considered significant. Appropriate imputation methods for missing data were considered based on the results of this analysis.

Before using imputation with the amount of social support scale, an exploratory factor analysis was conducted because there is no previous research demonstrating the validity of using these four items as indicators on one scale. Maximum likelihood estimation and varimax rotation were used with all available data to see if amount of social support across the four types of support could be expressed as a scale score average of the four items. Factors with an eigenvalue of 1.0 were considered appropriate for retention.

The assumptions of multivariate statistics were examined next. Univariate normality was assessed by calculating skew and kurtosis values and visually examining histograms and box plots of the data for skew, kurtosis, and outliers. Data were considered to exhibit univariate skew or kurtosis if the statistics equalled or exceeded |2.00| (Miles & Shevlin, 2001). Univariate outliers were identified by examining box plots, minimum and maximum values, and as cases having very large standardized scores (approaching 4.0; Stevens, 1996). Multivariate outliers were examined using Mahalanobis' distance. Mahalanobis' distance values for each case were calculated by running a multiple regression with subject number as the dependent variable, all of the other variables as independent variables, and saving the resulting Mahalanobis' distance for each case as a new variable. These distances were then examined using descriptive statistics to see if any of the values were above the critical value, indicating that the case was a multivariate outlier. Critical values were identified as those higher than the χ^2 value with degrees of freedom equal to the number of variables in the analysis at $p < .001$ (Tabachnick & Fidell, 2001). Bivariate plots of the relationships between the variables were examined to assess the assumptions of linearity and homoscedasticity, and a logical consideration of whether the data met the assumption of independence of observations was made.

3.3.4.2 Descriptive Statistics

Descriptive statistics were calculated for all variables, as well as scale reliabilities (Cronbach's α), and Pearson product-moment correlations among all of the variables. ANOVAs with a Bonferroni correction were run to examine whether there were gender differences on any of the variables.

3.3.4.3 Confirmatory Factor Analyses

Confirmatory factor analyses of the SFQS and PNSE were conducted to examine the measurement properties of these scales, as they are relatively new scales that have not been used extensively with this population. Confirmatory factor analyses were done using LISREL 8.50 (Joreskog & Sorbom, 2001). Models were specified such that items loaded exclusively on the theoretically expected factor, latent variables were allowed to freely co-vary, error covariance were constrained to be zero, and the variance of each latent variable was constrained to be 1.00 to establish the scale of the latent variable. Confirmatory factor models were evaluated based on an examination of model parameters and standardized residuals, as well as three fit indices: root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residual (SRMR). RMSEA estimates how well the specified model would fit the population covariance matrix, if it were known (Byrne, 1998), and is one of the most widely used and regarded as the most informative in most literatures (Byrne, 1998). Smaller RMSEA values indicate better fit, and models with a RMSEA $\leq$.05 are considered a good fit, .05-.08 are considered a reasonable fit, .08-.10 are considered a mediocre fit, and >.10 is considered a poor fit (Byrne, 1998). CFI assesses the fit of the model compared to a null or baseline model, and is also a very commonly used index of fit (Byrne, 1998). CFI ranges from 0-1, with larger CFI values indicating a better fit, and a CFI $\geq$ .90 is considered a good fit (Byrne, 1998). SRMR represents the average value across all standardized residuals

that result from fitting the hypothesized model to the variance-covariance matrix of the data (Byrne, 1998). SRMR values range from 0-1 and smaller values are better, with an SRMR of $\leq$ .05 is considered a good fit (Byrne, 1998). There is an extensive literature on fit indices and the choice of which to report and use. All of the fit indices available for structural equation modeling have limitations, and some work better than others under certain conditions such as various types of misspecification and nonnormality. For example, RMSEA and CFI are the most sensitive to misspecified factor loadings, while SRMR is most sensitive to errors in the structural components of models, so a combination of these indices provides a more comprehensive sense of model fit than any one index alone (Tabachnick & Fidell, 2001). Fit indices only provide a global indication of fit, and are unable to provide any information about the source of misfit in the model. Therefore, the plausibility of parameter estimates and the size and pattern of the standardized residuals from fitting the hypothesized model to the variance-covariance matrix were also examined in relation to evaluation of model fit. In the case of standardized residuals, values > 2.58 are considered large, and were reported and further investigated in terms of model fit (Byrne, 1998).

3.3.4.4 Moderator analyses

Hierarchical multiple regression was used to test the first four hypotheses/research questions regarding the prediction of relatedness by social relationship factors, the relative importance of the three psychological needs predicting motivation, and moderation by age and gender in each of these relationships. To examine these questions, recommendations for testing moderation were followed (Baron & Kenny, 1986; J. Cohen, Cohen, West, & Aiken, 2003; Jaccard & Turrisi, 2003). First, scores on all continuous predictor variables were centered by saving their standardized scores as new variables. In the subsequent results, these standardized variables are referred to by the name of the variable with a "Z" prefix (e.g., Zage). Second,

product terms were created by multiplying each of the predictors in the regression equation by each of the two moderator variables, Zage and gender, to create interaction variables (e.g., ZageZconflict). Third, hierarchical regression was used to regress the dependent variable on all of the centered main effect predictor variables in the first step, and adding all of the product terms in the second step. If the change in R^2 for step 2 was not significant, none of the moderators were considered significant, and a main effects model with the raw score independent variables predicting the dependent variable was run as the final model. If the change in R^2 was significant, a backward elimination strategy was used to identify specific significant interaction terms by dropping terms one by one, and if the change in R^2 was significant, the term was retained; if not, it was dropped (Jaccard & Turrisi, 2003).

3.3.4.5 Mediation analysis

Structural equation modeling analyses using LISREL 8.50 (Joreskog & Sorbom, 2001) were used to examine the fifth hypothesis regarding the fit of a statistical model based on the conceptual model of SDT. This analysis was done in two steps: an initial measurement model test of a model with all latent variables allowed to freely correlate, and a structural model test where the relationships between latent variables were specified based on the theoretically predicted paths. The measures of motivation (RAI) and physical activity (LTEQ) were both single-item measures. In order to include them in the structural model, a dummy latent variable was created for each of these two constructs. The model was specified such that the factor loading for the indicator was equal to 1, and the error variance was constrained to 0 (Hayduk, 1996).[1] The variance of the latent variable was allowed to freely vary. This specification

[1] Another approach to this problem is to set the error variance to one minus the reliability of the variable. The reliability of these variables was not assessed in this study, so as in prior research (e.g., Rhodes & Courneya, 2003) error variance was estimated based on typical reliability values reported in the literature. These alternate model tests were not substantially different from the models with error variance constrained to 0, and so are not reported here.

equates the dummy latent variable to the manifest variable, while allowing it to be treated as a latent variable in the structural model.

Mediation was tested using structural equation modeling and LISREL 8.50 (Joreskog & Sorbom, 2001) based on a three-step process recommended by Holmbeck (1997). The first step involved fitting a direct effects model where the independent variables (in this case, autonomy, competence, and relatedness) predicted the dependent variables (positive and negative affect, physical self-worth, and physical activity). The fit indices associated with this model must be acceptable and the structural path coefficients must be significant for mediation to hold. The second step involved fitting a mediator model where the independent variables predict the mediator variable which predicts the outcome variables. In this model, direct paths from the independent to dependent variables are constrained to zero (i.e., there are no direct effects pathways). Again, this model must fit adequately, and all structural path coefficients must be significant to support mediation. In the third step, a model was fit that was similar to the model in step 2, except that the direct paths from the independent to dependent variables were also freely estimated. A χ^2 difference test was then performed to test whether the model in step 3 fit significantly better than the model in step 2. If the step 2 model fits best, there is complete mediation. If the step 3 model fits best, there is only partial mediation. The direct effects path coefficients in step 3 should be reduced to non-significance as compared to those in the step 1 model in the case of full mediation, or substantially reduced in the case of partial mediation (Holmbeck, 1997). As in the confirmatory factor analyses models, global fit was assessed by examining RMSEA, CFI, and SRMR indices.

Mediator relationships in the model were further described by examining direct, indirect, and total effects in the final structural model (Maruyama, 1998). Calculations of direct, indirect, and total effects were obtained from the LISREL output.

3.4 Results

3.4.1 Data Screening

The data were examined for accuracy of entry, screened for missing data, and assessed regarding whether they met the assumptions of multivariate statistical methods. Overall, 3.32% of the data points were missing; however, the missing data was distributed across participants such that using listwise deletion to manage missing data would result in 42% of cases being excluded from the analysis. Given that excluding 42% of the data would result in a large decrease in statistical power and could introduce a considerable bias if data is not missing completely at random, potential patterns of missing data were examined, and options for imputing missing data were considered.

A series of ANOVAs, with $p < .001$, were used to examine whether missing data was MCAR or MAR (de Leeuw, 2001). Patterns of missing data existed with missing self-esteem enhancement and supportiveness, conflict resolution, and peer acceptance values. Missing items on self-esteem enhancement and supportiveness, $F(1,482) = 14.45$, $p<.001$, and peer acceptance, $F(1,529) = 13.45$, $p<.001$, were both associated with significantly lower levels of amount of social support. Missing items on conflict resolution were associated with significantly lower levels of conflict, $F(1,490) = 34.42$, $p<.001$, and older age, $F(1,551) = 23.10$, $p<.001$. It should also be noted that the largest amount of missing data was missing from the friendship quality scales, and the conflict resolution subscale in particular.

There were two issues with the friendship quality scale that provide some additional insight into the missing data in this scale. First, 43 participants were missing all items on the SFQS. All 43 of these participants who did not complete the scale also did not identify a best friend in dragon boat on the questionnaire. This suggests that this portion of missing data may be attributable to some participants not having a best friend in dragon boat about whom they

could answer these questions. An ANOVA examining the difference in length of time spent on their current team demonstrated that these participants who did not complete the SFQS had only been with their team for an average of 1.62 years (SD = 1.88), 1 full year less than the average for the rest of the sample, $F(1, 549) = 7.88, p = .005$. While this test did not meet the conservative significance level used for the ANOVAs with missing data, it does suggest a trend supporting the possibility that participants who did not complete the SFQS tended to have not been with their team as long, and may not have had sufficient time to develop close friendships with anyone on their team, resulting in an inability to complete the questionnaire.

A second problem with the SFQS identified by some participants was that items on the conflict resolution scale were "double-barrelled," or incorporated two potentially conflicting meanings into one item. For example, one item states: *My friend and I make up easily when we have a fight.* Participants who have not fought with their friend may not know how to answer this question, and may omit it as a result, leading to missing data. In total, 85 participants who completed the rest of the SFQS omitted all three items on the conflict resolution subscale. Those who omitted conflict resolution reported an average of 1.02 (SD = .09) units of conflict on a scale from 1-5, suggesting that they almost uniformly reported *not at all true* to all three conflict items. As noted above, they differed significantly from those who completed the conflict resolution scale, who on average reported 1.66 (SD = .94) on the conflict scale. Therefore, it is very plausible that participants who experienced lower levels of conflict in their friendships were often not able to respond to the conflict resolution items, and therefore tended to omit them.

Given that there were significant associations between missing items on peer acceptance, self-esteem enhancement and supportiveness, and conflict resolution subscales and other variables in the data set, these variables were classified as missing at random (MAR; de

Leeuw, 2001) while missing data in all of the other variables were classified as missing completely at random. Data that are MAR may lead to substantially biased results as they under represent those in the target population based on their social support or conflict scores. In contrast, the MCAR, or missing completely at random data, does not introduce a known bias to the results (de Leeuw, 2001).

Given the fact that most of the missing data were associated with social relationship variables, two steps were taken to account for missing data in a way that would both minimize potential bias and maximize sample size and power for testing each of the study hypotheses. First, person mean substitution, calculated using the mean of all complete items on the same subscale for that individual, was used to impute missing data for items on all variables that had at least 50% of the items in a particular scale present, other than social support network size and physical activity (LTEQ), as these scales did not have multiple items comprising a single scale. This imputation method has been advocated by Hawthorne and Elliott (2005) and Downey and King (1998) as it has been shown to perform better than listwise deletion, item mean substitution, and regression imputation, and similarly to the more complex method of hot deck imputation, especially in cases where the sample size is large and at least 50% of the items in a given subscale are present. Person mean substitution offers the advantages of predicting the imputed score from information associated with both the same variable and the same participant, as well as providing a relatively simple method (Hawthorne & Elliott, 2005). The use of this form of imputation was also supported by an initial analysis of the reliability of each of the scales and subscales in the study using all available data, as all subscales except external regulation demonstrated acceptable reliability, with $\alpha \geq .70$ (Nunnally, 1978). External regulation had a preliminary alpha value of .67, but none of the cases with data missing on this variable qualified for imputation based on the 50% available data rule, so no values were

imputed on this variable anyway. In summary, data were imputed only for participants who completed at least 50% of the items on a given subscale, but remained missing in any case where all items measuring a particular variable were missing.

An exploratory factor analysis on the four items for amount of social support was conducted using maximum likelihood estimation and varimax rotation. The results of this test found one-factor solution with an eigenvalue of 2.46, explaining 61.46% of the variance. All four of the amount of social support items loaded on the factor with loadings ranging from .54-.82. These results suggest a clear 1-factor solution, which support the practice of reporting and analyzing amount of social support as a scale score. Therefore, a new variable was created called *amount of social support* and the person mean substitution method of imputation described above was conducted for this scale as well.

In the second step, two separate data files were created. The first file contained all of the variables relevant to the first set of research questions pertaining to the relationship between social relationship variables and relatedness (i.e., social support network size, amount of social support, friendship quality, peer acceptance, relatedness, age, and gender). The second file contained all of the variables relevant to the other hypotheses (i.e., all variables except social support, friendship quality, and peer acceptance). In the first data file, the conflict resolution variable was removed due to the high proportion (n = 114; 20%) of missing cases, and then listwise deletion was used to eliminate cases that were missing data on any of the other subscales. This resulted in a total sample size of n = 469, representing 84% of the original sample. Results based on analyses using the n = 469 data set must be interpreted with caution. This procedure of dealing with missing data retained the maximum number of cases for all analyses but disproportionately eliminated participants with less social support in the n = 469

data file. The problem of potential bias is limited to tests of the first set of research questions, as all other hypotheses were tested using the second data file.

The second data file was similarly subjected to listwise deletion of all cases still missing data after the imputation process described above, resulting in a total sample size of $n = 539$, or 97% of the original sample. In this second data file, listwise deletion was not suspected of biasing the results, as all missing data were missing completely at random and less than 5% of the total sample was deleted. Therefore, it is expected that no substantial biases are introduced through the imputation and listwise deletion process with this data set. The data set used in a particular analysis in all subsequent results are identified by reporting the sample size used for that analysis (i.e., $n = 469$ or $n = 539$).

The distributions of all variables were examined to see if they met the assumptions of normality, homoscedasticity, and linearity required by ordinary least squares regression. Normality was examined using skew and kurtosis statistics (see Table 1) and by examining box plots of each variable for outliers. Skew and kurtosis values were considered to indicate a normal distribution if they were $< |2|$ (Miles & Shevlin, 2001). External regulation was positively skewed, indicating that participants tended to indicate low levels of external regulation, which is expected in a group of recreational adult sport participants. Conflict, external regulation, intrinsic motivation, and negative affect exhibited positive kurtosis, indicating that their distributions were more peaked than normal. Non-normal kurtosis values do not tend to bias statistical results by underestimating variance in sample sizes larger than 200 (Tabachnick & Fidell, 2001), so are not a particular concern in this study. Positive skew is also less of a problem with a larger sample size (Tabachnick & Fidell, 2001), so external regulation was retained without any adjustments for further analyses. Skew has a greater

impact on biasing the results than kurtosis; therefore, results of analyses involving external regulation should be interpreted with some caution.

The data were screened for univariate outliers by examining box plots and minimum and maximum values of each variable. While a few of the variables had some cases outside of the whiskers of the box plot, in all of these cases these values were very close to the neighbouring values in the distribution, and were within normal expectations for scores on that variable. Essentially, no wild values or true outliers were identified using these methods.

Mahalanobis' distance values were examined to identify multivariate outliers. This analysis was performed twice, once with the data set of $n = 469$, and once with the data set containing $n = 539$. For the first file, the critical value for χ^2 with $p < .001$ was $\chi^2 (11, n = 469) = 31.28$. Five cases had Mahalanobis' distance values greater than this, and were therefore identified as multivariate outliers. The critical value for the second file was $\chi^2 (10, n = 539) = 29.61$, with 7 cases being identified as multivariate outliers. These cases were examined, and none seemed to be outside of the range of expected values, and their overall patterns of scores across all of the variables made conceptual sense. Therefore, none of these cases were removed from the analyses.

Bivariate plots of the relationships between the variables were examined to assess the assumptions of linearity and homoscedasticity. None of the plots appeared to suggest a non-linear relationship in any of the cases, supporting the assumption of linearity. In addition, all of the plots appeared to have relatively equal variances across the distribution, supporting the assumption of homoscedasticity.

Ordinary least squares estimation also carries the assumption of independence of observations. In this study, consideration was given to whether observations were dependent if participants were part of the same dragon boat team, as it is conceptually plausible that social

relationship and motivation variables may be similar among members of the same team due to an unobserved team-level variable. For this reason, using mixed-effects modeling to test the study's hypotheses was considered, as this method would test for within-team dependence, and account for these relationships in the analysis. Using mixed-effects modeling, however, requires a minimum number of level-1 units (participants) be part of each level-2 unit (team) in the analysis to ensure adequate power of detecting both level-1 and level-2 effects. While different minimums have been proposed by different authors, and the decision is influenced in part by the nature of the research question, many authors recommend as many as 30 participants as a minimum, and it is generally agreed that ten or more participants per team is an absolute minimum (Hox, 2002). In this study, only 17 of the 75 teams in the study had at least 10 participants, and of those, only 2 had at least 20 participants. Given that so few of the study's participants could have been included in a mixed-effects analysis, it was considered inappropriate for use in this study. Results should be interpreted with caution, as the possibility of within-team dependence exists, and has not been accounted for in the analyses.

3.4.2 Descriptive Statistics

Means and standard deviations were calculated for all variables, and are reported in Table 3.1, along with the sample size used to compute these statistics and the possible range of scores on each scale. Note that the descriptive statistics for relatedness and age are calculated twice, once in each of $n = 469$ and $n = 539$, as these variables appear in both data sets.

For social support, participants had an average of 8.12 people in their network, and reported a moderate amount of support for their participation in dragon boat. Friendship quality means were moderately high for all subscales except conflict, which was low. These means were very similar to those found in previous work with youth sport samples (McDonough & Crocker, 2005; Weiss & Smith, 1999) and were in line with expectations, as participants responded to

Table 3.1: Descriptive statistics, skew, kurtosis, and scale reliabilities

Variable Name	*M*	*SD*	Skew	Kurtosis	α	*n*	Scale Range
1. Social support network size	8.12	3.93	.85	1.23	n/a	469	0-32
2. Social support amount overall	3.43	.89	-.31	-.24	.79	469	1-5
3. Self-esteem enhancement and supportiveness	4.26	.70	-1.07	.99	.80	469	1-5
4. Loyalty and Intimacy	3.87	.87	-.60	-.40	.77	469	1-5
5. Things in common	3.78	.81	-.52	-.13	.82	469	1-5
6. Companionship and pleasant play	4.08	.79	-.66	-.39	.78	469	1-5
7. Conflict	1.55	.89	1.91	3.29	.91	469	1-5
8. Peer acceptance	3.28	.58	-.80	.66	.78	469	1-4
9. Relatedness (n = 469)	5.16	.74	-1.03	1.11	.89	469	1-6
10. Age (n = 469)	44.46	14.57	.26	-1.06	n/a	469	19+
11. Relatedness (n = 539)	5.11	.75	-.93	.72	.88	539	1-6
12. Competence	5.30	.70	-1.15	1.30	.92	539	1-6
13. Autonomy	3.87	1.22	-.42	-.40	.86	539	1-6
14. External regulation	1.20	.45	3.26	12.96	.68	539	1-5
15. Introjected regulation	2.04	.98	.87	-.03	.73	539	1-5
16. Identified regulation	3.97	.85	-.81	-.10	.80	539	1-5
17. Intrinsic motivation	4.57	.62	-1.80	3.54	.90	539	1-5
18. Relative autonomy index	8.66	2.39	-1.02	1.09	n/a	539	-15-15
19. Positive affect	4.27	.54	-.56	.12	.89	539	1-5
20. Negative affect	1.35	.33	1.50	3.31	.73	539	1-5
21. Physical self-worth	4.61	1.07	-.90	.48	.97	539	1-6
22. LTEQ total METS	45.59	22.89	.80	1.64	n/a	539	≥0
23. LTEQ frequency of working up a sweat	2.41	.60	-.50	-.64	n/a	539	1-3
24. Age (n = 536)	44.92	14.66	.29	-.99	n/a	539	19+

participants responded to these items in reference to their best friend in dragon boat, so it was expected that their friendship quality would tend to be favourable. Descriptive statistics for the PNSE were also very similar to those found in prior work (Wilson et al., in press), and appeared to indicate that on average, participants' needs were fairly well met in the dragon boat context.

The mean and standard deviation values of the four motivation variables were similar to values found in previous research with physically active adults (Ingledew et al., 2004; Wilson & Rodgers, 2002a; Wilson et al., 2003) and the pattern of means was in line with expectations for a population of adults choosing to participate in a recreational activity: the mean for external regulation was lowest, followed by introjected regulation, identified regulation, and intrinsic motivation. This self-determined profile was in line with the moderate to high means for psychological need fulfillment, high positive affect and physical self-worth means, and low negative affect mean. The relative autonomy index also indicated that participants tended to be relatively self-determined, as the mean was 8.66 on a scale from -15 to 15. The LTEQ measures also indicated that the population was fairly active, and had means very similar to the healthy, active adult population with which the scale was originally developed (Godin & Shephard, 1985). All of these descriptive results indicate that the data are in line with what would be expected from a population of adults voluntarily involved in a recreational physical activity. Finally, it is important to note that the descriptive statistics and distributions for relatedness and age were almost identical in the two data subsets, suggesting that these two variables were not substantially biased by the deletion of data in the $n = 469$ data set.

ANOVAs with a Bonferroni correction were run to examine whether there were gender differences on any variables. Given that 24 ANOVAs were being run, gender differences on any of the variables should only be considered significant if $p < .002$. Results of these analyses

are found in Table 3.2. Women had higher scores than men on amount of social support, all friendship qualities except conflict, identified regulation, intrinsic motivation, the relative autonomy index, and positive affect. Men tended to score higher on external regulation.

3.4.3 Scale Reliabilities

Scale reliabilities were calculated using Cronbach's α, and are reported in Table 3.1. All scale reliabilities were acceptable, having an alpha value greater than or equal to .70, except for external regulation, which had an alpha value of .68. Given that this value was very close to the cut-off value, no adjustments were made to compensate for this value.

Table 3.2: Descriptive statistics for men and women

Variable Name	*M* males	*SD* males	*M* females	*SD* females	*n*	*F*	*p*
1. Social support network size	7.33	4.05	8.44	3.84	469	7.91	.005
2. Social support amount	3.18	.85	3.54	.88	469	17.74	<.001*
3. Self-esteem enhancement and supportiveness	3.99	.76	4.38	.63	469	33.65	<.001*
4. Loyalty and Intimacy	3.60	.86	3.99	.84	469	21.44	<.001*
5. Things in common	3.53	.80	3.89	.79	469	21.05	<.001*
6. Companionship and pleasant play	3.80	.81	4.20	.75	469	26.76	<.001*
7. Conflict	1.65	.89	1.50	.88	469	2.90	.089
8. Peer acceptance	3.26	.53	3.29	.60	469	.28	.598
9. Relatedness (n = 473)	5.03	.73	5.21	.74	469	6.24	.013
10. Age (n = 473)	43.25	14.46	44.98	14.61	469	1.39	.240
11. Relatedness (n = 539)	5.03	.73	5.15	.76	539	2.75	.098
12. Competence	5.32	.67	5.29	.71	539	.27	.606
13. Autonomy	3.76	1.20	3.91	1.23	539	1.56	.212
14. External regulation	1.30	.51	1.16	.42	539	12.30	<.001*
15. Introjected regulation	2.15	.96	1.99	.98	539	2.77	.096
16. Identified regulation	3.72	.85	4.06	.83	539	18.41	<.001*
17. Intrinsic motivation	4.42	.62	4.62	.61	539	11.99	.001*
18. Relative autonomy index	7.81	2.35	9.01	2.33	539	29.06	<.001*
19. Positive affect	4.14	.51	4.32	.54	539	12.80	<.001*
20. Negative affect	1.39	.31	1.33	.34	539	4.73	.030
21. Physical self-worth	4.70	.95	4.58	1.12	539	1.40	.237
22. LTEQ total METS	46.70	23.99	45.14	22.45	539	.52	.473
23. LTEQ frequency of working up a sweat	2.47	.54	2.39	.63	539	1.95	.163
24. Age (n = 536)	43.31	14.43	45.57	14.73	539	2.62	.106

* $p < .002$

3.4.4 Correlations

Bivariate correlations were calculated among all variables, and are presented in Table 3.3 for the data file with $n = 469$, and in Table 3.4 for the data file with $n = 539$. Looking first at Table 3.3, social support network size was moderately correlated with amount of social support, supporting the idea that these two aspects of social support are distinct. The four positive aspects of friendship quality (self-esteem enhancement and supportiveness, loyalty and intimacy, things in common, and companionship and pleasant play) all had moderate to strong intercorrelations, $r(468) = .58\text{-}.77$. These relationships suggest that they are similar constructs, and may lead to colinearity problems in the regression analyses. All of the social relationship variables except conflict had significant positive correlations with relatedness, consistent with the first set of research questions for this study.

The correlations among the motivation variables in the $n = 539$ data file (see Table 3.4) were consistent with simplex structure. Each of the four motivation variables had more positive correlations with adjacent variables on the motivational continuum and progressively more negative correlations with more distal motivation variables. As an illustration of this finding, external regulation had its strongest positive correlation with introjected regulation, $r(538) = .25$; a weak negative correlation with identified regulation, $r(538) = -.10$; and a stronger negative correlation with intrinsic motivation, $r(538) = -.18$.

Correlations between the three psychological needs and the relative autonomy index were consistent with the suggestion that fulfillment of all three needs is positively related to self-determined motivation, $r(538) = .24\text{-}.47$. Furthermore, low to moderate correlations in the expected direction were found between the relative autonomy index and the proposed outcomes of positive affect, $r(538) = .55$; negative affect, $r(538) = -.37$; physical self-worth, $r(538) = .27$, LTEQ total METS, $r(538) = .10$, and LTEQ frequency of working up a sweat, $r(538) = .14$.

Table 3.3: Pearson product-moment correlations among all variables (n = 469)

	1	2	3	4	5	6	7	8	9	10
1. Social support network size	-									
2. Social support amount	.37*	-								
3. Self-esteem enhancement and supportiveness	.19*	.37*	-							
4. Loyalty and intimacy	.16*	.29*	.68*	-						
5. Things in common	.10*	.23*	.58*	.75*	-					
6. Companionship and pleasant play	.12*	.25*	.63*	.77*	.77*	-				
7. Conflict	.02	.05	.05	.24*	.22*	.23*	-			
8. Peer acceptance	.10*	.16*	.33*	.29*	.27*	.30*	.06	-		
9. Relatedness	.29*	.38*	.36*	.32*	.30*	.31*	-.04	.44*	-	
10. Age	.06	.11*	.05	-.02	.01	-.07	-.19*	.03	.23*	-
11. Gender	.13*	.19*	.26*	.21*	.21*	.23*	-.09	.02	.12*	.05

* $p < .05$

Table 3.4: Pearson product-moment correlations among all variables (n = 539)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Relatedness	-													
2. Competence	.46*	-												
3. Autonomy	.29*	.22*	-											
4. External regulation	-.11*	-.18*	-.07	-										
5. Introjected regulation	.01	-.12*	-.06	.25*	-									
6. Identified regulation	.46*	.34*	.15*	-.10*	.19*	-								
7. Intrinsic motivation	.51*	.42*	.25*	-.18*	.04	.53*	-							
8. Relative autonomy index	.47*	.45*	.24*	-.61*	-.42*	.59*	.76*	-						
9. Positive affect	.51*	.52*	.16*	-.15*	.06	.57*	.61*	.55*	-					
10. Negative affect	-.17*	-.25*	-.16*	.17*	.21*	-.08*	-.36*	-.37*	-.10*	-				
11. Physical self-worth	.23*	.40*	.09*	-.12*	-.15*	.18*	.19*	.27*	.23*	-.17*	-			
12. LTEQ total METS	.06	.19*	-.01	-.08	.01	.12*	.05	.10*	.10*	.01	.27*	-		
13. LTEQ frequency of working up a sweat	.09*	.25*	.03	-.09*	-.02	.18*	.07	.14*	.20*	.02	.38*	.49*	-	
14. Age	.21*	.12*	.02	-.11*	-.16*	.35*	.24*	.36*	.23*	-.17*	.24*	-.03	.05	-
15. Gender	.07	-.02	.05	-.15*	-.07	.18*	.15*	.23*	.15*	-.09*	-.05	-.03	-.06	.07

* $p < .05$

Overall these correlation patterns are consistent with theoretically expected relationships and the hypotheses of this study.

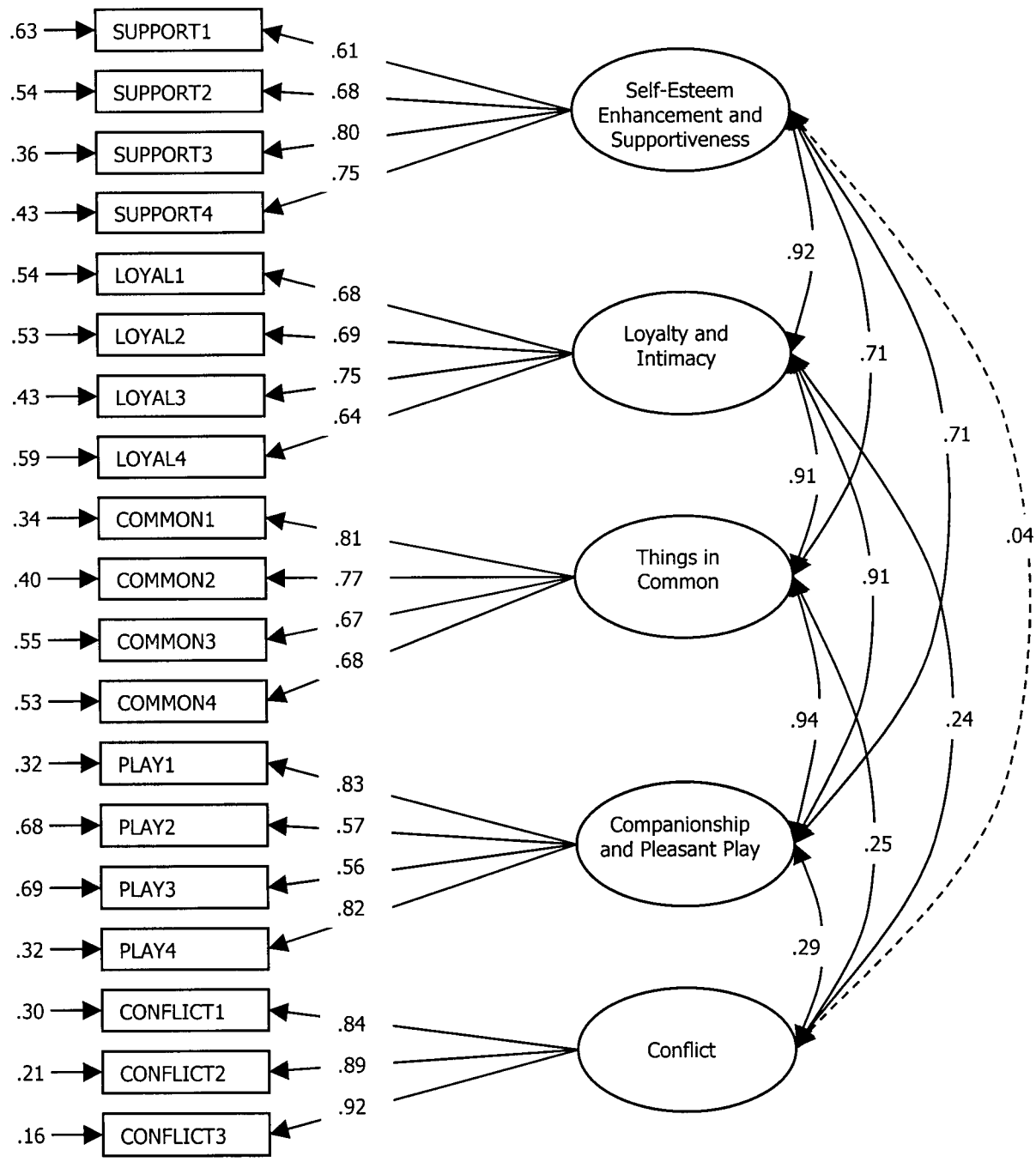
3.4.5 Confirmatory Factor Analyses of the SFQS and PNSE

3.4.5.1 SFQS

A five-factor model of sport friendship quality (n = 469) provided a poor fit, RMSEA = .13, CFI = .84, SRMR = .09 (see Figure 3.1). An examination of the standardized residuals found numerous large (>2.58) residuals associated with many of the items in the scale, suggesting that the source of the model misfit was not associated with a particular item or subscale, but rather was a result of misfit throughout the entire scale. A number of alternative models were tested to see if dropping a particular subscale, creating a higher-order friendship quality latent variable, or collapsing the positive quality subscales into one factor of positive friendship quality would provide a better fit. These alternative models must be regarded with caution as exploratory analyses, as any alteration of the model to improve overall fit to the data will necessarily capitalize on chance, decreasing the probability of the final model being replicable with another sample (Pedhazur, 1997).

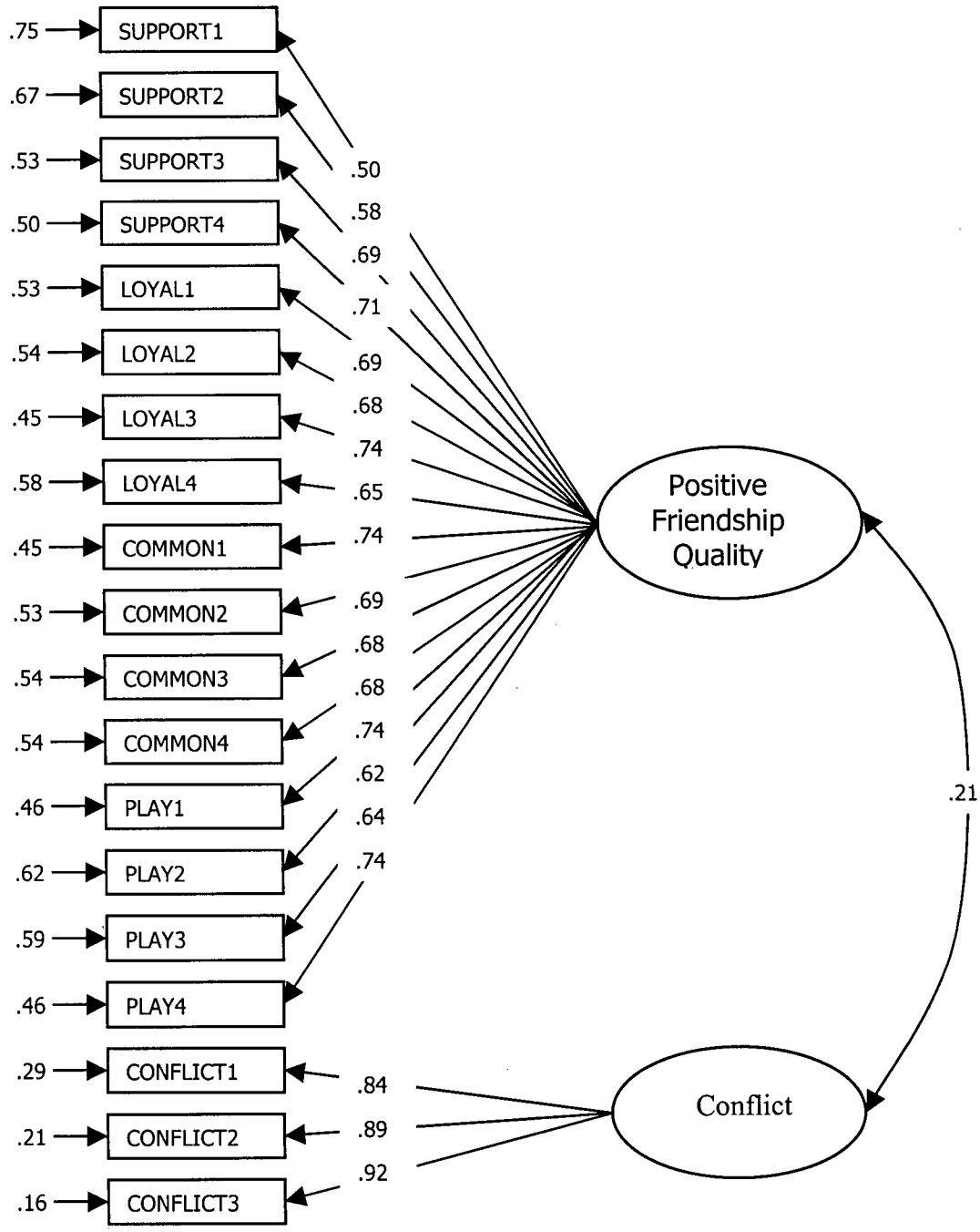
All of the alternate models yielded a worse fit than the original model, and so most are not presented here. The model that was the next best fit to the five-factor solution was the model with all of the positive friendship quality items loading on one factor (positive friendship quality) and the three conflict items loading on a conflict factor (see Figure 3.2). The fit of this model was poor, RMSEA = .16, CFI = .80, SRMR = .09, but this two-factor solution also eliminates colinearity issues in subsequent regression models testing the predictors of relatedness that arise because of the high correlations (>.70) among the positive friendship qualities (see Table 3.2).

Figure 3.1: Standardized solution for the confirmatory factor analysis of the five-factor model of sport friendship quality



Note: RMSEA = .13, CFI = .84, SRMR = .09; Solid lines indicate significant relationships, and dashed lines indicate non-significant relationships among variables.

Figure 3.2: Standardized solution of the confirmatory factor analysis of the two-factor model of sport friendship quality



Note: RMSEA = .16, CFI = .80, SRMR = .09; Solid lines indicate significant relationships.

Creating a composite score of the highly correlated variables may help reduce colinearity effects that may mask a true predictive relationship between positive friendship quality and relatedness (Tabachnick & Fidell, 2001). Some previous work with this scale has used a composite positive friendship quality factor and a conflict factor, although this work did not report a test of the factor structure of this solution (Ullrich-French & Smith, 2006). The two-factor solution works conceptually because it is thought that those four (or five, in studies that have retained conflict resolution) factors represent positive aspects of friendship quality, while conflict is a negative aspect. This grouping is also supported by the high intercorrelations among the positive friendship qualities found in this study and in previous work and much weaker associations with conflict (McDonough & Crocker, 2005; Weiss & Smith, 1999, 2002).

Given that none of the models fit the data well, it was decided to move forward to the hypothesis testing analyses with both possible solutions for the SFQS factor structure, as both have been used in the previous literature and comparing the results of the hypotheses tests with the two factor solutions may provide additional insight into the possibility of colinearity problems with the five-factor solution. To this end, a scale score for positive friendship quality was calculated with all of the 16 positive friendship quality items averaged to create a mean score. The descriptive statistics, skew, kurtosis, scale reliability, and correlations with other variables in the $n = 469$ data set are reported in Tables 3.5 and 3.6. All results pertaining to friendship quality must be regarded with caution, as the factor structure problems with this scale raise validity issues regarding what the scale is measuring in this population, but by proceeding in this manner, a preliminary estimate of the role of friendship in predicting relatedness could still be obtained, providing valuable information for future work in this area.

Table 3.5: Descriptive statistics, skew, kurtosis, and scale reliability for positive friendship quality

Variable Name	***M***	***SD***	**Skew**	**Kurtosis**	**α**	***n***	**Scale Range**
Positive friendship quality	4.00	.70	-.66	-.13	.93	469	1-5

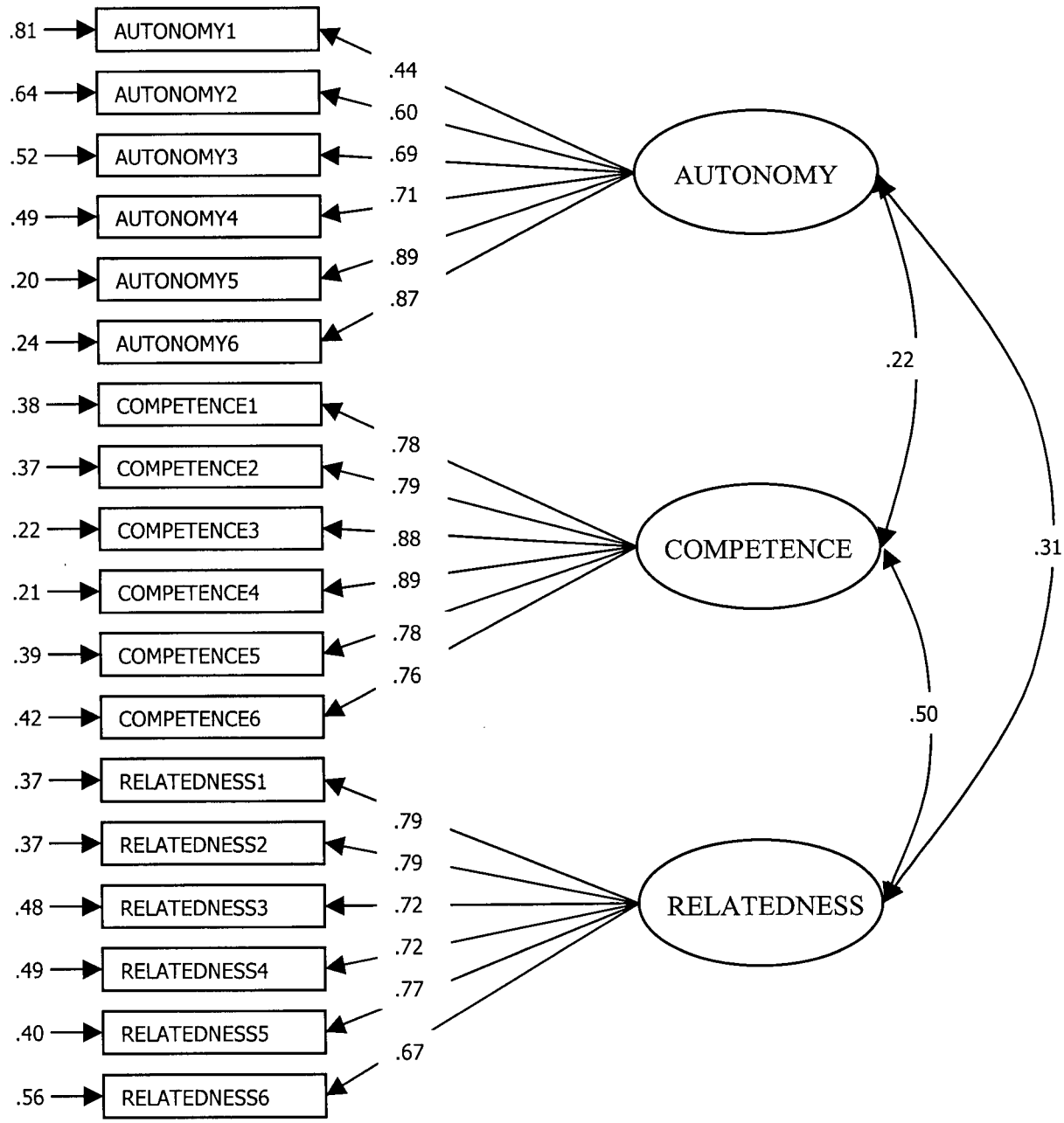
Table 3.6: Correlations between positive friendship quality and variables in the n = 469 data set

	Positive Friendship Quality
1. **Social support network size**	.16*
2. **Social support amount**	.32*
3. **Conflict**	.22*
4. **Peer acceptance**	.34*
5. **Relatedness**	.36*
6. **Age**	-.01
7. **Gender**	.26*

3.4.5.2 PNSE

The three-factor model of the PNSE was tested, resulting in a marginal overall fit, RMSEA = .10, CFI = .89, SRMR = .06 (see Figure 3.3). Looking more closely at the standardized residuals, it is apparent that a major source of misfit in this model is the autonomy subscale. Very large standardized residuals (> 2.58) were associated with almost all of the relationships among the autonomy items, suggesting that the proposed model may not be the best fit for the autonomy subscale. Attempts were made to identify a specific source of misfit by re-assessing model fit with some or all of the autonomy items excluded. None of these analyses resulted in a substantially better model fit, so no alterations were made to the model. Subsequent analyses including the PNSE should be interpreted with some caution due to the less than desirable fit of the factor structure in this study.

Figure 3.3: Standardized solution of the confirmatory factor analysis of the Psychological Need Satisfaction for Exercise Scale



Note: RMSEA = .10, CFI = .89, SRMR = .06; Solid lines indicate significant relationships.

3.4.6 Tests of Hypotheses

3.4.6.1 Prediction of Relatedness by Social Relationships

While no specific hypotheses were put forth regarding the prediction of relatedness by the social relationship factors (social support, friendship quality, and acceptance), one purpose of this study was to conduct an exploratory analysis concerning which of the specific social factors were significant predictors of relatedness, as well as examining whether age and gender moderated these relationships. To this end, a hierarchical regression was conducted, regressing relatedness on the centered social relationship variables (i.e., social support network size, amount of social support, peer acceptance, self-esteem enhancement and supportiveness, loyalty and intimacy, things in common, companionship and pleasant play, and conflict), centered age, and gender in the first step, and adding all the two-way product terms of each of the social relationship variables by gender and by age in step two.

The results of this regression analysis are found in Table 3.7. Step one accounted for 35% of the variance in relatedness, but the change in $R^2 = .02$ for step two was not significant ($p = .61$), indicating that age and gender did not moderate the relationships between the social relationship variables and relatedness. This finding may be limited by power, as there are 26 independent variables in the analysis; however, the ratio of independent variables to cases in the analysis is still 1:18, and is within the sample size range recommended in the literature (Tabachnick & Fidell, 2001).

Table 3.7: Test of age and gender as moderators in the prediction of relatedness by social relationship variables, with 4 positive friendship quality variables (n = 469)

Variable	B	SE B	β	*p*
Step 1				
Intercept	5.17	.05	-	<.01*
Zsocial support network size	.11	.03	.15	<.01*
Zamount of social support	.15	.03	.20	<.01*
Zself-esteem enhancement	.03	.04	.04	.49
Zloyalty and intimacy	.01	.05	.01	.85
Zthings in common	.04	.05	.06	.38
Zcompanionship and pleasant play	.08	.05	.10	.13
Zconflict	-.05	.05	-.07	.07
Zpeer acceptance	.24	.03	.33	<.01*
Zage	.13	.03	.18	<.01*
Gender	-.02	.06	-.01	.72
Step 2				
Intercept	5.16	.06	-	<.01*
Zsocial support network size	.15	.05	.20	.01*
Zamount of social support	.06	.06	.08	.30
Zself-esteem enhancement	.04	.08	.05	.63
Zloyalty and intimacy	.07	.10	.09	.49
Zthings in common	.09	.09	.13	.30
Zcompanionship and pleasant play	.01	.09	.01	.92
Zconflict	-.04	.06	-.06	.49
Zpeer acceptance	.27	.06	.37	<.01*
Zage	.13	.03	.18	<.01*
Gender	-.01	.07	-.01	.83
Zage×Zsocial support network size	-.04	.03	-.05	.20
Zage×Zamount of social support	.04	.03	.05	.25
Zage×Zself-esteem enhancement	.03	.04	.05	.42
Zage×Zloyalty and intimacy	-.01	.05	-.01	.85
Zage×Zthings in common	-.02	.05	-.02	.74
Zage×Zcompanionship and pleasant play	-.02	.05	-.03	.63
Zage×Zconflict	-.01	.03	-.02	.73
Zage×Zpeer acceptance	-.03	.03	-.04	.32
Gender×Zsocial support network size	-.06	.07	-.07	.35
Gender×Zamount of social support	.13	.07	.14	.08
Gender×Zself-esteem enhancement	-.02	.10	-.02	.81
Gender×Zloyalty and intimacy	-.09	.12	-.09	.47
Gender×Zthings in common	-.09	.11	-.10	.40
Gender×Zcompanionship and pleasant play	.12	.11	.13	.28
Gender×Zconflict	-.04	.07	-.04	.57
Gender×Zpeer acceptance	-.03	.03	-.04	.50

* $p < .05$; Note: $R^2 = .35$ for Step 1; $\Delta R^2 = .02$ for Step 2 ($p > .60$)

Given that there were no moderator effects, to simplify the solution the analysis was re-run using the raw score variables and omitting the product terms. Results are presented in Table 3.8. Peer acceptance ($\beta = .33$), amount of social support ($\beta = .20$), age ($\beta = .18$), and social support network size ($\beta = .15$) significantly predicted 35% of the variance in relatedness, $F(10, 458) = 26.65, p < .01$. None of the positive friendship quality variables were significant predictors of relatedness, which leads to the interpretation that positive friendship qualities are not a key factor in relatedness. As discussed previously, however, this could be a result of colinearity problems, as many of the intercorrelations among the positive friendship quality subscales are >.70 (Tabachnick & Fidell, 2001).

Table 3.8: Multiple regression testing the prediction of relatedness by social support network size, amount of social support, four aspects of positive friendship quality, conflict, peer acceptance, and age (n = 469).

Variable	B	SE B	β	*p*
Intercept	1.91	.23	-	<.01*
Social support network size	.03	.01	.15	<.01*
Amount of social support	.17	.04	.20	<.01*
Self-esteem enhancement and supportiveness	.04	.06	.04	.49
Loyalty and intimacy	.01	.06	.01	.85
Things in common	.05	.06	.06	.38
Companionship and pleasant play	.10	.06	.10	.13
Conflict	-.06	.03	-.07	.07
Peer acceptance	.41	.05	.33	<.01*
Age	.01	<.01	.18	<.01*
Gender	-.02	.06	-.01	.72

* $p < .05$

Note: Model significant, F (10, 458) = 26.65, $p < .01$, $R^2 = .35$

To investigate the possibility of collinear positive friendship qualities, the hierarchical multiple regression analysis was repeated with the single positive friendship quality score in place of the four separate friendship quality variables. Results of this analysis are presented in Table 3.9. The R^2 change was not significant, .02, $p = .34$, again indicating that age and gender did not moderate the relationships between any of the social relationship variables and relatedness. Therefore, a second regression was run with the raw score predictor variables and omitting the interaction terms to provide a simplified solution (see Table 3.10). In this analysis, all of the social relationship variables, including positive friendship quality, and age were significant predictors of relatedness, accounting for 33% of the variance, $F(7, 461) = 38.15$, $p < .01$. While this solution did not account for substantially more variance than the original solution, positive friendship quality did make a significant contribution to the prediction of relatedness, which results in a different interpretation about the role of friendship quality than in the initial run.

Given the cautions associated with this set of analyses, including (1) the potential bias introduced by deleting 16% of available cases, disproportionately deleting participants with lower levels of social support; and (2) the problematic factor structure of the SFQS with this sample, it is advisable to only draw tentative conclusions from these analyses. Overall, social support network size, amount of social support, and peer acceptance appear to positively predict relatedness perceptions in this sample of adult dragon boat participants. Positive friendship quality also plays a role, but its contribution appears to be small. Given the numerous limitations in measuring friendship quality in this population, however, it would be advisable to further explore issues surrounding the measurement of friendship with adult recreational sport participants before drawing any firm conclusions about these processes.

Table 3.9: Test of the moderator effects of age and gender on the prediction of relatedness by social relationship variables, with a single positive friendship quality variable (n = 469).

Variable	B	SE B	β	*p*
Step 1				
Intercept	5.17	.05	-	<.01*
Zsocial support network size	.11	.03	.14	<.01*
Zamount of social support	.15	.03	.20	<.01*
Zpositive friendship quality	.14	.03	.19	<.01*
Zconflict	-.05	.03	-.07	.06
Zpeer acceptance	.24	.03	.33	<.01*
Zage	.13	.03	.18	<.01*
Gender	-.02	.06	-.01	.74
Step 2				
Intercept	5.17	.06	-	<.01*
Zsocial support network size	.15	.05	.20	.01*
Zamount of social support	.06	.06	.08	.28
Zpositive friendship quality	.17	.06	.24	<.01*
Zconflict	-.03	.06	-.05	.54
Zpeer acceptance	.29	.06	.38	<.01*
Zage	.12	.03	.17	<.01*
Gender	-.02	.07	-.01	.79
Zage×Zsocial support network size	-.04	.03	-.06	.16
Zage×Zamount of social support	.04	.03	.05	.23
Zage× Zpositive friendship quality	.02	.03	-.02	.63
Zage×Zconflict	-.02	.03	-.02	.61
Zage×Zpeer acceptance	-.03	.03	-.04	.28
Gender×Zsocial support network size	-.06	.06	-.07	.32
Gender×Zamount of social support	.13	.07	.14	.07
Gender×Zpositive friendship quality	-.06	.07	-.06	.40
Gender×Zconflict	-.05	.06	-.06	.44
Gender×Zpeer acceptance	-.05	.07	-.06	.47

* $p < .05$

Note: $R^2 = .36$ for Step 1; $\Delta R^2 = .02$ for Step 2 ($p > .30$)

Table 3.10: Test the prediction of relatedness by social support network size, amount of social support, positive friendship quality, conflict, peer acceptance, and age (n = 469).

Variable	B	SE B	β	*p*
Intercept	1.93	.22	-	<.01*
Social support network size	.03	.01	.14	<.01*
Amount of social support	.17	.04	.20	<.01*
Positive friendship quality	.20	.05	.19	<.01*
Conflict	-.06	.03	-.07	.06
Peer acceptance	.41	.05	.33	<.01*
Age	.01	.00	.18	<.01*
Gender	-.02	.06	-.01	.74

* $p < .05$

Note: Model significant, $F(7, 461) = 38.15$, $p < .01$, $R^2 = .36$.

Overall, the results of these analyses did not support the idea that age and gender would moderate the prediction of relatedness by social support, friendship quality, and peer acceptance. These social relationship variables, along with age, do significantly predict relatedness in the overall population. Some question remains regarding whether positive friendship qualities play a significant role in the prediction of relatedness, and these results should be regarded as preliminary indications of these associations.

3.4.6.2 Prediction of Motivation by the Three Psychological Needs

Three hypotheses were put forward regarding the relationship between the three psychological needs of autonomy, competence, and relatedness, and self-determined motivation: (1) autonomy, competence, and relatedness would all predict self-determined motivation, with autonomy being the strongest predictor, followed by competence, and relatedness; (2) age would moderate the relationship between relatedness and self-determined motivation in that relatedness would be a stronger predictor for older participants than for younger participants; and (3) gender would moderate the relationship between relatedness and self-determined motivation in that relatedness would be a stronger predictor for females than for males. All of these analyses were carried out using the data file with $n = 539$. In testing each of these three hypotheses, the relative autonomy index (RAI) was used as the dependent variable rather than the individual BREQ scale scores in order to assess the prediction of the concept of self-determined motivation as a whole, rather than individually examining the prediction of the individual types of motivation on the continuum. The use of the RAI also served to simplify the analysis, as the hypothesis could be tested with a single regression model, rather than multiple models.

Hierarchical multiple regression was used to regress RAI on Zautonomy, Zcompetence, Zrelatedness, Zage, and gender entered in the first step, and all of the interaction terms entered

in the second step (see Table 3.11). The significance of the change in R^2 for step 2 was .01 (p = .57), indicating that age and gender did not moderate the relationships between any of the three needs and self-determined motivation. Given that there were no moderator effects, the analysis was re-run using the raw score variables and omitting interaction terms. Results are presented in Table 3.12. Competence (β = .30), age (β = .27), relatedness (β = .23), gender (β = .19), and autonomy (β = .09) significantly predicted 40% of the variance in self-determined motivation, $F(10, 533) = 71.30, p < .01$. These results did not support the hypotheses that autonomy would be the strongest predictor of self-determined motivation, or that age and gender would act as moderators, but they are consistent with SDT in that the three psychological needs in combination, along with age and gender, predicted a substantial proportion of the variance in self-determined motivation.

Table 3.11: Test of the moderator effects of age and gender on the prediction of self-determined motivation by autonomy, competence, and relatedness (n = 539).

Variable	B	SE B	β	*p*
Step 1				
Intercept	7.93	.15	-	<.01*
Zautonomy	.21	.08	.09	.01*
Zcompetence	.72	.09	.30	<.01*
Zrelatedness	.56	.10	.23	<.01*
Zage	.61	.08	.26	<.01*
Gender	1.03	.18	.19	<.01*
Step 2				
Intercept	7.97	.16	-	<.01*
Zautonomy	.22	.16	.09	.17
Zcompetence	.69	.17	.29	<.01*
Zrelatedness	.79	.18	.33	<.01*
Zage	.61	.08	.25	<.01*
Gender	1.02	.18	.19	<.01*
Zage×Zautonomy	-.03	.09	-.01	.70
Zage×Zcompetence	-.09	.10	-.03	.37
Zage×Zrelatedness	-.02	.10	-.01	.85
Gender×Zautonomy	-.01	.19	.00	.96
Gender×Zcompetence	.05	.21	.02	.79
Gender×Zrelatedness	-.33	.21	-.12	.12

* $p < .05$

Note: For step 1, $F(5,533) = 71.30, p < .01, R^2 = .40$; for step 2, $F(6, 527) = 32.77, p < .01, R^2 = .39$; $\Delta R^2 = .01, p = .57$

Table 3.12: Test of the prediction of motivation by autonomy, competence, relatedness, age, and gender (n = 536).

Variable	B	SE B	β	*p*
Intercept	-3.86	.70	-	<.01*
Autonomy	.17	.07	.09	.01*
Competence	1.03	.13	.30	<.01*
Relatedness	.74	.13	.23	<.01*
Age	.04	.01	.26	<.01*
Gender	1.03	.18	.19	<.01*

* $p < .05$

Note: Model significant, $F(5, 533) = 71.30, p < .01, R^2 = .40$

3.4.6.3 Testing the Mediator Model

The final hypothesis of this study was that self-determined motivation would mediate the relationship between psychological needs and affective and behavioural outcomes. This test does not include social relationship factors due to the problem of missing data discussed earlier and problems with bias and diminished sample size. The portion of the conceptual model that was examined provides a useful test of the mediating role of self-determined motivation that can be compared to similar tests with other populations in the literature (e.g., Kowal & Fortier, 2000; Ntoumanis, 2001; Sarrazin et al., 2002; e.g., Standage et al., 2003). Structural equation modeling was used to test the fit of the model with self-determined motivation (represented by the RAI) mediating the relationship between the three needs and positive and negative affect, physical self-worth, and physical activity. This model was tested in two steps: a measurement model, and a structural model.

Measurement model: The results of the measurement model analysis are presented in Tables 3.13 and 3.14. The measurement model analysis included only latent variables with multiple indicators, and therefore did not include the RAI and LTEQ. This model provided an adequate fit, although the CFI was a bit lower and the SRMR a bit higher than the cut-offs for a good fitting model, RMSEA .06, CFI .88, SRMR .06. The sources of this misfit were likely due to somewhat low factor loadings and high standardized residuals associated with the autonomy subscale discussed previously, as well as similar problems with the negative affect subscale. Correlations among the latent variables followed expectations, with all correlations significant, small to moderate correlations among the three psychological needs, and positive correlations with positive affect and physical self-worth, and negative correlations with negative affect. Overall, the measurement model fit the data reasonably well though, and the structural model was tested without any modifications to the measurement model.

Table 3.13: Factor loadings and uniquenesses for the measurement model of psychological need fulfillment and affective and behavioural outcomes

Measure and variable	Standardized factor loading	Uniqueness
Autonomy		
Autonomy1	.44	.81
Autonomy2	.60	.64
Autonomy3	.69	.52
Autonomy4	.71	.49
Autonomy5	.89	.20
Autonomy6	.87	.24
Competence		
Competence1	.79	.38
Competence2	.79	.37
Competence3	.88	.22
Competence4	.89	.21
Competence5	.78	.39
Competence6	.76	.42
Relatedness		
Relatedness1	.79	.37
Relatedness2	.80	.37
Relatedness3	.72	.49
Relatedness4	.71	.49
Relatedness5	.77	.40
Relatedness6	.66	.56
Positive Affect		
Positive1	.65	.58
Positive2	.53	.72
Positive3	.68	.54
Positive4	.74	.45
Positive5	.68	.53
Positive6	.67	.56
Positive7	.58	.66
Positive8	.79	.28
Positive9	.71	.49
Positive10	.65	.57
Negative affect		
Negative1	.36	.87
Negative2	.51	.74
Negative3	.48	.77
Negative4	.37	.86
Negative5	.54	.71
Negative6	.36	.87
Negative7	.69	.52
Negative8	.24	.94

Measure and variable	Standardized factor loading	Uniqueness
Negative9	.48	.77
Negative10	.63	.61
Physical Self-Worth		
PSW1	.92	.15
PSW2	.94	.11
PSW3	.93	.13
PSW4	.96	.11
PSW5	.87	.26
PSW6	.94	.15

RMSEA = .06, CFI = .88, SRMR = .06

Note: Correlations among latent variables for this analysis are indicated in Table 3.14.

Table 3.14: Correlations among latent variables in the measurement model of psychological need fulfillment and affective and behavioural outcomes

Latent variable	Autonomy	Competence	Relatedness	Positive affect	Negative affect	Physical self-worth
Autonomy	-					
Competence	.22*	-				
Relatedness	.31*	.50*	-			
Positive affect	.20*	.58*	.57*	-		
Negative affect	-.19*	-.35*	-.20*	-.14*	-	
Physical self-worth	.12*	.42*	.24*	.24*	-.19*	-

* $p < .05$

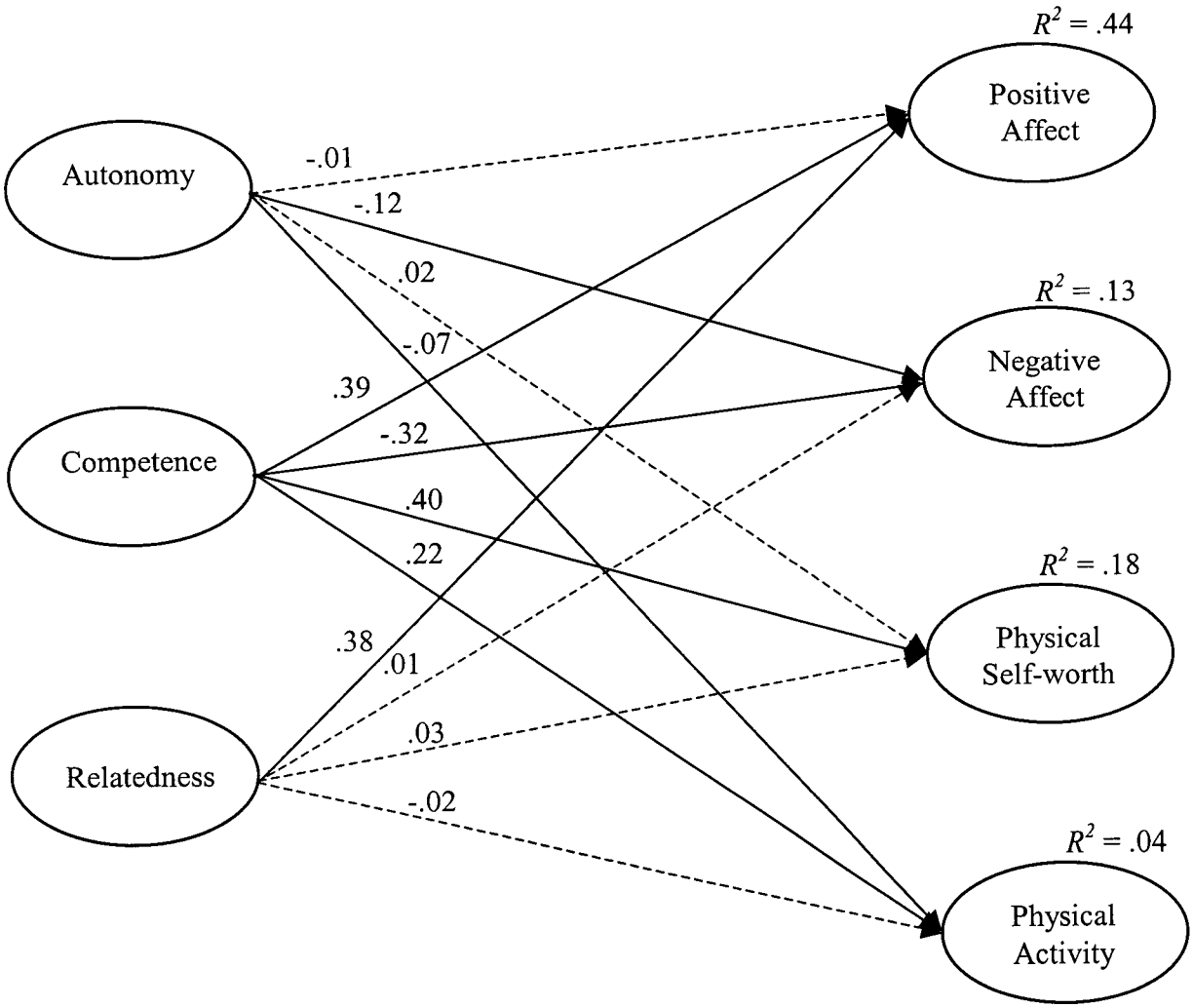
Note: Factor loadings and uniqueness for this analysis are indicated in Table 3.13.

Structural model: Testing for mediation was a three-step processes testing (1) a direct effects model with the three psychological needs predicting the four outcome variables; (2) a mediator model test with psychological needs predicting RAI which predicted the four outcome variables; and (3) a combined model with both direct effects and mediator effects estimated, and a comparison of the models and their pathways.

The results of the direct effects structural model analysis are presented in Figure 3.4. This model provided an adequate fit, RMSEA = .06, CFI = .87, SRMR = .06, satisfying the condition that the direct effects model must provide an adequate fit in order to demonstrate mediation. However, only seven of the twelve paths in this model were significant, suggesting that not all of the three psychological needs have an effect on all of the outcomes in the model. In cases where no direct relationship exists, it is impossible for a third variable to be a mediator.

Examining each of the outcomes in turn, positive affect is predicted by competence and relatedness but not autonomy. Negative affect is predicted by autonomy and competence but not relatedness. Physical self-worth and activity are only predicted by competence. While the full models were run in step 2 and 3, only those relationships that exhibited direct effects in this first step can be considered for mediation by the RAI. Notably, this direct effects model predicted 44% of the variance in positive affect, 13% for negative affect, 18% for physical self-worth, and only 4% for physical activity.

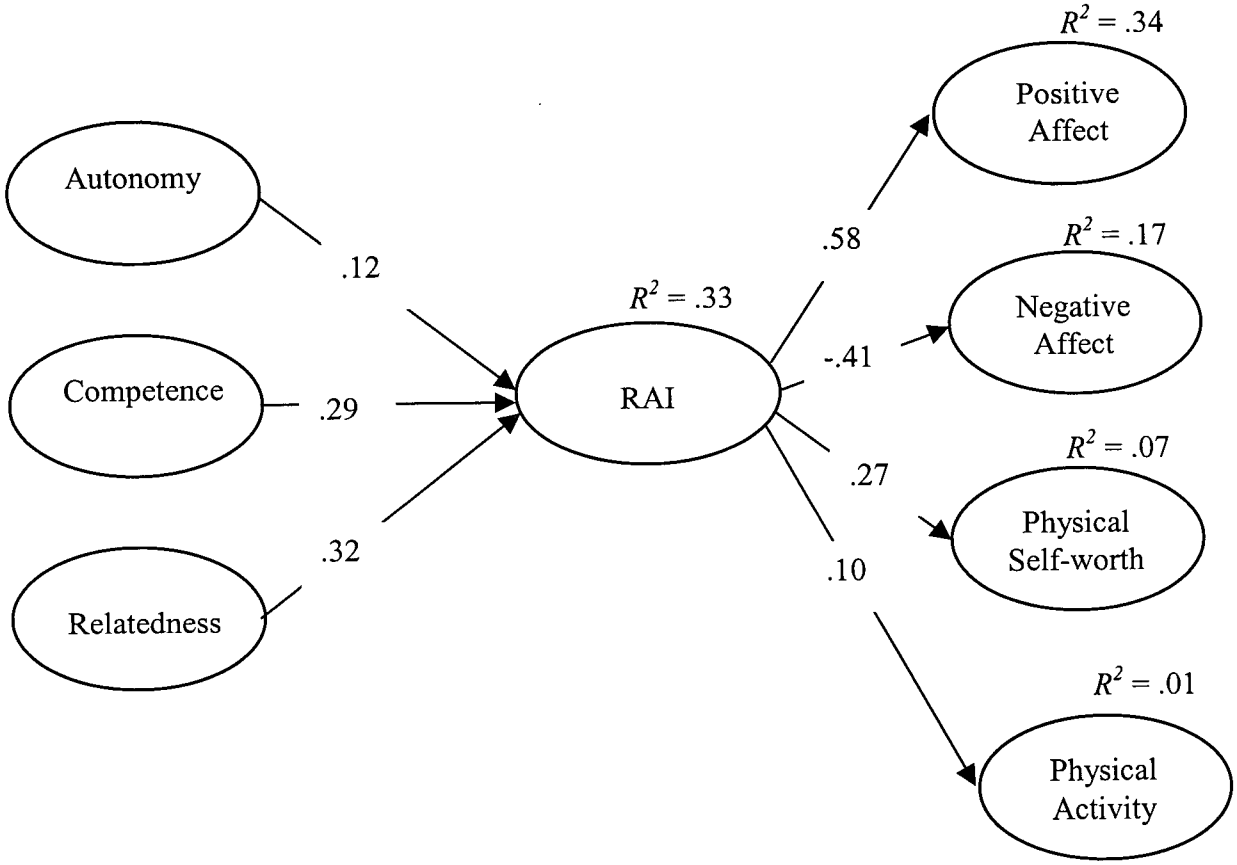
Figure 3.4: Direct effects model of psychological need satisfaction predicting affective and behavioural outcomes



Note: RMSEA = .06, CFI = .87, SRMR = .06; Solid lines indicate significant relationships ($p <$ .05), dotted lined indicate non-significant relationships

The results of the mediator model tested in step 2 of the analysis are presented in Figure 3.5. This model provided an adequate, but was somewhat poorer fit than the direct effects model, RMSEA = .07, CFI = .86, SRMR = .09. All of the paths in this model were significant, suggesting that in those cases where direct relationships were found in step 1, it is possible that the RAI mediated those relationships. This model predicted 33% of the variance in RAI, 34 % for positive affect, 17% for negative affect, 7% for physical self-worth, and only 1% for physical activity. In all cases except negative affect, the variance accounted for in the mediator model was less than that accounted for in the direct effects model, suggesting that there is at least some direct effect of the three psychological needs on the outcome variables in this study.

Figure 3.5: Structural model with RAI mediating the relationship between psychological need satisfaction and affective and behavioural outcomes



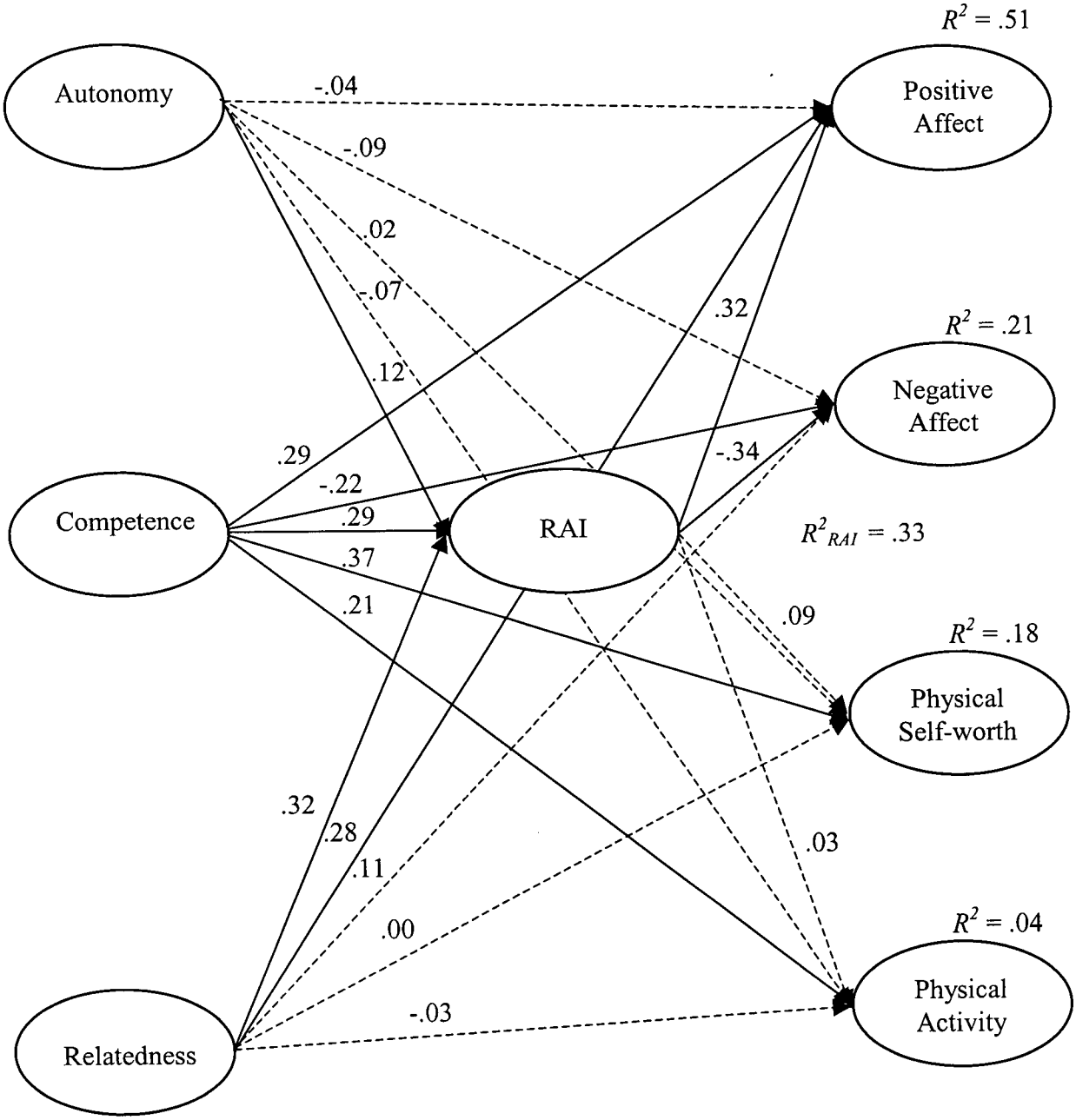
Note: RMSEA = .07, CFI = .86, SRMR = .09; Solid lines indicate significant relationships ($p <$ .05), dotted lined indicate non-significant relationships

In step 3, a mediator model was run that also included direct effects paths from the psychological needs to the outcome variables. This model was referred to as the combined effects model as it included both direct and mediated effects. The results of this test can be found in Figure 3.6. This model provided an adequate fit, similar to that of the direct effects model, RMSEA = .07, CFI = .86, SRMR = .09. A χ^2 difference test was performed to determine whether the model with both mediator and direct effects (i.e., Figure 3.6) provided an improved fit over the mediator model with direct paths constrained to 0 (i.e., Figure 3.5). The results of this analysis can be found in Table 3.15.

As can be seen by the significant χ^2 change, the combined effects model offers significant improvement in model fit over the mediator model. This suggests that the relationships between the three psychological needs and the outcome measures are not mediated, or are only partially mediated, by self-determined motivation. To determine whether particular relationships in the model were partially mediated by the RAI or were better represented by direct paths, the standardized parameter estimates (SPE) in the combined effects model were examined, and compared with those in the direct effects model. Looking first at the prediction of RAI, relatedness (SPE = .32), competence (SPE = .29) and autonomy (SPE = .12) significantly contributed to the prediction of 33% of the variance in RAI. This was unchanged from the mediator model, and cannot be compared to the direct effects model as the RAI is not included in that model.

Positive affect was predicted by competence (SPE = .29), relatedness (SPE = .28), and RAI (SPE = .32), with 51% of the variance accounted for. Compared to the direct effects model, the path coefficient for competence predicting positive affect decreased by .10, suggesting that this effect is partially mediated by RAI. Similarly, the effect for relatedness decreased by .10 in the combined model, also suggesting partial mediation by RAI.

Figure 3.6: Combined effects structural model



Note: RMSEA = .07, CFI = .86, SRMR = .09; Solid lines indicate significant relationships ($p<.05$), dotted lined indicate non-significant relationships

Table 3.15: Comparison of fit of the mediator and combined effects models

Model	**RMSEA**	**CFI**	**SRMR**	***df***	**Δdf**	χ^2	$\Delta\chi^2$	***p***
Mediator	.07	.86	.09	981	-	3088.11	-	-
Combined effects	.06	.87	.06	969	-12	2880.26	-207.85	<.01

Competence (SPE = -.22) and RAI (SPE = -.43) predicted 21% of the variance in negative affect. Compared to the direct effects model, the direct effect of competence predicting negative affect decreased from -.32 to -.22, again suggesting that this relationship is partially mediated by RAI. In the direct effects model, autonomy was also a significant predictor of negative affect (SPE = -.12; see Figure 3.4), but this effect was eliminated in the combined effects model, suggesting complete mediation of this relationship by RAI.

For physical self-worth and activity, competence was the only predictor in the combined effects model, predicting 18% and 4% of the variance in physical self-worth and physical activity, respectively. The lack of a relationship between RAI and these two outcomes eliminates the possibility of a mediated relationship, despite the significant paths between RAI and these two outcomes in the mediation-only model. The direct effect of competence predicts more of the variance in physical self-worth and physical activity than the effect of RAI, and the effect of RAI is non-significant in the combined effects model.

Overall, the combined effects model provided the best fit to the data, and suggested that the role of self-determined motivation is different for positive and negative affect as compared to physical self-worth and physical activity. For positive and negative affect, RAI partially mediates the effects of the psychological needs, although only competence and relatedness play a role, either direct or indirect, in predicting positive affect, while only autonomy and competence come into play in the predicting of negative affect. Conversely, physical self-worth and physical activity are best predicted directly by competence alone, without any effect of autonomy or relatedness or an intermediary effect of self-determined motivation. Consequently, the combined effects model was considered the best-fitting model with this data.

Direct, indirect, and total effects on the endogenous latent variables (see Table 3.16) were examined to further examine the nature of the relationships among variables in the

Table 3.16: Completely standardized indirect effects and t-values for the combined effects model

Indirect relationship	Indirect effect	*t*-value	Total effects	*t*-value
Autonomy → Positive affect	.04	2.67*	-.01	-.17
Autonomy → Negative affect	-.04	-2.61*	-.13	-2.42*
Autonomy → Physical self-worth	.01	1.51	.03	.57
Autonomy → Physical activity	.00	.58	-.07	-1.38
Autonomy → RAI	-	-	.12	2.89*
Competence → Positive affect	.09	4.86*	.38	7.93*
Competence → Negative affect	-.10	-4.39*	-.32	-5.27*
Competence → Physical self-worth	.03	1.72	.40	7.56*
Competence → Physical activity	.01	.59	.22	4.23*
Competence → RAI	-	-	.29	6.46*
Relatedness → Positive affect	.10	5.01*	.38	7.45*
Relatedness → Negative affect	-.11	-4.34*	.00	.05
Relatedness → Physical self-worth	.03	1.70	.03	.57
Relatedness → Physical activity	.01	.59	-.02	-.45
Relatedness → RAI	-	-	.32	6.64*

* $p < .05$

combined effects model. Indirect effects were obtained from the LISREL output, but conceptually represent a product of the two path coefficients that link two latent variables indirectly. For example, the indirect effect of autonomy on positive affect is the product of the paths from autonomy to RAI and RAI to positive affect. A significant *t*-value suggests that the indirect effect is significant. The results of this analysis provides further support for the contention that psychological need fulfillment played a role in predicting positive and negative affect, but not in physical self-worth and physical activity.

It is interesting to note that some indirect effects were significant but that the model testing strategy did not find evidence for a mediated relationship (e.g., autonomy to positive affect). This seeming discrepancy can be explained by understanding the nature of the two types of tests. The three-step model testing strategy is a true test of mediation, as it compares models with and without a mediator present and examines changes in parameters to provide a true test of mediation. In contrast, the indirect effects test can be significant if there is a mediated relationship, or if there is a significant relationship between the independent variable and the mediator, and between the mediator and the dependent variable that are caused by another unmeasured variable rather than by a true link between the independent and dependent variables (Holmbeck, 1997).

A comparison of direct and indirect effects can provide some insight into the degree of partial mediation in the combined effects model. In cases where both direct and mediated relationships exist, this decomposition of effects can provide insight into the relative role of direct and indirect effects in the total prediction. This partial mediation occurs in three instances in this model: the relationships between competence and positive affect, competence and negative affect, and relatedness and positive affect. Indirect effects account for 24% of the total effects of competence on positive effect, while direct effect accounts for 76% of the total

effect. For the relationship between competence and negative affect, indirect effects account for 31% of the total effect. Finally, for the prediction of positive affect by relatedness, indirect effects account for 26% of the total effect. These results provide further support for the partial mediation model, as much of the effect of competence and relatedness on affect is direct, while only a portion is mediated via RAI.

3.5 Discussion

The aim of the first study was to explore how social support network size, perceived social support, peer acceptance, and friendship quality contribute to predicting relatedness; to examine how the three psychological needs combine to predict motivation and affective and behavioural outcomes among adult dragon boat participants, and whether age and gender moderate these relationships. This work successfully addressed these aims by providing evidence from a large sample of adult dragon boaters. Partial support for the basic tenets of SDT was provided, adding to the evidence that relatedness is an important predictor of motivation for adults in activity programs. These findings expand on the relatedness literature by linking this construct to social relationship concepts from other theoretical perspectives. In addition, the role of age and gender as moderators was refuted, contributing to the larger knowledge of these processes in this context.

3.5.1 Generalizability

One of the major strengths of this study is that the sample was a large, diverse sample of active adults. The participants exhibited great variability in age, there were large proportions of both Caucasian and Asian participants, and 75 different teams were represented. The sample was disproportionately female and highly educated, but socioeconomic status was estimated as being only slightly above provincial median. Overall, the study appeared to sample a diverse group of participants in a recreational adult sport. While the activity context was very specific,

this diversity of participants enhances the generalizability of the results of this study within the activity of dragon boat, and enhances confidence in the findings. Perhaps most notably, the wide range of ages of participants enabled this study to adequately address questions regarding whether the relationships among constructs were similar across the adult lifespan, or were moderated by age.

3.5.2 Partial Support for Basic Tenets of SDT

Overall, the results of this study provided partial support for the basic tenets of SDT. As expected, autonomy, competence, and relatedness all contributed to the prediction of motivation, with higher levels of need fulfillment being associated with more self-determined motivation. Also in line with theoretical expectations, more self-determined motivation was associated with more positive and less negative affect. Contrary to expectations, however, there was no link between motivation and physical self-worth or physical activity. Furthermore, there was only partial support for mediation of the effects of psychological need fulfillment on positive and negative affect, as direct effects made a greater contribution than indirect (mediated) effects in most cases. These results provided partial support for two of the major hypotheses of the study. They provide evidence from a large, diverse sample in a somewhat unique recreational team activity context suggesting that SDT may be a useful tool for explaining and predicting motivation in adult activity. They also, however, raise questions about the relative importance of the three needs in predicting self-determination, and the utility of self-determined motivation as a mediator in the model.

The hypothesis that autonomy would be the strongest predictor of self-determined motivation, with competence second and relatedness third, was not supported. This finding is in line with previous work with adult masters swimmers (Kowal & Fortier, 2000) and youth physical education classes (Standage et al., 2003). It is contrary to some work with adults

participating in exercise classes (Li, 1999; Wilson et al., 2003; Wilson et al., 2002), youth in competitive sport (Gagne et al., 2003; Sarrazin et al., 2002), and adolescent physical education (Ntoumanis, 2001) that has found relatedness is a very weak or even non-significant predictor of motivation. There are a number of possible explanations for these different findings, including substantive contextual differences between the studies, statistical influences due to colinearity, and measurement differences.

One possible explanation for these equivocal findings is that elements of the situation within the broader context of physical activity influence how important relatedness is in determining motivation. Studies that have found relatedness is a key predictor of self-determination among adults has been done with participants in sport settings where social interaction likely occurs frequently with the same people over and extended period of time and participants may even work interdependently toward the same goals (Kowal & Fortier, 2000; and the present study). In contrast, research that has found that relatedness is not a key predictor has typically been done in an exercise class setting, where opportunities for interaction among participants may be more limited, and may be less likely to influence individual goal attainment (Li, 1999; Wilson et al., 2003). This speculation is based on a very limited number of studies, and future research will need to expand on the variety of contexts in which these questions have been studied to test this possibility.

Most work addressing the issue of the relative importance of the three needs has found that autonomy is the most important predictor of motivation (Grouzet, Vallerand, Thill, & Provencher, 2004). However, much of this work has not been done in the physical activity context, and has not included relatedness. Some calls have been made to fill this gap in the research, on the grounds that there may be contexts, such as group activities, in which relatedness is a key predictor of motivation (Grouzet et al., 2004). While the results of this

study do not provide a definitive description of the conditions under which relatedness is a key predictor, it does provide evidence that relatedness is very important in this context, and suggest characteristics of the context that provide clues for future research to extend these findings.

A second explanation for the varying results regarding the importance of relatedness between studies is statistical, in that the degree of correlation among the three needs may vary considerably between studies, and colinearity influences may result in problems with estimating beta-weights in regression or structural equation modeling analyses that may lead relatedness to have a non-significant relationship with motivation even if those variables are moderately or highly correlated. Only four studies, including the present work, have tested the relative importance of the three needs simultaneously using regression or structural equation modeling in an adult context (Kowal & Fortier, 2000; Li, 1999; Wilson et al., 2003), while other studies have relied on comparing zero-order correlation coefficients or testing separate regression models for each of the three needs, circumventing colinearity problems. As in the present study, colinearity does not appear to have been a problem in at least two previously published studies, as the intercorrelations were well below .70 (Tabachnick & Fidell, 2001), with Kowal and Fortier (2000) reporting correlations of r = -.01-.27, and Wilson and colleagues (2003) reporting r = -.04-.31. In one study the correlations among the three needs were not reported (Li, 1999). Overall, it seems that colinearity is not playing a substantial role in creating the different findings regarding the relative importance of relatedness in adult samples.

A third explanation for the differences in the relative importance of the three needs may be differences in measurement instruments used to assess both the three psychological needs and self-determined motivation. Among studies that have investigated the relationships between the three needs and self-determined motivation, two, besides the present study, used

Mullan and colleagues' (1997) BREQ (Wilson et al., 2003; Wilson et al., 2002); four used Pelletier and colleagues' (1995) Sport Motivation Scale (Gagne et al., 2003; Kowal & Fortier, 2000; Sarrazin et al., 2002; Standage et al., 2003), and one used the Exercise Motivation Scale (Li, 1999). While this variety of scales measuring motivation is substantial given the limited number of studies that have explored this question, all three of these scales were based on SDT, have substantial evidence supporting their reliability and validity, and were tailored to meet the needs of measuring motivation in the sport (Pelletier et al., 1995) and exercise (Li, 1999; Mullan et al., 1997) contexts.

If measurement is an issue in determining the relative association between the three needs and motivation, it is more likely that the problem lies in the measurement of psychological needs, as there is less uniformity in their measurement, and most of the measures have had much less rigorous development. For example, among the studies reviewed here, three used adapted versions of Richer and Vallerand's (1998) relatedness scale that was originally developed in French (Kowal & Fortier, 2000; Sarrazin et al., 2002; Standage et al., 2003); one used Reeve and Sickenius' (1994) Activity Feeling States scale (Wilson et al., 2003); one used an adapted version of Harter's (1985) teacher subscale of the social support scale for children (Li, 1999); and three used single items developed by the author or used in previous studies (Gagne et al., 2003; Ntoumanis, 2001; Wilson et al., 2002). Given that none of these measures were developed specifically for and validated in a physical activity context, the recent development of the PNSE (Wilson, 2003; Wilson et al., in press) used in this study represents a possible solution to this problem. If future work continues to explore these questions using reliable and valid measures designed for the activity context, it may be possible to shed more light on whether differences in findings about the importance of relatedness are meaningful or an artefact of the different measures.

What is perhaps more important than the relative size of the beta-weights of the three needs predicting motivation is that all three needs contributed significantly and uniquely to the prediction of motivation, and therefore are all worthy of attention in the area of activity planning, coach training, and intervention work to enhance motivation for physical activities among adults. Given that relatedness has previously been ignored or regarded as less important in some work, the major highlight from this study is that relatedness contributed substantially to the prediction of self-determined motivation. This provides evidence that relatedness is an important construct in the motivational processes of adult recreational physical activity participants.

The finding that self-determined motivation only partially mediated the relationship between psychological need fulfillment and positive and negative affect, and was unrelated to physical self-worth and physical activity provides some support for the tenets of SDT but raises key questions about the role of self-determination as a mediator. A moderate amount of variance in motivation was accounted for by the three psychological needs, and the relationships were especially strong between competence and relatedness and motivation. However, a substantial amount of variance in RAI remained unaccounted for (67%), suggesting that there may be other major predictors of self-determined motivation not accounted for in this model.

The variance accounted for in the outcomes varied considerably, with substantial prediction of the variance in positive affect, less in negative affect and physical self-worth, and very little in physical activity behaviour. The lack of associations between motivation and physical self-worth and physical activity may be at least partially accounted for by the different levels of generality of the four outcome measures. Positive and negative affect questions, like the questions about psychological need fulfillment and motivation, directed participants to

answer relative to their feelings about dragon boat specifically. In contrast, the physical self-worth and physical activity questions directed participants to answer the questions relative to their evaluations of their physical self and activity levels as a whole in their lives, not only in dragon boat. While it is quite possible that this model accounts for affect better than physical self-perceptions and activity, it is also likely that this difference in question focus impacted on the ability of the model to predict physical self-worth and physical activity.

Little previous work has tested a model with self-determined motivation mediating the relationship between all three psychological needs and affective and behavioural outcomes suggested by SDT in a physical activity context. The five previous studies that have tested models similar to that proposed in this study have found support for a mediational model, contrary to the findings in the current study (Kowal & Fortier, 2000; Li, 1999; Ntoumanis, 2001; Sarrazin et al., 2002; Standage et al., 2003). However, none of these studies specifically tested the role of motivation as a mediator of the relationships between psychological need fulfillment and affective and behavioural outcomes. These studies tested the fit of models based on SDT that included the mediated relationship tested here, but did not employ the three-step model testing approach to assess all of the relationships necessary to support mediation. In that respect, the results of this study are not entirely inconsistent with those of previous work. If the strategy of the present study had been to test the mediational model exclusively, without comparison to the direct effects and combined effects models, the conclusion would have been that the mediator model fit the data reasonably well, and that there was support for significance of all of the proposed pathways in the model. It was only in comparison to the direct effects and combined effects models that the problems with a full mediation model were highlighted. No other published work exists that fully tests mediation in this model, so these results provide new possibilities for testing this relationship in future work.

The finding that RAI only partially mediated the relationships between psychological need fulfillment and positive and negative affect is not necessarily inconsistent with SDT. Consistent with the theory, autonomy, competence, relatedness, and motivation all played a role in predicting outcomes. The finding that all of these variables have direct effects on affect rather than following a sequential mediation process is perhaps not surprising. Cognitions and emotions are complex, and can affect each other bi-directionally (Lazarus, 1999). For example, feeling competent in dragon boat may lead to more self-determined motivation, which could result in positive affect, but feeling competent may itself lead to positive emotions, independent of motivation. In addition, it is possible that those positive emotions, however derived, contribute to other aspects of the model such as motivation. Testing statistical models such as the one proposed in this study is important, as it provides evidence of important links among variables in the motivational process. In this study, evidence was found that competence and relatedness are key predictors of motivation in this population, and that they directly, and via self-determined motivation, predict affective outcomes. However, the correlational nature of the data precludes definitive conclusions about cause and effect, leaving many possibilities about the precise ordering of cognitive and affective events in the proposed sequence.

The lack of any effect of self-determined motivation on physical self-worth and physical activity was not consistent with expectations based on SDT. The finding that competence was related to both physical self-worth and activity is very consistent with previous literature (e.g., Crocker, Eklund, & Kowalski, 2000; Hayes, Crocker, & Kowalski, 1999; Kowalski, Crocker, & Kowalski, 2001) It was not expected, however, that self-determined motivation would have no predictive relationship with these variables. One possibility is the difference in level of specificity of the motivation variable and these two outcomes. Motivation questions pertained specifically to motivation towards dragon boat.

Physical self-worth questions asked participants to respond regarding feelings about themselves physically in general. Similarly, the LTEQ asked participants to report their physical activity from all types of activity.

Work by Vallerand (2000) has emphasized this point in the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM), which is based on SDT. This model suggests that variables in the motivational sequence of SDT will more closely relate to each other if they pertain to the same level of generality, namely global, contextual, or situational. The global level assesses the motivational process at the highest level of generality, as it pertains to the person's experience as a whole. In this study, physical self-worth and physical activity were assessed at a global level. The contextual level is concerned with motivational processes within a specific domain of a person's life, such as their physical activity participation, or even their participation over time in an activity such as dragon boat. All variables measured in this study except physical self-worth and physical activity were assessed at a contextual level. The situational level refers to motivational processes at a particular moment in time, in a specific situation. None of the variables in this study pertained to the situational level, but an example would be asking participants about their motivation toward dragon boat in a specific practice. While general, contextual, and situational motivation are clearly linked in the HMIEM, the strongest links are proposed to occur at the same level of generality. Therefore, it is possible that motivation may have been a predictor of physical activity in this study if physical activity had been measured as it related to dragon boat participation only. Further research that operationalizes activity as attendance at dragon boat practices may provide more insight into this question.

3.5.3 Linking Social Relationships to Relatedness

The present study served to expand knowledge about relatedness by linking the SDT literature to other theories and concepts of social relationships. Given that this was new ground, no specific hypotheses were proposed concerning which of the social relationship factors (social support network size, perceived social support, peer acceptance, and friendship quality) would predict relatedness, but the results of the exploratory analyses suggested that all of these constructs uniquely contributed to relatedness perceptions among adult dragon boaters. An emerging body of literature is beginning to place more emphasis on the importance of social relationships in physical activity (Smith, 2003), and evidence that these concepts are linked to motivation contributes to the understanding of the larger social context of physical activity.

Specifically, this study suggests that a sense of feeling accepted by one's peers, feeling supported, having a substantial support network, and having high quality friendships on one's team all contribute to relatedness, suggesting that social interventions that target each of these aspects may make a positive contribution to helping participants establish meaningful social connections that may enhance motivation. Research on peer relationships in the youth sport context has found links between social relationships and motivation, including that perceptions of peer acceptance and friendship quality make unique contributions to physical activity related affect and indirectly predict cognitive motivation for physical activity (Smith, 1999), that friendship quality is linked to enjoyment and commitment to physical activity (Weiss & Smith, 2002), and that both parent relationships and peer acceptance and friendship contribute to motivation (Ullrich-French & Smith, 2006). The present work extends these links to an adult population by demonstrating that acceptance, friendship and social support are unique predictors of relatedness, and together account for substantial variance in relatedness, which

played a major role in predicting self-determined motivation, supporting the contention that these factors are an important part of the motivation picture. Given that social relationships in physical activity have been under-researched, these substantial effects suggest that a more complete understanding of social elements may play an important role in furthering the understanding of physical activity motivation.

3.5.4 Age and Gender

Contrary to initial expectations, age and gender did not operate as moderators in the associations between social relationships and relatedness or psychological needs and self-determined motivation. While age and gender did not emerge as moderators, some gender differences were found in the study variables with women tending to have more positive perceptions of social factors, self-determined motivation, and positive affect; and age and gender did contribute as main effects to the prediction of relatedness (older age predicted more positive relatedness perceptions) and self-determined motivation (older age and female gender predicted more self-determined motivation). The data suggested that social connections are of key importance to motivation across the adult lifespan and across genders. It is plausible that adults seek to fulfill relatedness needs through group physical activities at many points in their life, regardless of gender. While this study did not investigate the possibility that these needs may be expressed differently in ways that may be influenced by age or gender, the basic underlying need for social connectedness in recreational activities seems to play a similar role for all of these adults.

In testing moderator effects, concerns about power and sample size are important, as testing interaction terms in hierarchical regression places substantial requirements on sample size (Pedhazur, 1997; Stevens, 1996). However, these concerns did not seem to be an issue in this study, as it was demonstrated that recommendations for sample size were met, and the

interaction terms in the moderator analyses were clearly non-significant, alleviating suspicions that a somewhat larger sample would be likely to yield significant results.

While the finding that age and gender did not act as moderators was contrary to the study hypotheses, it is not entirely surprising. While an argument was made for suspecting moderator effects, there is very little empirical evidence regarding age and gender effects in adult social and motivational processes, particularly in physical activity. What evidence there is tends not to be grounded in established theory, making it difficult to make firm predictions on their effects or interpret differences meaningfully.

3.5.5 Limitations

While this study has many strengths and unique findings, there are some limitations to the generalizability of results and conditions that may bias the results that must be acknowledged. In particular, issues surrounding missing data, the length of time participants had been involved with their dragon boat teams, and measurement concerns with the social support scale, the SFQS, and the autonomy scale should be noted when considering the validity of results.

Missing data was a considerable problem in this study, particularly with respect to the social relationship variables. The strategy of creating two separate data files prior to listwise deletion, one for questions including the social relationship variables and one excluding those variables, limited the problems associated with missing data to the analyses involving social relationship variables, but some notable potential biases remained with respect to the social relationship variables. The biggest problem with missing data resulted in the elimination of conflict resolution. This omission may have also substantially changed the positive friendship quality variable, but given the high association among positive friendship quality variables, more information was likely gained by eliminating conflict resolution and retaining as many

participants as possible. The second missing data issue was that even with conflict resolution removed, many people were eliminated from the analyses involving social relationships for missing data, and people with lower levels of social support and who did not have a friend in dragon boat were disproportionately excluded, introduced a potential bias to this section of the results.

A related issue that may have contributed to this problem is that a large proportion of participants were in their first season with their current team, which may have contributed to difficulties responding to questions about social relationships. In order to limit this problem somewhat, a point was made of contacting teams after the season was already well underway to minimize this effect. An alternate strategy could have been to limit the sample to those who had been in the group for at least 1 year. However, a large proportion of people were in their first year with a given team (25%), suggesting that many people switch teams frequently or begin the sport as a novice each season. New members therefore compose a large proportion of team members on many teams, and those who are new to an activity program tend to be the most vulnerable for drop-out (Dishman, 1994). This suggests that it is useful to include novice team members in studies on motivation, as being able to generalize the findings about the role of social relationships in motivation to those who are just starting and are perhaps the most vulnerable for drop out increases the applicability of these findings to a particularly at-risk group. There was a trend for more novice members to be excluded from the analyses involving the social relationship variables, but even if this bias were substantial, analyses demonstrating the strong link between relatedness and self-determined motivation included almost all participants who took part in the study, suggesting that having meaningful social connections plays an important role in motivation even for relatively new participants.

Finally, a variety of measurement issues were raised in this study that result in some caution in the interpretation of results, and suggest areas for future research to strengthen investigations in this area. Specifically, concerns were raised with the sport friendship quality and autonomy scales. The key problems with the sport friendship quality measure were the issues with missing conflict resolution items, the inclusion of "double-barrelled" questions in that scale, and problems with the factor structure. The problem with the conflict resolution scale has not been raised in the literature to date, and may have occurred here because this scale was applied in an adult population, but was originally developed for youth. Given that this problem has not been raised with youth samples, it may be appropriate to assume that youth friendships involve some degree of conflict that requires resolution, such that all participants are able to respond meaningfully to questions such as "*My friend and I make up easily when we have a fight.*" In contrast, many adult friendships may not involve conflicts that are identified as *fights, disagreements,* or *arguments* as specified in the three items of this subscale. Some adults may have developed strategies to avoid conflicts in their friendships or express them in ways that do not align with the terminology used in this scale. Most friendship measures, including the SFQS, have been developed for children or adolescents, which is why the SFQS was chosen for use in this study, as it was the only available measure of friendship quality specific to the activity context. Of other friendship measures that have been designed for adults, they tend not to include elements of conflict resolution or conflict (e.g., Mendelson & Aboud, 1999), but rather focus more on concepts akin to the positive friendship quality items ultimately retained for use in this study.

Even when conflict resolution was excluded there were problems with the factor structure of the SFQS. It was not possible to find a simple factor solution that resulted in acceptable indices of model fit. Problems with the factor structure have been reported in prior

work with the SFQS with youth (McDonough & Crocker, 2005; Weiss & Smith, 2002), but the fit of the confirmatory factor analysis model in this study was worse, and no degree of conceptually plausible model modifications resulted in an improvement in model fit. The results of this study revealed that despite problems with this scale, biases, and loss of power due to eliminating participants for incomplete data, positive friendship quality was still able to contribute to the prediction of relatedness, suggesting that it could be beneficial to develop or adapt more appropriate measures of friendship quality in the physical activity context for adults. This work could have merit, as friendship appears to be a factor in the motivational processes of adults, albeit with a small effect size in this study. In particular, although it may be possible to differentiate particular elements of friendship quality among adults, in studies examining the effects of friendship quality on constructs like motivation it may be more useful to have a one-dimensional measure of friendship, as the distinct, separate elements seem to be very highly related, leading to problems such as colinearity in regression analyses. More fine-grained measures with multiple dimensions may have more merit for use in studies that address more detailed research questions around the structure of friendship quality in activity.

Problems with the PNSE appeared to center around issues with the autonomy scale. The slight misfit of the CFA model may have had to do with the adaptation of this scale to the dragon boat context from the exercise class context in which it was originally developed. Autonomy, in a theoretical sense, does not necessarily imply independence or nonconformity to group norms (Chirkov et al., 2003). In a group activity such as dragon boat, where people are somewhat dependent on each other for performance, and have a clear leader (coach, captain, manager, etc.) making many decisions so that the group can operate efficiently, an individual does not necessarily have to abdicate their sense of autonomy to choose to follow group norms and decisions made by those in leadership positions. One can feel autonomous in the choice to

join the group and allow these leaders some degree of control over decisions that are not seen as important to make personally or that are trusted to that person because of a higher level of expertise.

In this way, the PNSE autonomy items that were developed and performed very well in the context of adult exercise generally (Wilson et al., 2003) may confuse autonomy with independent decision-making when they are adapted to the dragon boat context. Items such as *I feel free to make my own dragon boat program decisions* may confuse the issue of autonomy with questions about an agreed-upon decision-making and leadership structure. This question may not be answered the same way by a dragon boat participant finding out from their coach what the workout is that evening, as compared to an adult choosing to go to the gym or for a walk or run, or to an exercise class, even if both feel autonomous in their participation, as the focus is on freedom to make program decisions, which may be less relevant to autonomy in the dragon boat context. Ultimately, an autonomy scale may be better suited to be applicable across contexts if the items focused on the underlying perception of being autonomous rather than specific behaviours such as decision-making about a program.

3.5.6 Future Directions

Overall, this study enhances understanding of the link between social relationships among adults in a recreational team sport, their psychological need fulfillment, self-determined motivation, and affective and behavioural outcomes. Together, these results suggest that further investigation of social relationships in adult physical activity has potential implications for both understanding adult activity motivation, and designing unique intervention strategies aimed at improving adult activity motivation, experience, and behaviour.

CHAPTER IV: STUDY 2

4.1 Purpose

The purpose of Study 2 was (1) to examine the effects of eight-week coach-delivered cooperative and individualistic learning interventions on perceptions of social relationships, psychological need satisfaction, self-determined motivation, and affective outcomes among adult dragon boat participants, (2) to examine whether changes in relatedness were associated with change in self-determined motivation, while accounting for within-team clustering on these variables; and (3) to replicate the mediator model test to obtain further evidence about the role of self-determination in fully or partially mediating the relationships between psychological need fulfillment and affective outcomes. This intervention study builds upon the correlational findings in Study 1 to examine whether changes in social relationships, need fulfillment, self-determined motivation, and affective and behavioural outcomes are linked in theoretically predicted ways. It also examined whether the social context can be manipulated to improve motivational, affective, and behavioural outcomes.

As in the first study, dragon boat offered the advantage of studying adult recreational sport participants who were diverse in age, gender, ethnicity, and ability. This is also an activity where group interaction is important for both social and performance outcomes. In addition, the researcher had extensive expertise paddling and coaching dragon boat. This experience was important in the creation and implementation of a social intervention that was relevant to coaches and participants and was integrated with the technical elements of a dragon boat practice.

The intervention strategies used in this study were based on recommendations from the learning structure literature. Individualistic learning environments evaluate and reward participants based on their effort and progress, while cooperative structures must incorporate

positive interdependence, face-to-face interaction, individual accountability, social skill training, and opportunities for group evaluation (Hymel et al., 1993; Johnson & Johnson, 1990). While dragon boating appears to be an inherently cooperative physical activity because it necessarily has positive goal interdependence, there are aspects of practices that can also be structured as independent or competitive. Additionally, the other four factors are not inherent to dragon boating, and can be affected by the manner in which the coach structures learning activities during practices. Specifically, most common coaching practices currently used in dragon boating employ individualistic learning structures to teach technical components. On-task, face-to-face interaction, social skills training, and opportunities for participants to contribute to group evaluation are rarely incorporated into practice time. Through my personal work with educating dragon boat coaches and coaching dragon boat teams, I have observed that many coaches and paddlers identify negative social interactions and poor communication strategies used by paddlers as key barriers for learning, performance, and motivation. This suggests that it may be both feasible and beneficial to incorporate cooperative learning structures into dragon boat practices with positive outcomes that are relevant to coaches' and paddlers' current concerns and practices.

In order to limit the extent to which the outcomes of the intervention were dependent on personal characteristics of the researcher, and to enhance the generalizability of the results of this study, the interventions were delivered to intact dragon boat teams via the teams' coaches. Coach education modules were developed to train participating coaches in incorporating individualistic and cooperative learning strategies into their practices that were consistent with current dragon boat coaching theories and techniques.

Mixed effects modeling was used to address the second purpose of this study by examining whether individual changes in relatedness predicted changes in self-determined

motivation. This analysis examines this relationship while accounting for clustering of these variables within teams, and examining whether the group-level variable of intervention type predicted additional variance in change in motivation. It is expected that social perceptions such as relatedness and motivation for a team activity are influenced by group factors such as the coach and team atmosphere. These forces may act similarly on members within a group. Since the design of this study required that teams be randomly assigned to the learning structure intervention conditions rather than random individual assignment it is important to consider and statistically account for clustering of responses within teams. If common statistical tests using ordinary least squares estimation are employed, the assumption of independent observations is violated, which may artificially decrease standard errors and bias significance tests, increasing the Type I error rate (Thomas, 1993). In addition, mixed effects modeling allows for the simultaneous estimation of individual and team level effects. It is therefore possible to examine whether the relationships between changes in relatedness and changes in self-determined motivation are different for teams who experienced the cooperative learning intervention and the individual learning intervention.

4.2 Hypotheses

In order to meet the purpose of examining the effects of the two interventions on social relationships, psychological need fulfillment, self-determined motivation, and affective and behavioural outcomes, the following hypotheses were tested:

1. That both the individualistic and cooperative learning intervention groups would increase in autonomy, competence, self-determined motivation, positive affect, and physical self-worth perceptions over the course of the intervention study.
2. That the cooperative learning group would increase in social relationship perceptions (i.e., peer acceptance, social support network size, amount of social support, and friendship

quality) over the course of the intervention, while the individualistic learning group would not.

3. Changes in relatedness would predict changes in self-determined motivation.
4. Self-determined motivation, as represented by the relative autonomy index (RAI), would partially mediate the relationships between psychological need fulfillment and positive and negative affect, whereas competence will directly and exclusively predict physical self-worth.

4.3 Methodology

4.3.1 Participants

The coaches and paddlers from 12 dragon boat teams who practiced at least two times a week were recruited to participate in this study. In total, 210 adult dragon boat paddlers aged 19 years and older and their 14 coaches (2 teams had 2 coaches each) began the study. Of the 14 coaches who participated, 9 were male and 5 were female. Paddlers ranged in age from 19 to 66 (M age = 32.08, $SD = 8.44$). The majority of participants (n = 126, 60%) were male. Fifty-eight percent of participants reported their ethnicity as Asian, 36% were Caucasian, and the remaining 6% reported their ethnicity as African, East Indian, Filipino, Iranian, Lebanese, Métis, Persian, or mixed ethnicity. Participants tended to be highly educated, with 95% of the sample having at least some post-secondary education, and 61% having at least an undergraduate degree. Based on estimates from participants' postal codes and the 2002 British Columbia Statistics from the Canada Customs and Revenue Agency, the median income of participants in the study was approximately 4% below the provincial median (which was just over $22,000 for the 2002 tax year). Only 26% of the sample had estimated incomes below 80% of the provincial median, and 25% had estimated incomes above 120% of the provincial median.

On average, participants had been involved in dragon boating for 4.81 years (*SD* = 3.96), and 14% were in their first year of dragon boating. They had been on their current team for an average of 2.74 years (*SD* = 2.73), with 14% in their first year on their current team. Participants reported practicing 2-4 times per week (*M* = 2.30, *SD* = .57) for an average of 7.68 (*SD* = 1.41) months per year.

4.3.2 Procedures

This study used a 2 × 2 quasi-experimental design to compare the effects of two types of intervention strategies over time on dragon boat paddlers. This type of design is similar to an experiment, except that it lacks individual random assignment to groups. Individual random assignment was not possible in this case, as paddlers could not be expected to leave their regular teams for two months and be randomly assigned to other teams in the middle of the racing season to participate in a fully randomized experiment when they have goals and commitments with their regular teams. This lack of random assignment creates a threat to internal validity of the study, as participants were recruited into the study in in-tact groups that could have introduced some bias. To minimize this, multiple teams participated in each intervention condition, and teams were randomly assigned to the conditions. In addition, statistical analyses such as mixed effects modelling helps to statistically account for within-team clustering, allowing some statistical control of within-group effects at the analysis stage.

Initial contact was made by email letter (see Appendix D) with coaches of teams that held regular practices at least twice a week and catered to members 19 years of age or older. Coaches who expressed interest in the study were provided with a copy of the consent form for coaches (see Appendix E). Coaches who consented to participate were randomly assigned to either the cooperative or individualistic intervention conditions by flipping a coin. Arrangements were then made for the researcher to meet with the coach and their team at a

regular practice session. At that meeting, the researcher gave a brief explanation of the study's procedures, distributed consent forms containing written information about the procedures for the assigned intervention condition (see Appendix F and G), and answered any questions that the participants had at that time. Team members were told that while their coach had given his or her consent to participate as a coach in the study, that in no way obliged them to participate as individuals in the study, and information about them would only be collected if they gave their individual consent to participate. Participants also had the opportunity to contact the researcher by phone or email, provided on the consent forms, if they had any questions or concerns about the study. Approximately one week later, the researcher met with the team again before or after a practice to collect signed consent forms from individuals who agreed to participate, and volunteers completed a Time 1 questionnaire (see Appendix H).

After the team's completion of the Time 1 questionnaire and prior to the team's next practice, the researcher met with the coach for a 45-60 minute training session to teach the coach the procedures of the learning intervention that they would be using with their team for the subsequent eight weeks. At this session, coaches were provided with an illustrated manual (see Appendix I and J). The manual contained (a) an outline of the procedures they were being asked to follow in each practice; (b) an explanation of the learning structure they had been assigned to; (c) detailed instructions for conducting activities designed to integrate the learning structure's principles into their dragon boat practices; (d) illustrated and laminated cue cards of the activities that they could take in the dragon boat with them to help them conduct the activities; (e) practice planning and log sheets that would help remind them to include all of the study elements in each practice and record their adherence to the program and any comments they had; (f) attendance sheets for all study participants from their team; and (g) contact

information so that they could reach the researcher if they had questions or comments at any point throughout the study.

The cooperative learning intervention had four components that coaches were asked to incorporate into their practices. At the first practice session during the intervention period, teams participate in a team-building exercise called "the human knot with a twist" that was aimed at providing instruction for positive communication and prosocial interactions. The activity involved having participants solve a physical problem as a group while following three positive communication rules (maintaining eye contact, not interrupting, and using "I" statements) based on research on communication skills training for interactive team sports (Sullivan, 1993). This was an "off-water" activity that took place once, prior to the first practice in the eight week intervention.

The other three activities were incorporated into each of the practices during the intervention period. The first of these was a pre-practice distraction "park" exercise. Once in the boat, participants sitting in adjacent seats were given approximately 2-3 minutes to briefly discuss one distraction that they have on their mind that they need to "park," or put out of their mind to deal with later, to be able to fully focus on their practice session (adapted from Orlick, 1986). Partners were encouraged to actively listen, but not to enter into extended discussion.

The second ongoing element of the cooperative learning intervention was that at least one cooperative learning drill was incorporated into each practice. Coaches were given eight drills to choose from, each focusing on a different commonly taught technical element of dragon boat, but all incorporating the principles of cooperative learning (Hymel et al., 1993; Johnson & Johnson, 1990) in their approach. Positive interdependence is partially addressed by the fact that dragon boat is an activity where any individual's success in racing depends on the success of all members together. Positive interdependence was additionally addressed by

having all drills involve a common learning goal that groups of paddlers must work together to attain. Face-to-face interaction was facilitated by all drills requiring dyad or small-group discussion and interaction. Individual accountability was enhanced by the small group focus. Dragon boats are large, and it is difficult for a coach to observe all of the participants' behaviours during individualistic drills. During cooperative drills, all participants had the attention of at least their own partner or small group, enhancing their accountability to put effort into the task. Social skills training was not specifically addressed in each drill, as it was addressed in the team-building activity. Group evaluation opportunities were provided by having the coach asking for feedback about how the drill went as part of his or her way of bringing the large group back together so that they can move on to the next component of their practice.

Cooperative learning structures are complex, and were novel to many coaches. To facilitate the implementation of cooperative learning drills, the series of eight drills were provided to coaches to help them fulfill this component of the intervention. These drills were based on current practices in dragon boat technique and coaching (Carlsson, 2002), and cooperative learning structures used in physical education (Grineski, 1996). The drills were written in such a way that they provided coaches instruction in structure only, and did not direct their specific technical comments or the workload they had planned for their teams' practices. In addition, if coaches wanted a drill for a technical element that was not reflected in the eight drills provided, they were invited to contact the researcher at any time during the study with their request, and a new drill was created that fulfilled both the coach's technical needs and the cooperative learning requirements.

Finally, at the end of each practice, prior to returning their boat to the dock, cooperative intervention participants took part in a post-practice learning recap exercise. They paired up

with their seat partner again, and took turns explaining to each other one specific thing that they learned or were struggling with understanding or doing in that practice. The partner was asked to actively listen and ask questions if necessary, and then partners reversed roles. Each participant was given only 1-2 minutes in the boat for this exercise, but participants were encouraged to continue their discussion with their team-mates or coach after practice if they wanted. This exercise followed the learning leader-learning listener approach outlined in Cohen (1994), and was aimed at fostering positive interpersonal interactions, as well as facilitating learning through requiring participants to clearly explain complex thoughts.

The individualistic learning condition had only three components that were parallel to the components of the cooperative condition. There was no parallel to the teambuilding activity because individualistic learning does not require communication training at the beginning of an intervention program, which was the main purpose of that activity in the cooperative condition. The pre-practice distraction "park" exercise was identical to the cooperative condition except that participants were asked to reflect individually on a distraction rather than to discuss it with a partner. The eight individualistic learning drills were designed to address the same elements of dragon boat technique as those in the cooperative condition, but focused on having participants work independently, without any interaction with team-mates required. The post-practice learning recap was again identical to the cooperative condition except that participants were asked to reflect individually on one thing they learned or were struggling with, rather than discussing with a partner.

During the training session, the researcher and the coach reviewed all of the procedures and specific activities of the intervention, the coach was given the opportunity to ask any questions he or she had, and the researcher asked the coach questions or for comments throughout the training session to ensure that the coach understood the activities and the

characteristics of the intervention condition. During the training session the researcher followed a detailed checklist to be sure that all coaches received the same necessary information (see Appendix K). At the end of the session, the coach was asked to complete a short questionnaire about training session including their perceptions of confidence and competence to carry out the intervention, feedback about the training session, and their expectations for the intervention program (see Appendix L). In addition, the researcher completed log sheets after each training session with notes about how the training sessions went and any questions or comments the coach had (see Appendix M).

The coach then carried out the intervention with their team for eight weeks. During that time, the researcher telephoned each coach on a weekly basis to ask whether the coach had completed all of the study elements that week, whether they had run into any barriers or problems, and whether they had any questions or needed any additional assistance from the researcher. Log sheets were made for each phone call to ensure that each coach was asked the same questions each week (see Appendix N) and the researcher completed a post-call journal sheet following each phone call to record any concerns or comments following the call (see Appendix O).

After the last practice in the intervention period, the researcher met with the team again and study participants completed the Time 2 questionnaire. This questionnaire was identical to the first questionnaire, but after completing it, participants were also asked to complete a short feedback form about the intervention they had experienced including whether they thought it was beneficial, how often the intervention activities were conducted in their team's practices, how engaged they were in the intervention activities, and any comments they had about the program (see Appendix P and Q). At this time coaches were asked to return their practice logs and participant attendance sheets, and to complete a coach program feedback questionnaire.

This questionnaire assessed the coaches' opinion on how beneficial they thought the intervention was for their team, how difficult it was to carry out the intervention, how confident they were in their abilities to conduct the intervention, and whether they encountered any barriers or challenges in their efforts to conduct the intervention. They were also asked to provide feedback about the manual, the training session they received, the weekly contact they had with the researcher, and any additional comments they had (see Appendix R).

Once all of this data had been gathered, the team was told that the study was complete, and they were thanked for their participation. The coaches were provided with the manual for the intervention condition that they were not assigned to so that they could see the other program, and were told that they were welcome to use any of the activities from either condition in their future coaching if they wanted to. Teams were also provided with a free one-hour workshop on one of five psychological skills training for dragon boating topics of their choice (stress management, imagery, goal setting, positive self-talk, or competition planning) as a thanks for their participation in the study. Both at the completion of the study and at the beginning of the workshop participants were reminded that the workshop was not a part of the study procedures and information discussed in the workshop would not be collected as data or associated with the study in any way.

4.3.3 Measures

The same instruments were used to measure peer acceptance (Neeman & Harter, 1986), friendship quality (Weiss & Smith, 1999), social support (Richman et al., 1993), autonomy, competence, relatedness (Wilson, 2003), motivation (Mullan et al., 1997), positive and negative affect (Watson et al., 1988), and physical self-worth (Marsh et al., 1994), as described in Study 1 and detailed in Appendix C. In addition, instruments assessing social cohesion and mastery climate perceptions were included in the questionnaire for Study 2, and are described below.

Attendance at dragon boat practices during the 8-week intervention period was also recorded by coaches, and a variety of short questionnaires and log sheets described in the procedures section above and detailed in Appendices K-R were used to assess the integrity of the interventions.

4.3.3.1 Social Cohesion

The individual attraction to the group-social and group integration-social subscales of the Group Environment Questionnaire (GEQ; Carron, Brawley, & Widmeyer, 2002) were used to assess participants' perceptions of social cohesion on their dragon boat teams. Social cohesion was assessed so that differences between participants in the cooperative and individualistic conditions could be compared at Time 1 to rule out differences in social cohesion as a potential confound. The group integration-social subscale assesses an individual's perception of the degree of similarity, closeness, and bonding within their team as a whole, while the individual attraction to the group-social subscale assesses an individual's perception of his or her personal acceptance and social interactions with the group. The group integration-social subscale contains 4 items and individual attraction to the group-social has five items, all rated on a 9-point Likert scale with the anchors *strongly disagree* and *strongly agree.*

Considerable work has been done on the psychometric properties of the GEQ. Reliability of the group integration-social subscale has typically been found to be acceptable (>.70), but the attraction to the group-social subscale has often found to have an internal consistency value in the .62-.69 range (Carron et al., 2002). Evidence regarding the factorial validity of the GEQ has been mixed, but extensive support for predictive validity has been published, with expected relationships found between the cohesion subscales and variables such as adherence, leadership, and attributions (Carron et al., 2002).

4.3.3.2 Mastery Motivational Climate

The mastery motivational climate subscales of the Perceived Motivational Climate in Sport Questionnaire-2 (Newton, Duda, & Yin, 2000) were used to assess participants' perceptions of three facets of mastery motivational climate on their dragon boat team: perceptions of an emphasis effort/improvement, that one has an important role on the team, and that the coach fosters cooperative learning. These aspects of motivational climate were assessed so that differences between participants in the cooperative and individualistic conditions could be compared at time 1 to rule out differences in social cohesion as a potential confound, and so that it could be used as part of an intervention check, as it was expected that effort/improvement and important role would increase in both conditions, and cooperative learning perceptions would increase only in the cooperative learning condition. The effort/improvement subscale contains eight items, the important role subscale has five, and the cooperative learning subscale has four items, each rated on a five-point Likert scale with the anchors *strongly disagree* and *strongly agree*. Extensive evidence has been gathered to support the reliability and validity of the PMSCQ-2, demonstrating that all subscales have acceptable reliability (α = .74-.79), the factor structure of the scale is supported, and that theoretically expected associations exist between the subscales and measures of motivation and satisfaction (Newton et al., 2000). The questionnaire was originally developed and validated with female adolescents and young adults (Newton et al., 2000), but has since been employed with a wide variety of participants including adult males and females (Standage, Duda, & Pensgaard, 2005)

4.3.4 Data Analysis

4.3.4.1 Data Screening

The data were analyzed by first screening the data to assess accuracy of entry, attrition from the study, explore patterns of missing data, and to examine conformity to the assumptions

of normality, linearity, homoscedasticity, and linearity. Scores that appeared deviant were checked with the questionnaire and corrected if necessary. Frequency and patterns of missing data were explored by performing a series of ANOVAs with a Bonferroni correction to assess differences between those with missing data (coded as 0) and not missing (coded as 1) on each variable, with all measured variables (Tabachnick & Fidell, 2001). Appropriate imputation methods for missing data were considered and implemented based on the results of this analysis.

The assumptions of multivariate statistics were examined next. Univariate skew and kurtosis were calculated and values equal to or exceeding |2.00| were identified as deviating from normality (Miles & Shevlin, 2001). Visual inspection of histograms and box plots provided further information on the shape of the univariate distributions, and extreme cases on these plots were investigated as potential outliers. Multivariate outliers were examined using Mahalanobis' distance. Mahalanobis' distance values were saved for each case from a multiple regression analysis with subject number as the dependent variable and all of the other variables as independent variables. Mahalanobis' distance values higher than a critical value of χ^2 value with degrees of freedom equal to the number of variables in the analysis at $p < .001$ were considered multivariate outliers (Tabachnick & Fidell, 2001). Bivariate plots of the relationships between the variables were examined to assess the assumptions of linearity and homoscedasticity, and a logical consideration of whether the data met the assumption of independence of observations was made.

4.3.4.2 Descriptive Statistics

Descriptive statistics, scale reliabilities (Cronbach's α), and correlations were calculated for all variables at both time points, and series of ANOVAs with Bonferroni correction were

performed to examine if there were gender differences or group differences on any of the Time 1 variables.

4.3.4.3 Confirmatory Factor Analysis

A confirmatory factor analysis of the SFQS was conducted to examine the factor structure of this scale because of the ambiguous factor structure results for this scale in study 1. Confirmatory factor analysis was conducted using LISREL 8.50 (Joreskog & Sorbom, 2001). Models were specified with items loading exclusively on the expected factor, latent variables allowed to freely covary, error covariance constrained to zero, and the variance of each latent variable constrained to 1.00 to establish scale. Model fit was evaluated based on the plausibility of model parameters and residuals and three fit indices: root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residual (SRMR). RMSEA values of $\leq .05$ indicated good fit, .05-.08 reasonable fit, .08-.10 mediocre fit, and $>.10$ poor fit ; CFI $\geq .90$ indicated good fit; and SRMR $\leq .05$ was considered a good fit (Byrne, 1998).

4.3.4.4 Repeated measures MANOVA and ANOVA

Repeated measures MANOVAs and ANOVAs with follow-up simple main effects analyses were used to test the main hypotheses regarding how social relationships, psychological need fulfillment, motivation, and affect would change over the course of the intervention. Separate multivariate tests were run for groupings of dependent variables based on the conceptual model of the motivational sequence in SDT (see Figure 2.1), with social relationship variables tested together, then psychological needs, motivation, and finally affect. For each section of variables, a repeated measures MANOVA was run with intervention type as the between-subjects factor. A significant time effect for the omnibus multivariate test would indicate that a linear combination of the dependent variables changed throughout the study. A

significant time × group effect on the multivariate test would demonstrate that the linear combination of the dependent variables changed differently throughout the intervention based on the intervention. Follow-up repeated measures ANOVAs (with intervention type as the between-subjects factor in the case of a significant multivariate interaction effect) with a Bonferroni correction were conducted if significant multivariate effects were found to provide further insight into whether and how each of the individual variables changed over time (indicated by significant time effects) or in response to the intervention (significant time × group effects). If a significant univariate interaction was found, simple main effects were calculated to further examine whether there were significant changes on that variable within each intervention condition separately. Follow-up ANOVAs were used rather than discriminant function analysis because the hypotheses of the study pertained to how each of the individual variables would change in response to the intervention, rather than whether cases could be classified into groups.

4.3.4.5 Mixed Effects Modeling

Residualized change scores and a mixed effects modeling analysis using the mixed procedure in SPSS 11.5 were used to test the hypothesis that changes in relatedness would predict changes in motivation, and to explore whether there was substantial within-team clustering. A decision on what type of change scores to calculate (simple difference or residualized) was made based on Williams' and Zimmerman's (1983) decision rule, where the simple difference score is used only if $\rho(X_1,X_2) > \sigma_{x1}/\sigma_{x2}$. Residualized change scores were calculated by running a regression with the Time 1 variable as the predictor and the Time 2 variable as the dependent variable, and saving the unstandardized residuals as a new variable, the residualized difference score. Descriptive statistics, skew, kurtosis, and the correlations between the change scores were calculated, and standard deviations were examined to assess

whether there was enough variation in the change scores to use them as variables in the analysis.

Mixed effects modeling was used to predict change in RAI with change in relatedness as an independent level-1 variable and intervention group as a level-2 independent variable. An unconditional means model with only an intercept and an error term predicting change in RAI was run as a baseline model to check if there was substantial clustering within teams. Degree of team clustering was assessed by calculating the intraclass correlation coefficient. While no formal statistical tests exist to determine whether within-team clustering was substantial, intraclass correlations as small as .01-.05 have been found to inflate alpha levels (J. Cohen et al., 2003), warranting the use of mixed effects modeling. A conditional model with change in relatedness as a level-1 predictor was then tested to examine whether changes in relatedness accounted for change in RAI, and whether there was between-team variability in the intercepts of the model. Finally, a conditional model with the same level-1 predictor and adding the level-2 predictor of intervention type was run to test whether the type of intervention experienced by a team could account for between-team differences in the relationship between change in relatedness and change in RAI.

4.3.4.6 Mediation analysis

Structural equation modeling analyses using LISREL 8.50 (Joreskog & Sorbom, 2001) were used to examine the hypothesis that self-determined motivation would partially mediate the relationships between psychological need satisfaction and affective outcomes. As in Study 1, this analysis involved testing a measurement model and a three-step model testing process to support or refute mediation. Other than the fact that physical activity was not included in this study, the model specification was identical to that conducted in Study 1, so the specifics are no repeated here.

4.4 Results

4.4.1 Data Screening

The data were screened for deviant values, attrition from the study, patterns of missing data, and the assumptions of multivariate analyses. Differences between participants in the cooperative and individualistic intervention groups at Time 1 were also examined. Fifty-one people (24%) who began the study did not complete the second questionnaire. Twelve of these people were from one team that did not complete the study because the team restructured during the study and, as a result, the coach decided not to continue participating as many of the study participants were no longer on the team. Nine people stopped dragon boating during that time for reasons such as injury and moving to another city. The other thirty participants were still dragon boating but were not present on the day the final questionnaire. Attempts to make arrangements for them to complete the missed questionnaires at an alternate time were not successful in these cases. All 51 participants without Time 2 data were excluded.

A series of ANOVAs with a Bonferroni correction ($p < .001$) (Tabachnick & Fidell, 2001) were conducted to test whether there were differences between those who did and did not complete the Time 2 questionnaire on any of the Time 1 variables, but no significant differences were found. This suggests that while a substantial number of participants did not complete the study, this attrition did not introduce any known bias on any of the measured variable into the results of this study.

The next intended step of the analysis was to examine attendance rates to see if any participants should be removed from the analysis due to low attendance rates, and therefore limited exposure to the intervention. Unfortunately, attendance records for many teams were incomplete or not provided by coaches, making this analysis untenable. This is a limitation of this study, as retaining participants with low attendance could result in increased Type II, errors

in that some participants may have had a lower than expected "dose" of the intervention, decreasing the intervention's effect.

Patterns of missing data in the remaining cases (n = 159) were examined by creating a dummy variable for each variable in the data set with a missing value coded as 0, and all other values coded as 1. ANOVAs with a Bonferroni correction ($p < .001$) demonstrated that (1) missing items on conflict resolution were associated with lower social support network size, amount of social support, and friendship quality; and (2) missing conflict and self-esteem enhancement and supportiveness items were associated with lower amount of social support. The largest amount of missing data was from the conflict resolution subscale, with 15% of cases missing at Time 1 and 17% at Time 2. As in Study 1, the conflict resolution scale was omitted from the subsequent analyses given that such a high percentage of the data were missing at random (de Leeuw, 2001). In addition, all results involving conflict and self-esteem enhancement and supportiveness must be treated with caution, as they disproportionately exclude participants with lower amounts of social support.

Missing data was imputed using person mean substitution for all cases that had at least 50% of the items in a particular scale present (Downey & King, 1998; Hawthorne & Elliott, 2005). The viability of this strategy was supported by a reliability analysis of all variables using all available data, as all subscales except individual attraction to the group-social at Time 2 ($\alpha = .63$) demonstrated acceptable reliability with $\alpha \geq .70$ (Nunnally, 1978). Three people were missing item 4 for individual attraction to the group-social. Given that only three cases were involved, the reliability was >.60, and all cases had 80% of the data on the subscale present, person mean substitution was used in these cases, despite the somewhat low alpha level. Listwise deletion was used in each of the analyses to eliminate participants who were missing data for a variable relevant to that analysis.

The distributions of all variables were examined to see if they met the assumptions of normality, homoscedasticity, and linearity. Normality was examined using skew and kurtosis statistics (see Table 4.1) and by examining box plots of each variable for outliers. External regulation and negative affect at Time 1 were positively skewed, indicating that participants tended to indicate low levels of external regulation and negative affect, which was expected in a group of recreational adult sport participants. Time 1 external regulation, intrinsic motivation, the relative autonomy index, and negative affect and Time 2 external regulation, negative affect, and social support network size all exhibited positive kurtosis, indicating that their distributions were more peaked than normal. Overall, these departures from normality were not considered problematic. Kurtosis of the degree found here introduces only minimal bias (Tabachnick & Fidell, 2001), and although external regulation was skewed, subsequent analyses were performed with the RAI, which was normally distributed. Results involving the skewed Time 1 negative affect variable should, however, be interpreted with caution.

The data were screened for univariate outliers by examining box plots and minimum and maximum values. All of these inspections found that the distributions and were within normal expectations for scores on that variable and no wild values were identified. A Mahalanobis' distance test was conducted to look for multivariate outliers. The critical value was assessed with forty-six degrees of freedom, one for each variable at both time points, excluding positive friendship quality and the RAI, as these variables were composites of other variables in the analysis. The critical value was χ^2 (46) = 81.4, and the largest Mahalanobis' distance value was 74.39, indicating that there were no multivariate outliers. An examination of bivariate plots of all variables suggested there were no non-linear relationships. In addition, all of the plots appeared to have relatively equal variances across the distribution, supporting the assumption of homoscedasticity.

Table 4.1: Descriptive statistics, skew, kurtosis, and scale reliabilities

Variable Name	Time 1						Time 2						Scale Range
	M	***SD***	**Skew**	**Kurtosis**	**α**	***n***	***M***	***SD***	**Skew**	**Kurtosis**	**α**	***n***	
Social support network size	7.24	3.44	.65	.39	n/a	150	6.62	3.56	1.49	4.68	n/a	151	0-32
Social support amount overall	3.31	.86	-.43	.12	.77	156	3.31	.90	-.37	.02	.81	153	1-5
Self-esteem enhancement and supportiveness	4.14	.71	-.68	-.06	.79	153	4.08	.73	-.68	.12	.85	154	1-5
Loyalty and Intimacy	3.84	.93	-.61	-.33	.84	153	3.87	.92	-.55	-.62	.87	153	1-5
Things in common	3.80	.83	-.46	-.38	.86	153	3.78	.85	-.36	-.64	.86	154	1-5
Companionship and pleasant play	4.08	.80	-.78	-.05	.79	153	4.07	.81	-.61	-.32	.83	154	1-5
Positive friendship quality	3.96	.73	-.53	-.38	.94	153	3.95	.75	-.49	-.46	.95	153	1-5
Conflict	1.75	1.02	1.38	1.17	.90	151	1.83	1.04	1.27	.64	.92	150	1-5
Peer acceptance	3.14	.57	-.22	.87	.79	155	3.25	.53	-.22	.88	.72	154	1-4
Individual attraction to the group-social	6.55	1.47	-.48	-.12	.63	159	6.59	1.51	-.52	-.18	.70	158	1-9
Group integration-social	6.23	1.74	-.36	-.71	.82	159	6.05	1.78	-.45	-.18	.84	158	1-9
Relatedness	5.03	.68	-.72	1.06	.85	159	4.96	.80	-.88	1.06	.90	159	1-6
Competence	5.24	.67	-.99	1.75	.91	159	5.24	.64	-.59	-.10	.91	159	1-6
Autonomy	3.57	1.19	-.07	-.78	.90	158	3.77	1.13	-.22	-.47	.89	158	1-6
External regulation	1.35	.65	2.61	7.83	.79	159	1.41	.64	1.89	3.51	.80	159	1-5

Variable Name	Time 1						Time 2						Scale Range
	M	*SD*	Skew	Kurtosis	α	*n*	*M*	*SD*	Skew	Kurtosis	α	*n*	
Introjected regulation	2.44	1.08	.53	-.73	.75	159	2.40	1.03	.66	-.17	.78	159	1-5
Identified regulation	3.97	.73	-.87	.80	.76	159	4.02	.78	-.71	-.10	.82	159	1-5
Intrinsic motivation	4.44	.59	-1.22	2.01	.86	159	4.39	.58	-.77	.12	.87	159	1-5
Relative autonomy index	7.71	2.63	-1.48	4.51	n/a	159	7.57	2.51	-.86	.92	n/a	159	-15-15
Positive affect	4.12	.51	-.43	.24	.86	159	4.09	.46	-.27	.19	.81	159	1-5
Negative affect	1.49	.51	2.19	6.35	.87	159	1.46	.43	1.80	4.70	.81	159	1-5
Physical self-worth	4.49	.98	-.96	1.49	.97	159	4.55	1.01	-.79	.80	.97	159	1-6
Effort/improvement	4.34	.47	-.42	-.58	.83	159	4.36	.45	-.29	-.73	.85	159	1-5
Important role	4.14	.59	-.71	.94	.81	159	4.20	.62	-.58	-.10	.87	159	1-5
Cooperative learning	4.08	.67	-.68	.56	.81	159	4.15	.65	-.59	.15	.84	159	1-5

In this study, it is possible that the assumption of independence of observations is violated, as social relationship and motivational constructs for participants who were part of the same dragon boat team are very likely to be associated, or affected by some team-level factors. While this non-independence cannot be accounted for in the repeated measures MANOVA and ANOVA analyses conducted to test the main hypotheses of the study, part of the mixed effects modeling tests of the additional set of exploratory research questions assessed and accounted for within-team dependence in the analysis. However, using mixed-effects modeling is generally thought to require an absolute minimum of 10 level-1 units (participants) be part of each level-2 unit (team) in the analysis (Hox, 2002). One team in this study had only six participants complete the study, so for the mixed effects modeling analysis, this team was excluded, leaving ten teams and 153 participants. Given the small number of level-2 units (teams) and minimally acceptable number of participants per team in the mixed effects modeling analyses, the power of this test is somewhat compromised. However, given the possibility of non-independence on social and motivational variables within teams, and the lack of existing research accounting for possible clustering on social and motivation variables in physical activity, these analyses served an important purpose as an exploratory analysis to examine whether such clustering occurs and whether it can affect the interpretation of results.

4.4.2 Descriptive Statistics

Means, standard deviations, number of participants with complete data, and scale range are reported for each variable at both time points in Table 4.1. As in Study 1, the composite relative autonomy index (RAI) and positive friendship quality scores were also included. Descriptive statistics were similar to those presented in Study 1 and in previous literature, and were in line with theoretically expected results for a population of adults voluntarily involved in a recreational physical activity. Gender differences in all variables at both time points were

also examined using ANOVAs with a Bonferroni correction, but there were no significant differences ($p < .001$), so the details of these analyses are not reported.

Results of a series of ANOVAs with a Bonferroni correction ($p < .002$) indicated that individualistic and cooperative groups did not differ on any Time 1 variables. Of particular interest in this set of analyses, there were no differences between the groups at Time 1 on any of the social cohesion or mastery motivational climate variables. One purpose of including these variables was to test whether the two groups differed at the beginning of the study on how they saw mastery aspects of their sport environment and social cohesiveness of their teams, as Time 1 differences on these variables could have biased the results of the study.

4.4.3 Scale Reliabilities

Scale reliabilities were calculated using Cronbach's α, and are reported in Table 4.1. All scale reliabilities were acceptable, having an alpha value greater than or equal to .70, except for individual attraction to the group-social at time 1, which had an alpha value of .63. Given that this reliability was above .60 and was consistent with previous research (Carron et al., 2002), no changes were made to this scale to account for this low reliability, but some caution must be taken when interpreting the results of analyses involving this variable.

4.4.4 Correlations

Bivariate correlations were calculated among all variables and are presented in Table 4.2 for Time 1 and Table 4.3 for Time 2. High intercorrelations among the four positive friendship quality subscales ($r = .59$-$.84$) at both time points suggested that it may be feasible to use a single positive friendship quality factor, as these four variables may be essentially capturing one underlying construct of positive friendship quality. Using the composite positive friendship quality score would also minimize colinearity problems when these variables are

Table 4.2: Pearson product-moment correlations among all variables at Time 1

	1	2	3	4	5	6	7	8	9	10
1. Social support network size	-									
2. Social support amount	.37*	-								
3. Self-esteem enhancement and supportiveness	.32*	.43*	-							
4. Loyalty and intimacy	.20*	.42*	.71*	-						
5. Things in common	.10	.36*	.59*	.80*	-					
6. Companionship and pleasant play	.20*	.39*	.67*	.80*	.78*	-				
7. Positive friendship quality	.22*	.45*	.82*	.94*	.90*	.91*	-			
8. Conflict	.04	-.04	.18*	.34*	.30*	.32*	.33*	-		
9. Peer acceptance	.18*	.22*	.24*	.24*	.19*	.21*	.25*	.03	-	
10. Individual attraction to the group-social	.37*	.45*	.44*	.41*	.35*	.39*	.44*	.16	.34*	-
11. Group integration-social	.29*	.15	.08	.15	.12	.18*	.15	.14	.26	.36*
12. Relatedness	.26*	.38*	.48*	.43*	.39*	.44*	.48*	.01	.46*	.54*
13. Competence	.06	.16*	.33*	.30*	.14	.24*	.28*	-.05	.32*	.31*
14. Autonomy	.12	.20*	.18*	.24*	.19*	.13	.21*	.09	.24*	.29*
15. External regulation	.01	.00	-.03	.12	.14*	.05	.08	.26*	-.05	-.02
16. Introjected regulation	.05	.03	.10	.11	.04	-.02	.06	.16	.00	.02
17. Identified regulation	.16	.24*	.34*	.19*	.17*	.19*	.25*	-.05	.10	.30*
18. Intrinsic motivation	.05	.19*	.31*	.13	.09	.15	.18*	-.02	.14	.22*
19. Relative autonomy index	.04	.14	.21*	.01	.01	.10	.08	-.22*	.11	.18*
20. Positive affect	.11	.39*	.46*	.35*	.26*	.30*	.38*	-.08	.25*	.39*
21. Negative affect	.12	.05	.04	.11	.14	.08	.11	.27*	-.02	-.01
22. Physical self-worth	-.01	.06	.06	-.02	.01	.01	.01	-.24*	.29*	.06
23. Effort/improvement	.23*	.39*	.29*	.19*	.10	.17*	.21*	.04	.24*	.44*
24. Important role	.10	.32*	.10	.05	.03	-.01	.05	-.08	.23*	.33*
25. Cooperative learning	.20*	.41*	.22*	.08	.08	.14	.14	-.09	.14	.33*

	11	12	13	14	15	16	17	18	19	20
1. Social support network size										
2. Social support amount										
3. Self-esteem enhancement and supportiveness										
4. Loyalty and intimacy										
5. Things in common										
6. Companionship and pleasant play										
7. Positive friendship quality										
8. Conflict										
9. Peer acceptance										
10. Individual attraction to the group-social										
11. Group integration-social	-									
12. Relatedness	.29*	-								
13. Competence	.04	.48*	-							
14. Autonomy	.10	.35*	.30*	-						
15. External regulation	-.05	-.07	-.15	.03	-					
16. Introjected regulation	-.17*	.07	.00	.02	.22*	-				
17. Identified regulation	-.06	.32*	.16*	.15	-.16*	.30*	-			
18. Intrinsic motivation	-.02	.34*	.13	.14	-.31*	.12	.60*	-		
19. Relative autonomy index	.07	.24*	.18*	.08	-.77	-.38*	.50*	.72*	-	
20. Positive affect	-.02	.43*	.37*	.15	-.06	.24*	.48*	.49*	.28*	-
21. Negative affect	-.05	-.13	-.18*	-.03	.47*	.36*	.07	-.07	-.39*	.14
22. Physical self-worth	-.03	.14	.40*	.18*	-.15	-.17*	.11	.08	.21*	.13
23. Effort/improvement	.15	.31*	.18*	.24*	-.21*	.05	.28*	.30*	.30*	.32*
24. Important role	.11	.28*	.13	.23*	-.19*	.01	.20*	.25*	.26*	.27*
25. Cooperative learning	.13	.38*	.14	.21*	-.24*	-.06	.24*	.33*	.35*	.23*

	21	22	23	24	25
1. Social support network size					
2. Social support amount					
3. Self-esteem enhancement and supportiveness					
4. Loyalty and intimacy					
5. Things in common					
6. Companionship and pleasant play					
7. Positive friendship quality					
8. Conflict					
9. Peer acceptance					
10. Individual attraction to the group-social					
11. Group integration-social					
12. Relatedness					
13. Competence					
14. Autonomy					
15. External regulation					
16. Introjected regulation					
17. Identified regulation					
18. Intrinsic motivation					
19. Relative autonomy index					
20. Positive affect					
21. Negative affect	-				
22. Physical self-worth	-.18*	-			
23. Effort/improvement	-.02	.16*	-		
24. Important role	-.12	.13	.64*	-	
25. Cooperative learning	-.08	.11	.68*	.63*	-

Table 4.3: Pearson product-moment correlations among all variables at Time 2

	1	2	3	4	5	6	7	8	9	10
1. Social support network size	-									
2. Social support amount	.41*	-								
3. Self-esteem enhancement and supportiveness	.22*	.54*	-							
4. Loyalty and intimacy	.11	.43*	.74*	-						
5. Things in common	.06	.44*	.66*	.79*	-					
6. Companionship and pleasant play	.18*	.47*	.74*	.84*	.80*	-				
7. Positive friendship quality	.15	.51*	.86*	.94*	.90*	.93*	-			
8. Conflict	-.07	.10	.04	.30*	.26*	.23*	.24*	-		
9. Peer acceptance	.18*	.33*	.43*	.43*	.32*	.39*	.45*	.12	-	
10. Individual attraction to the group-social	.22*	.37*	.33*	.35*	.26*	.39*	.36*	.14	.25*	-
11. Group integration-social	.06	.08	.09	.10	.02	.13	.09	-.03	.20*	.43*
12. Relatedness	.23*	.43*	.48*	.41*	.37*	.43*	.46*	.05	.37*	.53*
13. Competence	.10	.15*	.31*	.28*	.19*	.27*	.28*	-.04	.37*	.18*
14. Autonomy	.15	.24*	.18*	.24*	.18*	.16*	.21*	-.02	.25*	.21*
15. External regulation	-.09	.11	.00	.01	.03	.05	.06	.14	-.02	-.04
16. Introjected regulation	.03	.29*	.19*	.13	.18*	.14	.18*	.25*	.13	.14
17. Identified regulation	.10	.36*	.41*	.32*	.32*	.37*	.38*	.11	.20*	.27*
18. Intrinsic motivation	.16*	.31*	.40*	.35*	.34*	.41*	.40*	.01	.27*	.23*
19. Relative autonomy index	.13	.08	.23*	.21*	.16*	.22*	.21*	-.13	.14	.15
20. Positive affect	.14	.50*	.50*	.41*	.43*	.49*	.50*	.05	.32*	.38*
21. Negative affect	.03	.22*	.03	-.03	.06	.02	.02	.17*	.04	.05
22. Physical self-worth	.01	.01	.10	.01	.01	.06	.05	-.19*	.29*	.01
23. Effort/improvement	.24*	.37*	.34*	.22*	.15	.30*	.28*	.05	.26*	.34*
24. Important role	.20*	.31*	.33*	.23*	.15	.18*	.25*	-.01	.26*	.24*
25. Cooperative learning	.28*	.48*	.33*	.19*	.09	.25*	.24*	-.07	.24*	.39*

	11	12	13	14	15	16	17	18	19	20
1. Social support network size										
2. Social support amount										
3. Self-esteem enhancement and supportiveness										
4. Loyalty and intimacy										
5. Things in common										
6. Companionship and pleasant play										
7. Positive friendship quality										
8. Conflict										
9. Peer acceptance										
10. Individual attraction to the group-social										
11. Group integration-social	-									
12. Relatedness	.40*	-								
13. Competence	.05	.35*	-							
14. Autonomy	.09	.34*	.29*	-						
15. External regulation	-.09	-.06	-.17*	.02	-					
16. Introjected regulation	-.04	.13	-.02	.04	.32	-				
17. Identified regulation	.10	.43*	.36*	.15	-.04	.37*	-			
18. Intrinsic motivation	.23*	.43*	.31*	.23*	-.23*	.21*	.63*	-		
19. Relative autonomy index	.19*	.31*	.35*	.13	-.76*	-.36*	.47*	.69*	-	
20. Positive affect	.11	.48*	.40*	.29*	-.13	.28*	.50*	.55*	.36*	-
21. Negative affect	-.10	.06	-.23*	.05	.25*	.39*	.05	-.05	-.29*	.20*
22. Physical self-worth	.03	.13	.38*	.19*	-.07	-.12	.07	.09*	.15	.16*
23. Effort/improvement	.20*	.39*	.28*	.26*	.01	.16*	.40*	.39*	.24*	.39*
24. Important role	.16	.36*	.33*	.28*	.04	.18*	.32*	.33*	.16*	.38*
25. Cooperative learning	.13	.44*	.22*	.31*	.11	.12	.37*	.39*	.19*	.39*

	21	22	23	24	25
1. Social support network size					
2. Social support amount					
3. Self-esteem enhancement and supportiveness					
4. Loyalty and intimacy					
5. Things in common					
6. Companionship and pleasant play					
7. Positive friendship quality					
8. Conflict					
9. Peer acceptance					
10. Individual attraction to the group-social					
11. Group integration-social					
12. Relatedness					
13. Competence					
14. Autonomy					
15. External regulation					
16. Introjected regulation					
17. Identified regulation					
18. Intrinsic motivation					
19. Relative autonomy index					
20. Positive affect					
21. Negative affect	-				
22. Physical self-worth	.20*	-			
23. Effort/improvement	.03	.16*	-		
24. Important role	.05	.20*	.69*	-	
25. Cooperative learning	.08	.18*	.71*	.69*	-

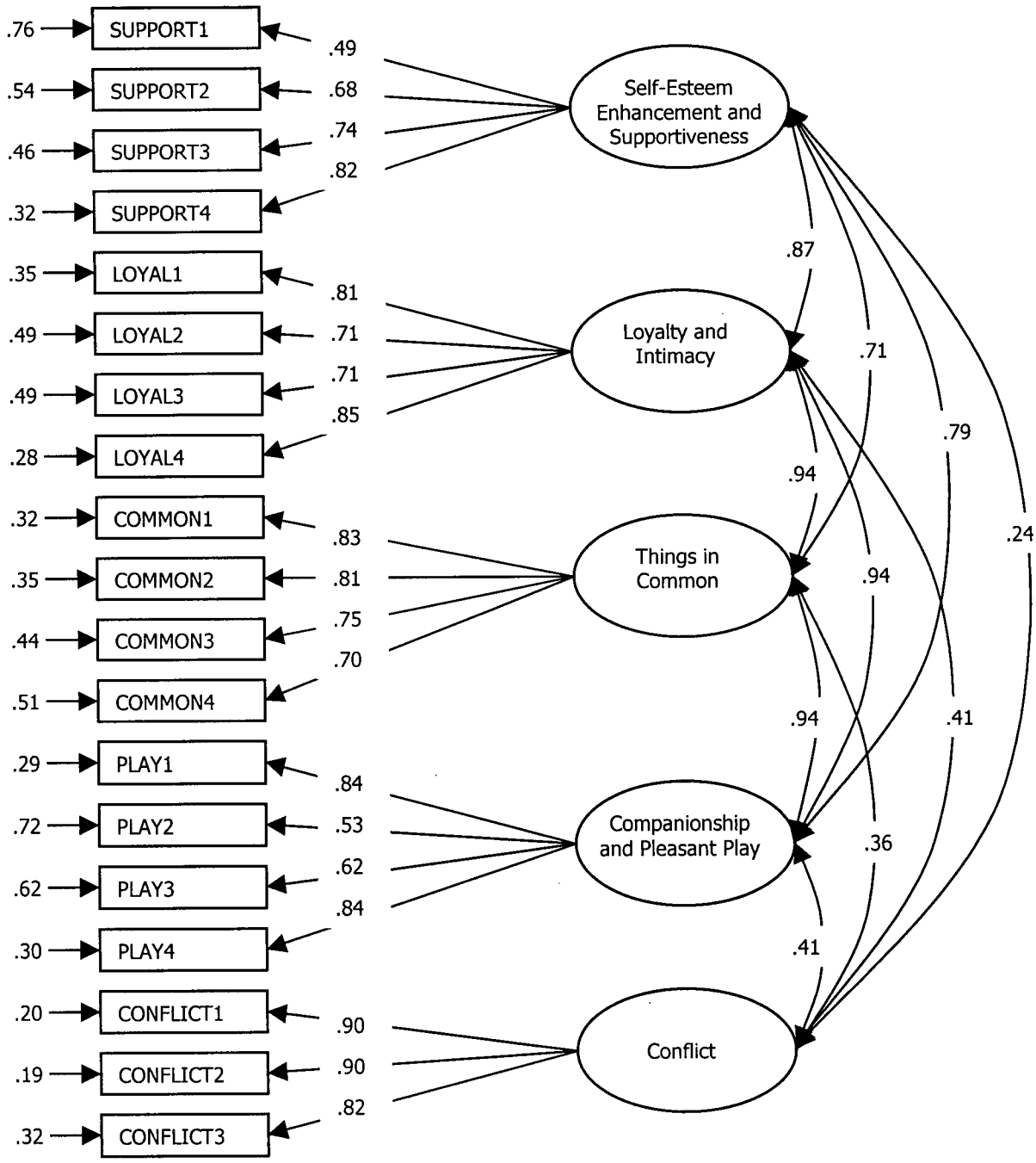
considered together in a multivariate analysis (Tabachnick & Fidell, 2001). Moderate correlations were found among the social relationship factors (social support network size, amount of support, friendship qualities, peer acceptance, and the two social cohesion factors) at both time points. This moderate association suggested that these constructs are related, yet distinct aspects of social relationships in dragon boat, supporting the inclusion of all of these variables in this investigation on social relationships.

Autonomy, competence, and relatedness were moderately correlated (r = .29-.48), suggesting that they are distinct constructs. As in Study 1, correlations among the four types of motivation supported the simplex structure of the BREQ, as each type of motivation was more positively correlated with motivation types that lie closer to it on the motivational continuum than those that are farther away. Finally, the two social cohesion factors were only moderately correlated (r = .36-.43), suggesting that they should be considered as separate variables rather than amalgamated into one composite index of social cohesion (Carron et al., 2002). Overall, the results of the correlation analysis were in line with theoretically predicted relationships.

4.4.5 Confirmatory Factor Analysis of the Sport Friendship Quality Scale

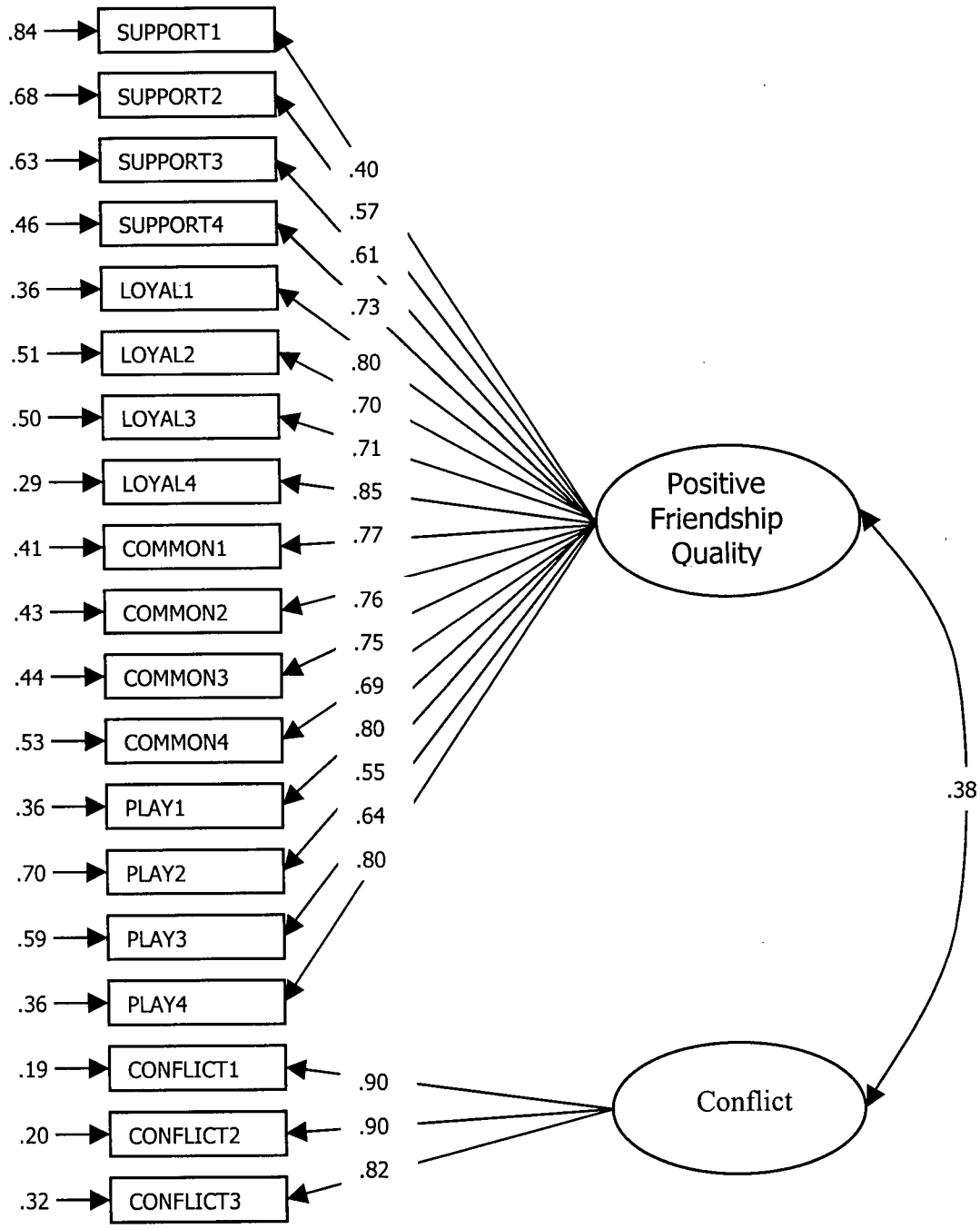
The two options for the factor structure of the SFQS used in Study 1 were tested using the Time 1 data from Study 2. The original five-factor model with self-esteem enhancement and supportiveness, loyalty and intimacy, things in common, companionship and pleasant play, and conflict was tested first and resulted the best, although still poor, fit of the two models, RMSEA = .12, CFI = .87, SRMR = .08 (see Figure 4.1). There were numerous large (>2.58) residuals, but they were not concentrated in a particular subscale, suggesting that there was misfit throughout the entire scale. These fit statistics were a slight improvement over those found in Study 1, but the fit was still poor. Given that none of the various alternative models tested in the (see Figure 4.2), as that solution proved useful, if not an improvement in fit, in

Figure 4.1: Standardized solution for the confirmatory factor analysis of the five-factor model of sport friendship quality (n = 151)



Note: RMSEA = .12, CFI = .87, SRMR = .08; Solid lines indicate significant relationships

Figure 4.2: Standardized solution of the confirmatory factor analysis of the two-factor model of sport friendship quality (n = 151)



Note: RMSEA = .14, CFI = .84, SRMR = .08; Solid lines indicate significant relationships

Study 1, and the inter-factor correlations among the positive friendship qualities in the first model were very high (r = .71-.94), again suggesting that using separate factors for friendship quality may lead to multicolinearity problems in a multivariate analysis (Tabachnick & Fidell, 2001). The fit of this two-factor model was poor, RMSEA = .14, CFI = .84, SRMR = .08, but again it was a slightly better fit than the parallel model test in Study 1.

4.4.6 Manipulation Check and Assessment of Implementation Integrity

The purpose of collecting information on mastery motivational climate perceptions was to provide supporting information regarding whether the intervention affected motivational climate in expected ways, which could provide valuable information relevant to the interpretation of the results of the hypotheses tests. It was expected that both intervention groups would experience an increase in effort/improvement and important role perceptions, but that the cooperative learning group would experience larger increases in cooperative learning perceptions than would the individualistic group. Because the purpose of this analysis was to test changes in the three mastery climate variables as separate constructs, and different patterns of results were expected for the different variables, three separate repeated measures ANOVAs with intervention type as the between-subjects factor were conducted. Bonferroni corrections were not used with the ANOVAs for this analysis as it was considered more important to avoid type II than type I errors.

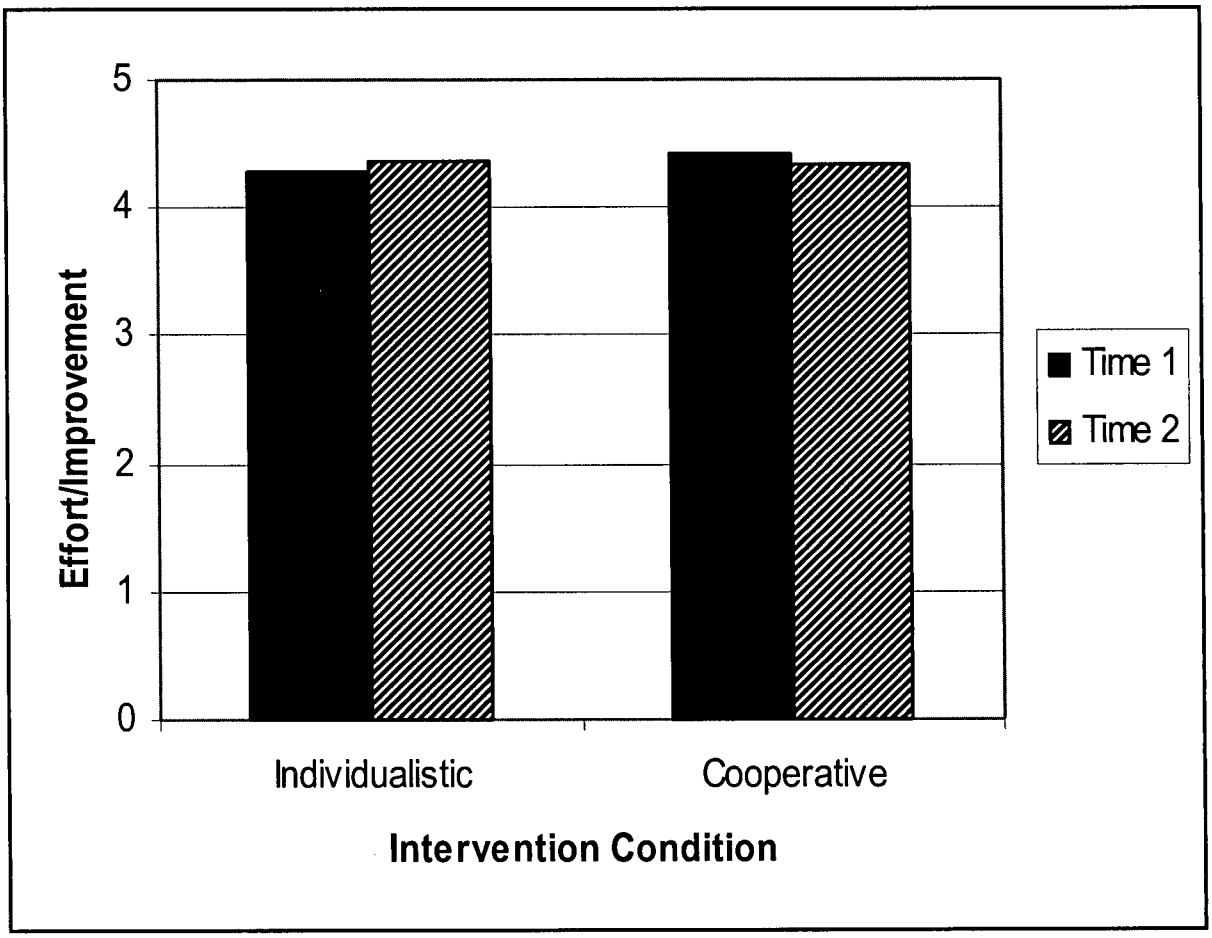
As can be seen in Table 4.4, no effects were found for time, but there were significant time × group interactions for effort/improvement and important role. Follow-up simple main effects tests examined whether significant changes were experienced in each group on each of these two variables. The results of these tests are found in Figure 4.3 and 4.4. No significant simple main effects were found for effort/improvement, but there was a small increase in

Table 4.4: Repeated measures ANOVAs with intervention group as the between-subjects factor testing differences in mastery climate perceptions

Source	*df*	*F*	partial η^2	*p*
Time				
Effort/improvement	1,157	.02	.00	.889
Important role	1,157	1.48	.01	.225
Cooperative learning	1,157	1.43	.01	.234
Time × group				
Effort/improvement	1,157	5.42	.03	.021*
Important role	1,157	6.50	.04	.012*
Cooperative learning	1,157	.79	.01	.374

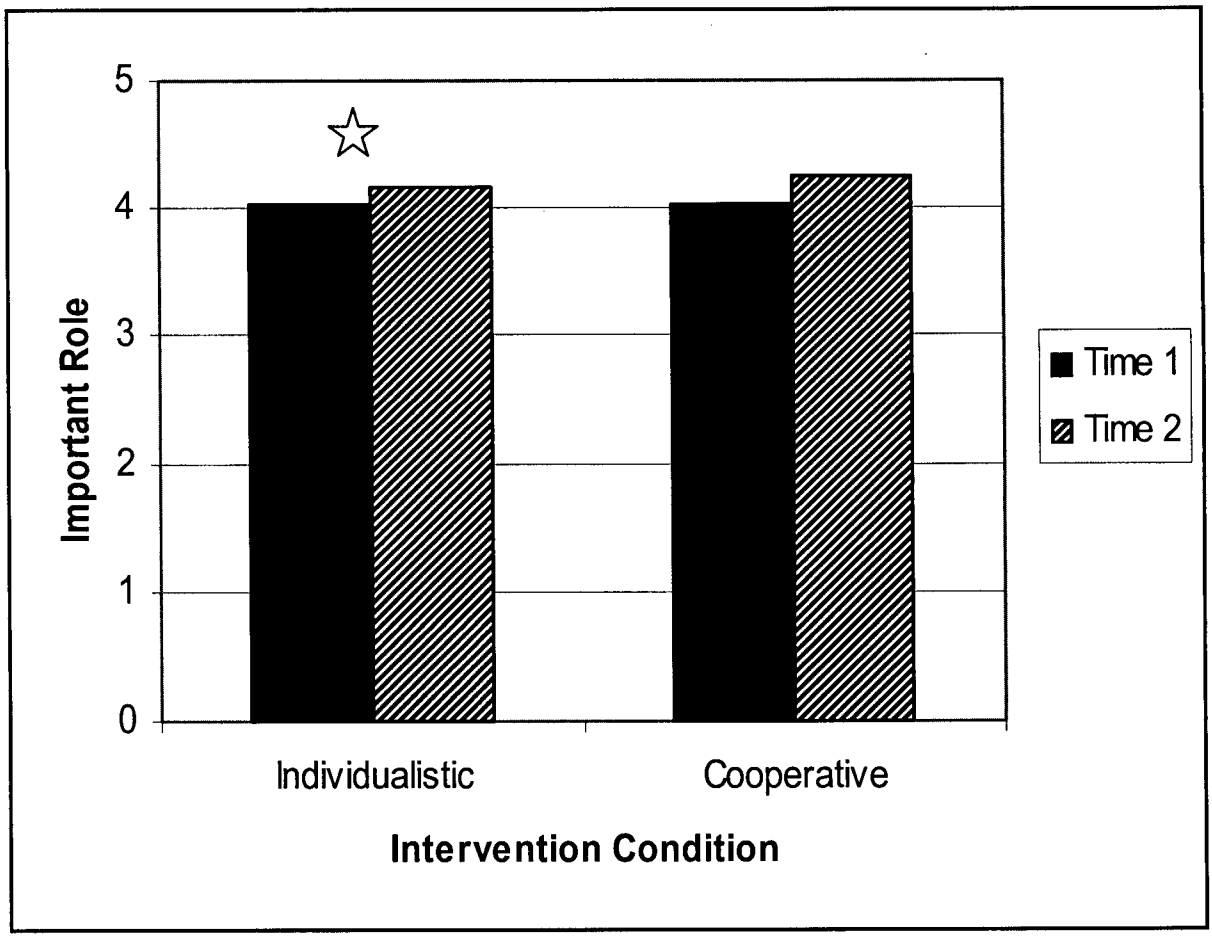
* $p < .05$

Figure 4.3: Simple main effects test for effort/improvement



☆ $p < .05$

Figure 4.4: Simple main effects test for important role



☆ $p < .05$

perceptions of having an important role on the team among individualistic group participants, (M_{t1} = 4.02, SD_{t1} = .62; M_{t2} = 4.17, SD_{t2} = .63), $F(1,91) = 7.63$, $p = .007$, partial $\eta^2 = .08$. These results provided only weak support the effectiveness of the intervention in changing the motivational climate, but given that the focus of the study was to examine whether the intervention changed specific social relationship and motivation variables, the analyses proceeded to test the study hypotheses even though there was little evidence of motivational climate change in response to the intervention.

Other measures assessing the efficacy of the interventions and implementation integrity were used, including the coach logs, training session evaluations, coach phone call notes, and feedback questionnaires from participants and coaches (see Appendices J-Q). These measures were specifically designed for this study, and so have no psychometric evidence, but they do provide some insight into the integrity of the interventions and their implementation. Coaches reported feeling highly efficacious about their ability to deliver the intervention to their team following the training session (M = 22.72, SD = 2.49 out of 25.00), completed an average of 87% of the prescribed intervention activities over the eight weeks, and generally rated the intervention as helpful for their teams. On average, paddlers recalled doing approximately 82% of the intervention activities, tended to be moderately to highly involved or engaged in the activities (M = 3.00, SD = 1.23 out of 5.00), and viewed them as having moderate benefit (M = 2.75, SD = 1.15 out of 5.00) for their team. Generally, these results support a fairly effective implementation of the program, suggesting that any lack of effect of the intervention is likely attributable to the program design or its length rather than the effectiveness of coaches in delivering the intervention as requested.

4.4.7 Tests of Intervention Condition Differences over Time

To test the hypotheses that both intervention groups would increase in self-determined motivation and positive affective outcomes, but that the cooperative learning group would improve their social relationship perceptions (i.e., peer acceptance, social support network size, amount of social support, and friendship quality) more than the individualistic group over the course of the intervention, a series of 2×2 repeated measures MANOVAs with intervention type as a between-subjects factor and time as a within-subjects factor were run. Follow-up univariate ANOVAs were conducted to identify the individual variables contributing to the multivariate relationship, and simple main effects tests in the case of a time×intervention condition effect. Four sets of these analyses were conducted, one for each level of the conceptual model of SDT (see Figure 2.1). This strategy made it possible to test whether the intervention affected social relationships, psychological need fulfillment, motivation, and affective outcomes generally, and the effects on the individual variables.

The first set of analyses was a 2×2 repeated measures MANOVA with five social relationship factors as dependent variables: social support network size, amount of social support, positive friendship quality, conflict, and peer acceptance. The composite friendship quality score was used in place of the four separate friendship quality variables because the ability of MANOVA to detect group differences is compromised when the dependent variables are highly correlated ($r > |.6|$; Tabachnick & Fidell, 2001), as is the case with the four separate positive friendship quality variables in this study. Results of the multivariate and follow-up univariate analyses are found in Table 4.5. Wilks' lambda showed a significant multivariate effect for time, $F(5, 116) = 2.49$, $p = .035$, partial $\eta^2 = .10$, but no time by intervention type interaction, , $F(5, 116) = 1.60$, $p = .163$, partial $\eta^2 = .07$.

Table 4.5: Repeated measures multivariate and univariate tests of differences in social relationship variables over the course of an 8-week cooperative or individualistic learning intervention

Source	*df*	*F*	partial η^2	*p*
Multivariate Test				
Between subjects				
Group	5,116	.54	.02	.743
Within subjects				
Time	5,116	2.49	.10	.035*
Time × group	5,116	1.61	.07	.163
Univariate Tests				
Time				
Social support network size	1,120	4.75	.04	.031
Amount of social support	1,120	.06	.00	.813
Positive friendship quality	1,120	.08	.00	.784
Conflict	1,120	.28	.00	.599
Peer acceptance	1,120	7.26	.06	.008**

* $p < .05$, significance level for the multivariate test

** $p < .01$, Bonferroni corrected significance level for the univariate tests

Follow-up univariate ANOVAs with a Bonferroni correction ($p < .01$) examining the time effects for each of the five social relationships variables found that there was a small but significant effect for time for peer acceptance, $F(1, 120) = 7.26$, $p = .008$, partial $\eta^2 = .06$, with peer acceptance increasing in the sample as a whole from a mean of 3.14 at Time 1 ($SD = .57$) to a mean of 3.25 at Time 2 ($SD = .53$). There was also a trend of decreasing social support network size over time in both groups that was non-significant using the Bonferroni-corrected significance level of $p < .01$, but would have been considered significant with the less conservative $p < .05$, $F(1,120) = 4.75$, $p = .03$, partial $\eta^2 = .04$.

This negative change in social support network size may have been affected by the fact that the social support questionnaire became increasingly labour-intensive the more people a participant identified as part of their social network. Once they had experience completing it at Time 1, it is possible that some participants chose not to be as extensive in identifying people in their social support network at Time 2, as they knew that it would lead to spending more time on the questionnaire. Conversely, it may have been that social support network size did decrease over time. As can be seen by the effect size (partial $\eta^2 = .04$), this change was very small, or even non-significant based on the significance criteria chosen, and therefore is not considered a substantial effect of the intervention. Overall, there was a small positive change in social relationships over the course of the study, resulting from an increase in mean peer acceptance perceptions, but there was no effect of the intervention type on changes in social relationships.

The second set of analyses (see Table 4.6) used a 2×2 repeated measures MANOVA with autonomy, competence, and relatedness as dependent variables to examine whether the intervention affected perceptions of psychological need fulfillment in dragon boat. Wilks' lambda criterion found small but significant effects for time, $F(3, 153) = 3.00$, $p = .032$, partial

Table 4.6: Repeated measures multivariate and univariate tests of differences in psychological need satisfaction variables over the course of an 8-week cooperative or individualistic learning intervention

Source	*df*	*F*	partial η^2	*p*
Multivariate Test				
Between subjects				
Group	3, 153	.39	.01	.764
Within subjects				
Time	3, 153	3.00	.06	.032*
Time × group	3, 153	3.15	.06	.027*
Univariate Tests				
Time				
Autonomy	1,155	5.91	.04	.016
Competence	1,155	.03	.00	.870
Relatedness	1,155	1.78	.01	.184
Time × group				
Autonomy	1,155	8.01	.05	.005**
Competence	1,155	.54	.00	.465
Relatedness	1,155	.06	.00	.807

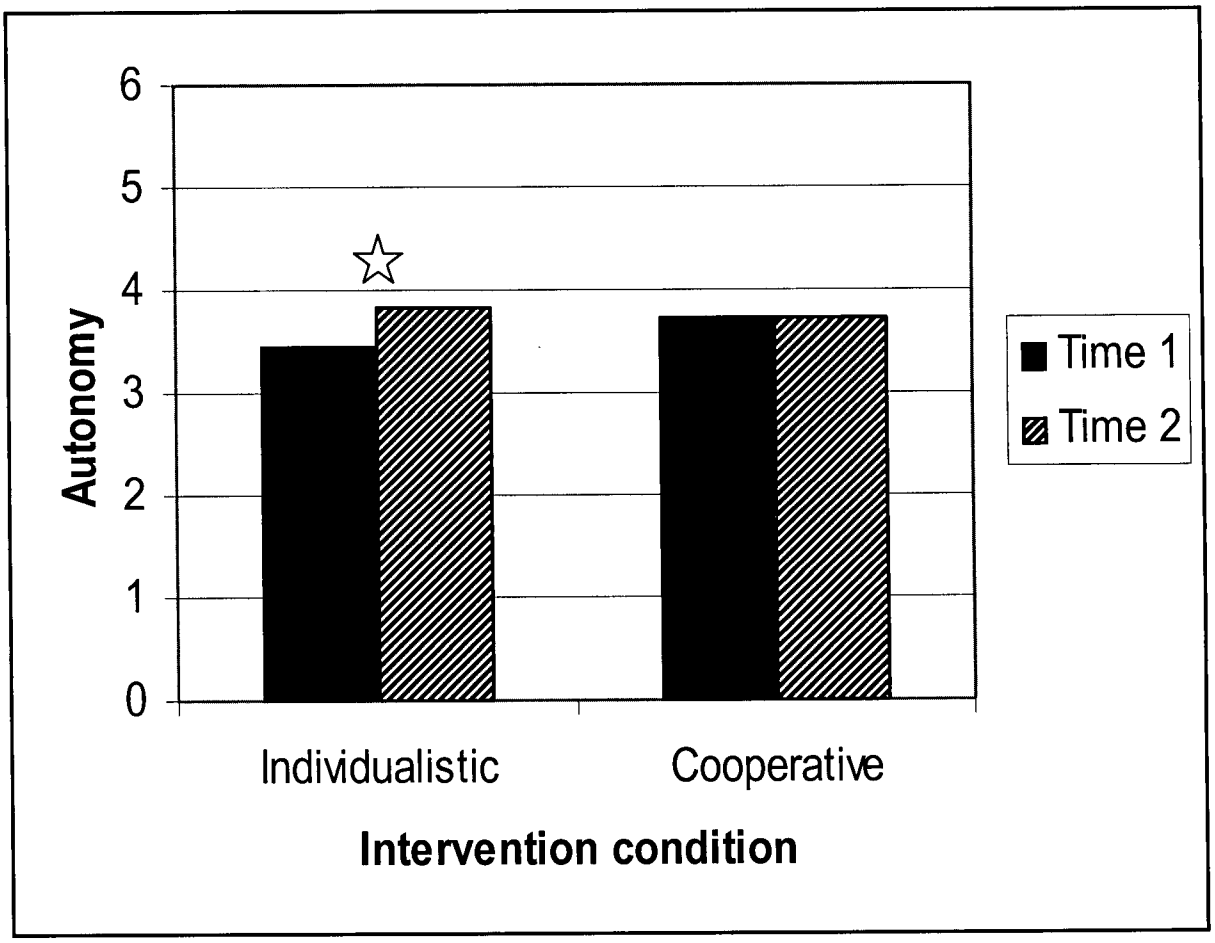
* $p < .05$, significance level for the multivariate test

** $p < .008$, Bonferroni corrected significance level for the univariate tests

Table 4.7: Simple main effects results for the decomposition of the time × group interaction for autonomy

Group	**Time**	***M***	***SE***	***M* difference**	***SE***	***df***	***F***	***p***
Individualistic	1	3.46	.12	.36	.09	1,155	16.47	<.001
	2	3.82	.12					
Cooperative	1	3.73	.15	-.03	.10	1,155	.07	.794
	2	3.71	.14					

Figure 4.5: Graph of the simple main effects results for the time × group interaction for autonomy



☆ $p < .025$, Bonferroni corrected significance level

$\eta^2 = .06$, and the time by intervention type interaction, $F(3, 153) = 3.15, p = .027$, partial $\eta^2 = .06$. Follow-up repeated measures ANOVAs with a Bonferroni correction ($p < .002$) examining the time and time × group effects for each of the three psychological needs found that none of autonomy, competence, or relatedness demonstrated a significant univariate time effect, and only autonomy had a significant time × group interaction (see Table 4.7 and Figure 4.5). The time effect for autonomy was close to being significant, $F(1, 151) = 5.91, p = .016$, partial $\eta^2 = .04$, and would have been considered so with a more liberal $p < .05$ criterion. The very small effect size suggests that this effect is not practically significant, and that even if a more liberal statistical significance criteria were used to find this effect significant, it would not be interpreted as being a substantial effect of the intervention. It is likely that autonomy played a role in the multivariate time effect on psychological needs, but based on the significance criteria chosen, no individual univariate effects for time were identified. The time × group interaction effect was small but significant for autonomy, $F(1, 151) = 8.01, p = .005$, partial $\eta^2 = .05$, suggesting that the intervention condition experienced by participants had a slight effect on the degree of change in autonomy they experienced over the course of the intervention. Simple main effects were examined to decompose the interaction effects. These results are presented in Table 4.7 and Figure 4.5. The individualistic group increased on autonomy ($M_{t1} = 3.46$, $SD_{t1} = 1.23$; $M_{t2} = 3.82$, $SD_{t2} = 1.18$), $F(1, 90) = 15.41, p < .001$, partial $\eta^2 = .15$, while the cooperative group did not change significantly, ($M_{t1} = 3.73$, $SD_{t1} = 1.13$; $M_{t2} = 3.71$, $SD_{t2} = 1.07$), $F(1, 65) = .08, p = .784$, partial $\eta^2 = .00$. Therefore, contrary to the hypotheses, autonomy increased in the individualistic group, but not in the cooperative group throughout the 8-week intervention.

The third set of analyses (see Table 4.8) used a 2×2 repeated measures ANOVA with the relative autonomy index (RAI) as the dependent variable to examine whether the

Table 4.8: Repeated measures ANOVA testing the differences in the relative autonomy index (RAI) over the course of an 8-week cooperative or individualistic learning intervention

Source	***df***	***F***	**partial η^2**	**p**
Between subjects				
Group	1,157	.49	.00	.487
Within subjects				
Time	1, 157	1.75	.01	.187
Time × group	1, 157	9.66	.06	.002*

* $p < .05$

intervention affected perceptions of psychological need fulfillment in dragon boat. The only significant effect was for the time by intervention type interaction, $F(1, 157) = 9.66, p = .002$, partial $\eta^2 = .06$. Simple main effects were examined to decompose the interaction effects. These results are presented in Table 4.9 and Figure 4.6.

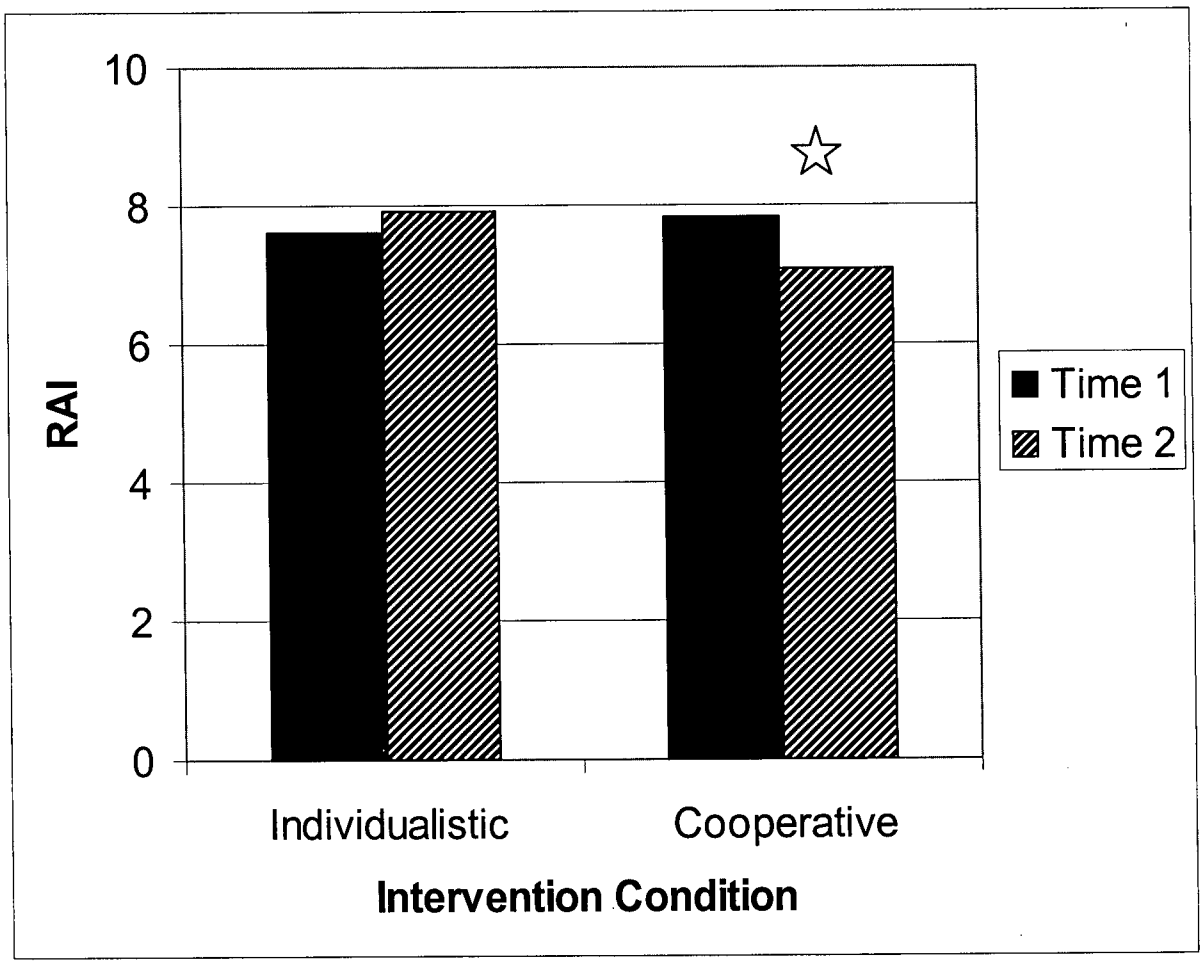
The individualistic group did not change in self-determined motivation ($M_{t1} = 7.60$, $SD_{t1} = 2.73$; $M_{t2} = 7.90$, $SD_{t2} = 2.17$), $F(1, 91) = 1.69, p = .163$, partial $\eta^2 = .02$, while the cooperative group decreased significantly, ($M_{t1} = 7.86$, $SD_{t1} = 2.49$; $M_{t2} = 7.11$, $SD_{t2} = 2.51$), $F(1, 66) = 8.01, p = .006$, partial $\eta^2 = .11$. This result was surprising, as it ran counter to the expectations of the cooperative learning condition. It was expected that both intervention conditions would result in increased self-determined motivation. While the null finding seen with the individualistic group may indicate that the intervention was not substantial enough to cause change, the finding that the cooperative intervention may have actually undermined self-determined motivation in this instance required further investigation.

Table 4.9: Simple main effects results for the decomposition of the time × group interaction for the relative autonomy index

Group	**Time**	***M***	***SE***	***M* difference**	***SE***	***df***	***F***	***p***
Individualistic	1	7.62	.28	.29	.22	1,155	1.69	.195
	2	7.91	.26					
Cooperative	1	7.83	.33	-.75	.26	1,155	8.11	.005*
	2	7.09	.31					

$p < .025$

Figure 4.6: Graph of the simple main effects results for the time × group interaction for the relative autonomy index (RAI)



☆ $p < .025$, Bonferroni corrected significance level

It was of considerable interest to investigate how each of the four types of motivation on the self-determination continuum were affected by the intervention. Although the RAI provides a convenient summary index that allows an examination of the construct of self-determination, this analysis does not provide information regarding whether external or introjected regulation increased, or identified regulation or intrinsic motivation decreased to cause a net decrease in the relative autonomy index in the cooperative intervention group. To examine these questions, a 2×2 repeated measures MANOVA with external, introjected, and identified regulation and intrinsic motivation as dependent variables was run (see Table 4.10). The only significant multivariate effect was the time × group interaction, $F(4, 154) = 2.80$, $p = .028$, partial $\eta^2 = .07$. Follow-up repeated measures ANOVAs with a Bonferroni correction ($p < .013$) examining the time and time × group effects for each of the types of motivation found that none of the univariate time × group effects were significant at $p < .013$. However, both external and identified regulation would have been significant at $p < .05$, suggesting that the decline in RAI in the cooperative group is likely due to changes in more than one type of motivation on the continuum, and that there are very likely issues of lack of power in detecting differences when multiple significance tests are performed in this study with its relatively small sample. The very small effect sizes again suggest, however, that any effect of the intervention on these variables is not substantial. The only strong conclusion that can be drawn from these tests is that self-determined motivation decreased in the cooperative group, but increased in the individualistic group, consistent with hypotheses for the individualistic group, but counter to those for the cooperative group.

Table 4.10: Repeated measures multivariate and univariate tests of differences in the four types of motivation over the course of an 8-week cooperative or individualistic learning intervention

Source	*df*	*F*	partial η^2	*p*
Multivariate Test				
Between subjects				
Group	4, 154	1.17	.03	.325
Within subjects				
Time	4, 154	1.73	.04	.147
Time × group	4, 154	2.80	.07	.028*
Univariate Tests				
Time × group				
External regulation	1,157	4.98	.03	.027
Introjected regulation	1,157	.68	.00	.411
Identified regulation	1,157	4.64	.03	.033
Intrinsic motivation	1,157	2.97	.02	.087

* $p < .05$, significance level for the multivariate test

** $p < .013$, Bonferroni corrected significance level for the univariate tests

Finally, a 2×2 repeated measures MANOVA was run with positive affect, negative affect, and physical self-worth as dependent variables to examine whether the intervention influenced affective experiences. The results of this analysis are presented in Table 4.11, but there were no significant multivariate effects, and therefore no follow- up univariate analyses were performed. Contrary to the study hypotheses, neither intervention lead to improved affective experiences in dragon boat for participants.

Table 4.11: Repeated measures MANOVA with positive affect, negative affect, and physical self-worth as dependent variables over an 8-week cooperative or individualistic learning intervention

Source	*df*	*F*	partial η^2	*p*
Multivariate Test				
Between subjects				
Group	3, 155	.48	.01	.697
Within subjects				
Time	3, 155	1.16	.02	.326
Time × group	3, 155	.69	.01	.559

* $p < .05$

4.4.8 Mixed Effects Modeling Test of the Association Between Changes in Relatedness and Changes in Self-Determined Motivation

4.4.8.1 Calculation of Change Scores

To examine the relationship between change in relatedness, and change in self-determined motivation (measured using the RAI), change scores in these variables were first calculated. To decide between the use of simple difference scores and residualized difference scores, Williams' and Zimmerman's (1983) decision rule was used. According to this rule, the simple difference score is used only if $\rho(X_1,X_2) > \sigma_{x1}/\sigma_{x2}$. The calculations for this decision rule can be found in Table 4.12. The results of this analysis suggest that in both cases residualized difference scores are most appropriate as they will maximize the reliability of the change score variable (Zumbo, 1999).

Residualized difference scores were calculated by running a regression with the Time 1 variable as the predictor and the Time 2 variable as the dependent variable, and saving the unstandardized residuals as a new variable, the residualized difference score. These change scores are identified as the variable name with a delta symbol as a prefix (e.g., Δrelatedness). Descriptive statistics, skew, kurtosis, and the correlation between the change scores are reported in Table 4.13. A summary examination of the standard deviations demonstrates that the change score variables have substantial variance, suggesting that attempts to account for the variance in change in these variables are appropriate. The change score variables also have acceptable skew values. Although kurtosis is above 2 for Δrelatedness and ΔRAI, the analyses are somewhat robust to elevated kurtosis, so are expected to be unbiased (Miles & Shevlin, 2001). Box plots for these two variables were created to look for univariate outliers. On both plots there were a few individuals just outside of the whiskers of the plots, but still within the

Table 4.12: Change score decision rule calculations for relatedness and the RAI

	$\rho(X_1,X_2)$	σ_{x1}	σ_{x2}	**Use simple difference score if $\rho(X_1,X_2) > \sigma_{x1}/\sigma_{x2}$**	**Change score decision**
Relatedness	.65	.68	.80	.65 < .85	Residualized difference score
SDI	.64	2.63	2.51	.64 < 1.05	Residualized difference score

Table 4.13: Correlation, descriptive statistics, skew, and kurtosis for residualized change score variables

	ΔRelatedness	**ΔRAI**
ΔRelatedness	-	
ΔRAI	.33*	-
M	.00	.00
SD	.61	1.94
Skew	-1.33	-.77
Kurtosis	4.05	2.68

* $p < .05$

expected range of values. Scatter plots of the relationships were also examined for linearity, and visual inspection suggested that fitting a linear relationship was appropriate.

4.4.8.2 Mixed Effects Modeling

It would have been preferable to conduct the mixed effects modeling analysis with Δautonomy, Δcompetence, and Δrelatedness as three independent level-1 variables and intervention group as a level-2 independent variable predicting ΔRAI. However, given the limited sample size, power limitations would have been an issue, and preliminary attempts to generate a solution for this relatively complex model would not converge. The decision to focus on Δrelatedness was therefore supported as the best practical option, as understanding the relationship between relatedness and self-determined motivation was the focal point of the thesis. The exclusion of Δautonomy and Δcompetence limits the conclusions drawn from the analysis to discuss the role of Δrelatedness only, without controlling for Δautonomy and Δcompetence, but the results can still provide valuable information regarding within-team clustering, associations between Δrelatedness and ΔRAI, rather than simple correlations between these variables at a single time point, and an analysis of whether the intervention type influenced the relationship between Δrelatedness and ΔRAI.

Unconditional model: An unconditional model with only an intercept and an error term predicting ΔRAI was run as a baseline model using SPSS 12.0 MIXED procedure to check if there was substantial clustering within teams. The equations for this model using both the multi-level approach (Bryk & Raudenbush, 1987) and the combined equation fit by SPSS are as follows:

Level 1: $\Delta RAI_{ij} = \beta_{0j} + r_{ij}$ where $r_{ij} \sim N(0, \sigma^2)$
Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$ where $u_{0j} \sim N(0, \tau_{00})$

Combined equation: $\Delta RAI_{ij} = \gamma_{00} + u_{0j} + r_{ij}$

The level 2 intercept estimate for this model was not significantly different from zero, $\gamma_{00} = .01$, $F(1,9.47) = .00$, $p = .97$, suggesting that the overall mean of ΔRAI is not significantly different from 0. This is not surprising or particularly meaningful, given that ΔRAI are residualized difference scores, and are therefore necessarily centered around zero. The degree of team clustering ΔRAI was assessed by calculating the intraclass correlation coefficient using the following formula:

$$\rho = \tau_{00}/[\ \tau_{00} + \mathrm{var}(\varepsilon_{ij})] = .87/[.87 + 3.02] = .22$$

While there is no significance test for the intraclass correlation, this value was considered large from the perspective of how an intraclass correlation of this size could affect the alpha coefficient used in significance tests of the regression model. An intraclass correlation as small as .01-.05 is regarded as substantial enough to inflate alpha levels (J. Cohen et al., 2003), so the value of .22 suggested that there was substantial within-group clustering, which supported the use of mixed effects modeling with this data.

Conditional model: Change in relatedness as a level-1 predictor: A conditional model adding the level-1 predictor of Δrelatedness was run to examine whether changes in relatedness predicted ΔRAI. The level 1 and 2 equations and the combined equation for this model are as follows:

Level 1: $\Delta\mathrm{RAI}_{ij} = \beta_{0j} + \beta_{1j}\Delta\mathrm{relatedness}_{ij} + r_{ij}$ where $r_{ij} \sim N(0, \sigma^2)$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$ where $\begin{vmatrix} u_{0j} \\ u_{1j} \end{vmatrix} \sim N \begin{vmatrix} 0 \\ 0 \end{vmatrix} \begin{vmatrix} \tau_{00} & \tau_{01} \\ \tau_{10} & \tau_{11} \end{vmatrix}$

$B_{1j} = \gamma_{10} + u_{1j}$

Combined equation: $\Delta\mathrm{RAI}_{ij} = \gamma_{00} + \gamma_{01}\Delta\mathrm{relatedness}_{ij} + u_{0j} + u_{1j}\,\Delta\mathrm{relatedness}_{ij} + r_{ij}$

The estimate for Δrelatedness was significant, 1.08, $F(1,11.39) = 11.39$, $p = .01$, suggesting that changes in relatedness predicted changes in self-determined motivation, and that for every unit increase in change in relatedness, there was, on average, a 1.08 unit increase

in change in self-determined motivation. All of the other estimated parameters other than the model residual were not significant, suggesting that there was no between-team variability in intercepts ($\tau_{00} = .58, p = .11$) or slopes ($\tau_{11} = .49, p = .26$), and there was no relationship between slope and intercept for teams ($\tau_{10} = -.49, p = .12$). The key interpretation of these findings was that whereas changes in relatedness were positively associated with changes in self-determined motivation, there was not significant variation in this relationship between teams. This suggested that attempts to account for team differences in the relationship between Δrelatedness and ΔRAI with the team-level variable of learning structure would not be useful, as there was not sufficient between-team variance to account for. For the sake of completeness, this final model test was run to check this statement, but the learning structure condition indeed did not predict between-group differences in the relationship, and so those results are not presented here.

4.4.9 Test of the Mediation Model

The third purpose of this study was to replicate the mediator model analysis done in Study 1 to provide additional evidence on the question of whether self-determined motivation mediates the relationship between fulfillment of the three psychological needs and affective outcomes in dragon boat. Given the findings from Study 1 that RAI was only a partial mediator of the effects of the psychological needs on positive and negative affect, and that competence, but not RAI affected physical self-worth, it was expected in this second sample of dragon boat participants that the same pattern of results would emerge again. In this study, the LTEQ measure was not administered, and using attendance as a behavioural measure was untenable, so the effects on activity were not tested in this model.

Data screening and descriptive statistics. The test of this mediational model was simply a replication of the cross-sectional model test performed in Study 1, and was not

intended to include a test of any effects of the intervention conducted in Study 2. Consequently, this test was performed using Time 1 data only, prior to the implementation of intervention strategies with the teams. Because only Time 1 data for the three psychological needs, RAI, positive and negative affect, and physical self-worth were needed for this model test, it was possible to include participants who completed only a Time 1 questionnaire in Study 2. Using the same data screening and person mean substitution methods described in the data screening section, all of the Time 1 data was examined for inclusion in the mediator model test. Only one participant had to be excluded for missing greater than 50% of the data on one subscale to be used in the analysis, resulting in a sample size of $n = 209$ for the model test. As with the smaller subset of data used in the repeated measures and mixed effects modeling analysis, the data were examined to ensure that they adhered adequately to the assumptions of multivariate analyses, and descriptive statistics, scale reliabilities, and correlations were calculated for the $n = 209$ sample.

The distributions of all variables relevant to the mediation model test were examined to see if they met the assumptions of normality, homoscedasticity, and linearity. Consistent with the previous data screening results, negative affect was positively skewed, and the relative autonomy index and negative affect exhibited positive kurtosis (see Table 4.14). These small departures from normality were not considered particularly problematic as non-normal kurtosis values are well tolerated in sample sizes larger than 200 (Tabachnick & Fidell, 2001). Results involving the skewed Time 1 negative affect variable should be interpreted with some caution, however, the skew was only slightly larger than the 2.00 cut-off value (Miles & Shevlin, 2001), so should not bias the results extensively. An examination box plots and bivariate plots did not reveal problems with univariate outliers, linearity, or homoscedasticity. Six participants had a Mahalanobis' distance value greater than the critical value of χ^2 (45) = 80.07, $p < .001$, and

were therefore considered potential multivariate outliers (Tabachnick & Fidell, 2001). These cases were examined for patterns of responses, but none of them had any wild values or implausible combinations of responses, so all were retained in the subsequent analyses.

Descriptive statistics and correlations among the variables are reported in Table 4.14. Similar to Study 1, autonomy, competence, and relatedness were moderately correlated (r = .25-.47). Almost all other correlations were at least somewhat lower than those found in Study 1, suggesting that the prediction of RAI and affective outcomes by psychological needs, and affective outcomes by RAI may be somewhat weaker in this study as compared to Study 1.

Table 4.14: Descriptive statistics, skew, and kurtosis for variables in the mediation model test with n = 209

Variable Name	1	2	3	4	5	6	7
1. Relatedness	-						
2. Competence	.47*	-					
3. Autonomy	.32*	.25*	-				
4. Relative autonomy index	.30*	.21*	.08	-			
5. Positive affect	.43*	.35*	.14*	.33*	-		
6. Negative affect	-.11	-.18*	.00	-.36*	.10	-	
7. Physical self-worth	.11	.42*	.13	.25*	.10	-.23*	-
M	5.00	5.21	3.56	7.56	4.10	1.48	4.50
SD	.68	.65	1.12	2.72	.50	.47	.99
Skew	-.76	-.97	-.07	-1.34	-.46	2.17	-.82
Kurtosis	1.01	1.73	-.63	3.50	-.01	6.80	1.11
Scale Range	1-6	1-6	1-6	-15-15	1-5	1-5	1-6

* $p < .05$

Measurement model: Structural equation modeling was used to test the hypothesis of partial mediation. A measurement model was tested, followed by the three-step structural model test of mediation. The results of the measurement model analysis are presented in Tables 4.15 and 4.16. The measurement model analysis included only latent variables with multiple indicators, and therefore did not include the RAI. This model provided an adequate fit, although the CFI and SRMR were a bit worse than in study 1, RMSEA .06, CFI .86, SRMR .07. This somewhat worse fit may be explained by the smaller sample size in this study ($N_{study\ 2}$ = 209) as compared to Study 1 ($N_{study\ 1}$ = 539). Correlations among the latent variables followed expectations, and were very similar to those found in Study 1 in most cases. The major difference was that while all of the correlations were significant in Study 1, a number of the correlations with negative affect and physical self-worth were not significant in this study. Again, power may contribute to this finding, as with a smaller sample size a larger correlation is required to demonstrate significant association. However, the magnitude of many of these associations was also smaller than found in study 1. Overall, the measurement model fit the data reasonably well, and the structural model was tested without any modifications to the measurement model.

Structural model: The test for mediation involved testing (1) a direct effects model with the three psychological needs predicting the three outcome variables; (2) a mediator model test with psychological needs predicting RAI which predicted the three outcome variables; and (3) a combined model with both direct effects and mediator effects estimated, and a comparison of the models and their pathways.

Table 4.15: Factor loadings and uniquenesses for the measurement model of psychological need fulfillment, positive and negative affect, and physical self-worth

Measure and variable	Standardized factor loading	Uniqueness
Autonomy		
Autonomy1	.51	.74
Autonomy2	.74	.46
Autonomy3	.76	.42
Autonomy4	.79	.37
Autonomy5	.76	.42
Autonomy6	.81	.35
Competence		
Competence1	.71	.49
Competence2	.80	.35
Competence3	.82	.32
Competence4	.79	.37
Competence5	.87	.25
Competence6	.67	.55
Relatedness		
Relatedness1	.73	.46
Relatedness2	.75	.44
Relatedness3	.57	.68
Relatedness4	.71	.50
Relatedness5	.75	.43
Relatedness6	.73	.47
Positive Affect		
Positive1	.62	.62
Positive2	.52	.73
Positive3	.62	.62
Positive4	.65	.58
Positive5	.62	.62
Positive6	.62	.62
Positive7	.52	.73
Positive8	.73	.47
Positive9	.65	.58
Positive10	.60	.64
Negative affect		
Negative1	.49	.76
Negative2	.59	.65
Negative3	.66	.56
Negative4	.58	.67
Negative5	.58	.66
Negative6	.64	.58
Negative7	.75	.44
Negative8	.55	.69

Measure and variable	Standardized factor loading	Uniqueness
Negative9	.55	.69
Negative10	.71	.50
Physical Self-Worth		
PSW1	.92	.15
PSW2	.93	.14
PSW3	.90	.18
PSW4	.92	.15
PSW5	.89	.21
PSW6	.92	.16

RMSEA = .06, CFI = .86, SRMR = .07

Note: Correlations among latent variables for this analysis are indicated in Table 4.16.

Table 4.16: Correlations among latent variables in the measurement model of psychological need fulfillment, positive and negative affect, and physical self-worth

Latent variable	**Autonomy**	**Competence**	**Relatedness**	**Positive affect**	**Negative affect**	**Physical self-worth**
Autonomy	-					
Competence	.28*	-				
Relatedness	.35*	.50*	-			
Positive affect	.16*	.37*	.48*	-		
Negative affect	-.03	-.23*	-.14	.10	-	
Physical self-worth	.16*	.46*	.13	.12	-.26*	-

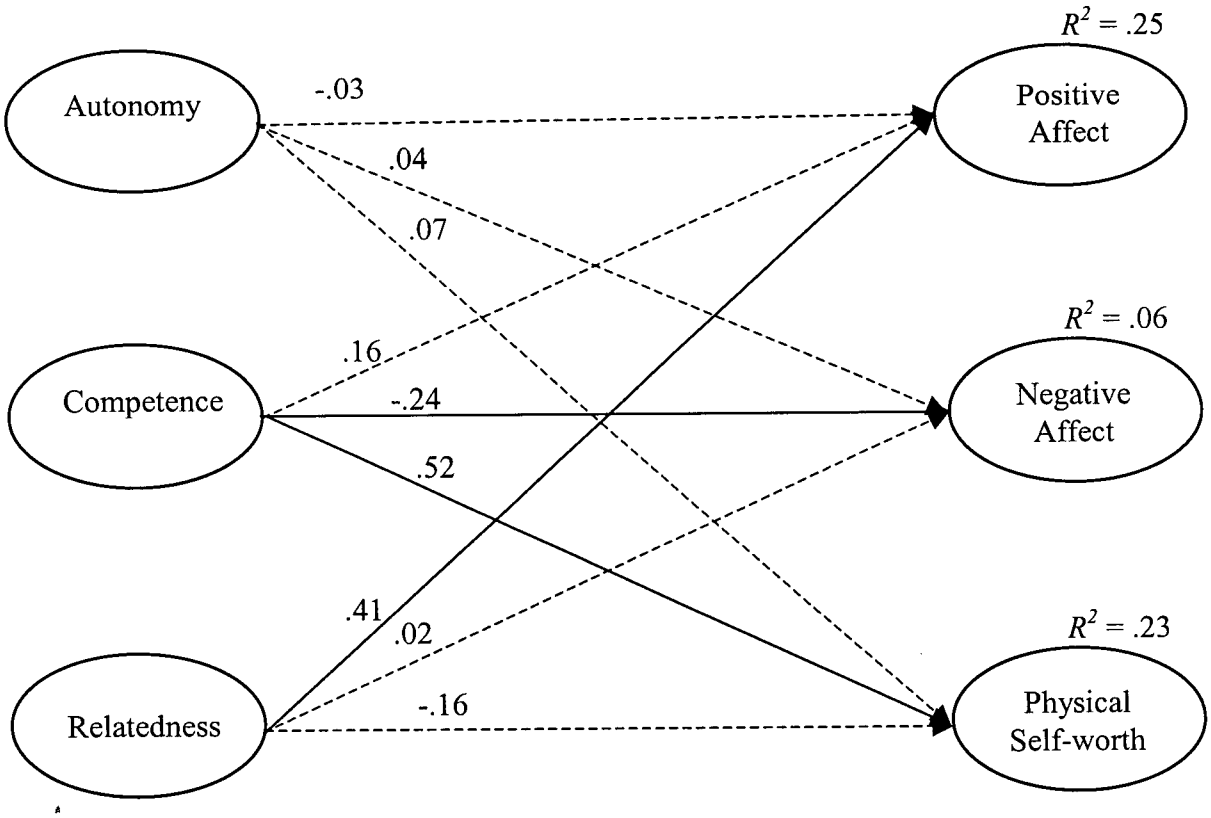
$p < .05$

Note: Factor loadings and uniqueness for this analysis are indicated in Table 4.15.

The results of the direct effects structural model analysis are presented in Figure 4.7. This model provided an adequate fit, RMSEA = .06, CFI = .86, SRMR = .08, similar to Study 1 and satisfying the condition that the direct effects model must provide an adequate fit in order to demonstrate mediation. However, only three of the nine paths in this model were significant, suggesting that the mediation hypothesis is not tenable for all of the relationships in the model. Most notably, autonomy did not have an effect on any of the outcome variables. Positive affect was only predicted by relatedness, whereas negative affect and physical self-worth were predicted by competence. While the full models were run in step 2 and 3, only those relationships that exhibited direct effects in this first step can be considered for mediation by the RAI. Overall, this direct effects model predicted 25% of the variance in positive affect, 6% for negative affect, and 23% for physical self-worth.

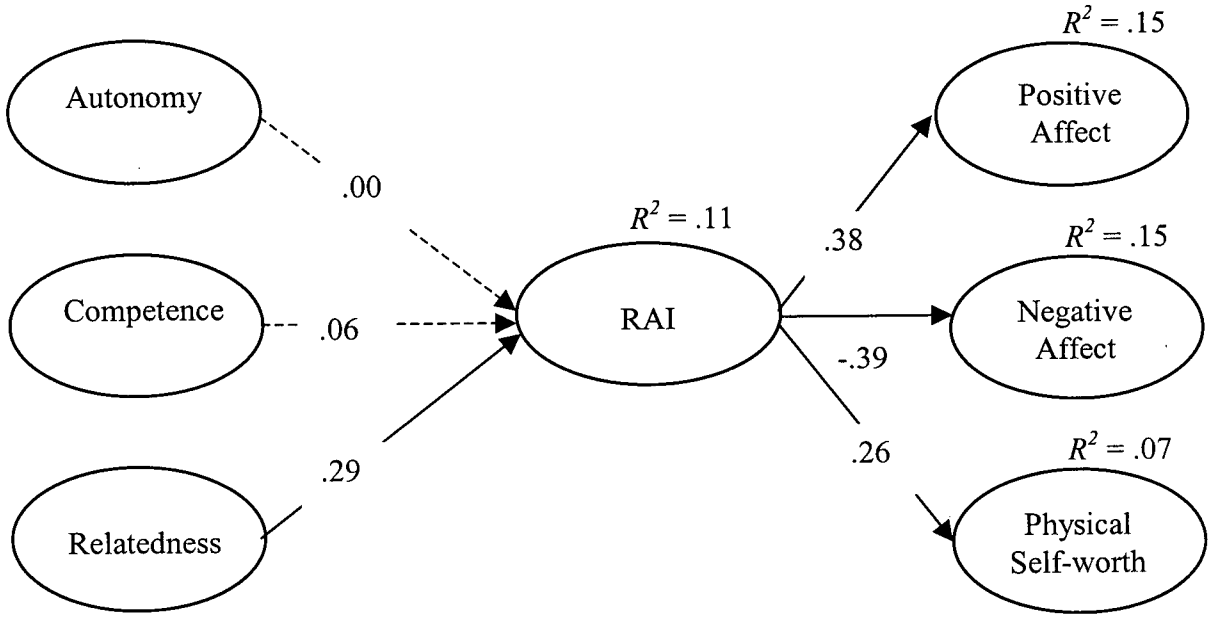
The results of the mediator model tested in step 2 of the analysis are presented in Figure 4.8. This model provided an adequate fit according to the RMSEA, but the CFI and SRMR suggested a poor fit for this model, RMSEA = .07, CFI = .84, SRMR = .11. All of the paths of RAI predicting outcomes in this model were significant, but relatedness was the only significant predictor of RAI, suggesting that RAI is only a potential mediator for the relationship between relatedness and positive affect, as all of the other relationships in the model do not meet the first two basic assumptions that the independent variable must be significantly related to both the dependent variable and the mediator in order for mediation to hold. This model predicted only 11% of the variance in RAI, 15 % for positive affect, 15% for negative affect, and 7% for physical self-worth. In all cases, except negative affect, the variance accounted for in the mediator model was less than the direct effects model, again suggesting that the role of direct effects will be important in the final model.

Figure 4.7: Direct effects model of psychological need satisfaction predicting affective outcomes (n = 209)



Note: RMSEA = .06, CFI = .86, SRMR = .08; Solid lines indicate significant relationships ($p <$ .05), dotted lined indicate non-significant relationships

Figure 4.8: Structural model with RAI mediating the relationship between psychological need satisfaction and affective outcomes (n = 209)



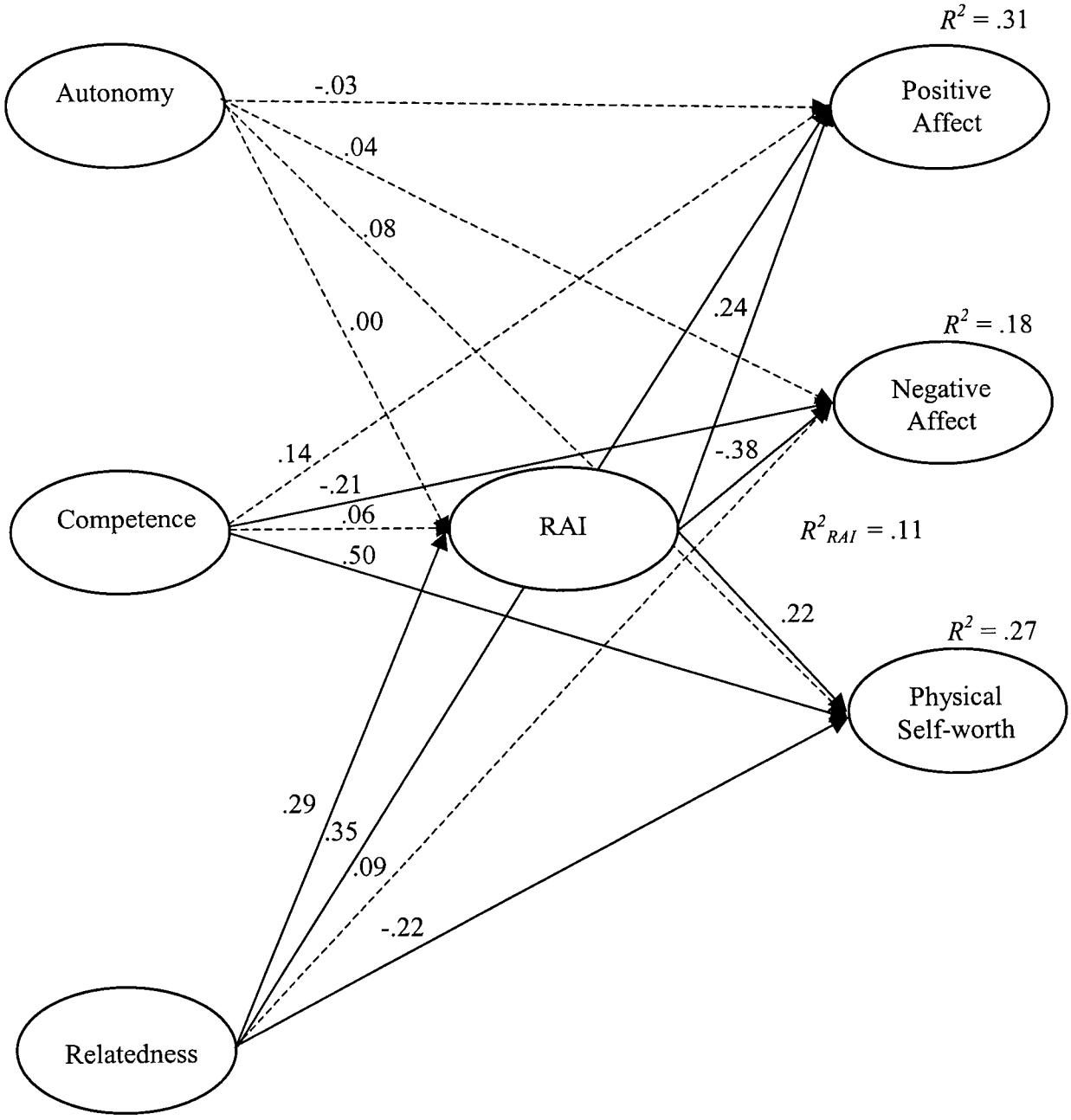
Note: RMSEA = .07, CFI = .84, SRMR = .11; Solid lines indicate significant relationships ($p <$ .05), dotted lined indicate non-significant relationships

In step 3, a combined effects model was run that included both direct effects paths from the psychological needs to the outcome variables and the mediated paths through RAI. The results of this test can be found in Figure 4.9. This model provided an adequate fit, similar to that of the direct effects model, although the CFI and SRMR indices were still fairly poor, RMSEA = .07, CFI = .85, SRMR = .08. A χ^2 difference test was performed to determine whether the model with both mediator and direct effects (i.e., Figure 4.9) provided an improved fit over the mediator model with direct paths constrained to 0 (i.e., Figure 4.8). The results of this analysis can be found in Table 4.17. The combined effects model offers significant improvement in model fit over the mediator model, as evidenced by the significant negative χ^2 change. This suggests that full mediation in all cases in this model is untenable. The individual relationships are either not mediated or are only partially mediated by RAI.

To further investigate the possibility of partial mediation in some relationships in the model, the standardized parameter estimates (SPE) in the combined effects model were compared with those in the direct effects model. First, RAI was only significantly predicted by relatedness (SPE = .29), with 11% of the variance in RAI. Positive affect was predicted by relatedness (SPE = .35), and RAI (SPE = .24) with 31% of the variance accounted for. Compared to the direct effects model, the path coefficient for relatedness decreased by .06 in the combined model, suggesting some partial mediation by RAI.

Competence (SPE = -.21) and RAI (SPE = -.38) predicted 18% of the variance in negative affect. The effect of competence on negative affect could not be partially mediated, however, because there is no significant effect of competence on RAI. RAI seems to have its own direct effect on negative affect that is not influenced by autonomy, competence, or relatedness.

Figure 4.9: Combined effects structural model (n = 209)



Note: RMSEA = .07, CFI = .85, SRMR = .08; Solid lines indicate significant relationships ($p <$ .05), dotted lined indicate non-significant relationships

Table 4.17: Comparison of fit of the mediator and combined effects models

Model	**RMSEA**	**CFI**	**SRMR**	***df***	**Δdf**	χ^2	$\Delta\chi^2$	***p***
Mediator	.07	.84	.11	937	-	1819.25	-	-
Combined effects	.07	.85	.08	928	9.0	1740.67	-78.58	<.01

For physical self-worth, the findings are somewhat more complex. Competence (SPE = .50), relatedness (SPE = -.22) and RAI (SPE = .22) together significantly predicted 27% of the variance in physical self-worth in the combined model. RAI cannot partially mediate the effects of competence or relatedness because there was no relationship between competence and RAI in the mediator model, or between relatedness and physical self-worth in the direct effects model. The direct effect of relatedness only became significant when RAI was included in the model. While this was not expected, it is plausible given that relationships in structural model are estimated as linear combinations of the independent variables, as in multiple regression, and the contribution of any given variable is affected by the other variables in the equation.

The fact that the parameter for relatedness predicting physical self-worth changed from non-significant to significant when RAI was included is further understood by the observation that this parameter was very close to meeting the cut-off for significance in the direct effects model (t = -1.82), and the change in parameter magnitude was not dramatic (from -.16 to -.22) even though this change represented a shift from non-significance to significance. Colinearity effects do not seem to have come into play in this shift, as the simple correlation between relatedness and RAI was only $r(208) = .30$. However, the simple correlation between relatedness and physical self-worth was positive, $r(208) = .13$, while the structural path coefficient in the combined effects model was negative (SPE = -.22), suggesting that this relationship was influenced by the presence of other predictor variables in the model that affected the parameters of this relationship. Overall, the role of relatedness in predicting physical self-worth in the combined effects model was not mediated by RAI, and the direct effect was small, and possibly a statistical artefact.

Overall, the combined effects model provided the best fit to the data. For the relationship between relatedness and positive affect, RAI acts as a partial mediator. In this study, autonomy did not enter into the model in any way. While RAI was not a mediator in the prediction of negative affect or physical self-worth, direct effects of RAI did add to the prediction of those variables. Most dramatically, substantially more variance in negative affect accounted for when RAI was included in the model than in the direct effects model ($R^2_{\text{direct effects}} = .06$; $R^2_{\text{combined effects}} = .18$). Consequently, the combined effects model was considered the most appropriate model with this data.

Direct, indirect, and total effects on the endogenous latent variables (see Table 4.18) were examined to explore the contribution of direct and indirect effects to total effects in mediated pathways. This analysis again illustrates that autonomy had no significant relationships with the other latent variables in this model. For competence, significant total effects on negative affect and physical self-worth coupled with no significant indirect effects illustrate that 100% of the effect of competence on these outcomes was direct. For the prediction of positive affect by relatedness, the one relationship that was found to be mediated by RAI in this study, 16% of the effect of relatedness was indirect, while the remaining 84% was direct. This finding supports only partial mediation, and a much more substantial direct than mediated effect. Relatedness has small significant indirect effects on negative affect and physical self-worth, but the total effects of relatedness on these variables is non-significant, suggesting that this indirect effect simply results from the fact that relatedness affects RAI and RAI affects these outcomes, but that it is not a mediated effect, as relatedness has no direct impact on these two outcomes.

Table 4.18: Completely standardized indirect effects and t-values for the combined effects model

Indirect relationship	Indirect effect	*t*-value	Total effects	*t*-value
Autonomy → Positive affect	.00	-.04	-.03	-.41
Autonomy → Negative affect	.00	.04	.04	.45
Autonomy → Physical self-worth	.00	-.04	.08	1.04
Autonomy → RAI	-	-	.00	-.04
Competence → Positive affect	.02	.74	.15	1.76
Competence → Negative affect	-.02	-.75	-.23	-2.45*
Competence → Physical self-worth	.01	.75	.52	5.73*
Competence → RAI	-	-	.06	.76
Relatedness → Positive affect	.07	2.41*	.43	4.29*
Relatedness → Negative affect	-.11	-2.68*	-.02	-.17
Relatedness → Physical self-worth	.06	2.21*	-.16	-1.87
Relatedness → RAI	-	-	.29	2.24*

* $p < .05$

4.5 Discussion

The aims of this study were (1) to examine the effects of the learning interventions on social and motivational constructs in the SDT model among adult dragon boaters; (2) to examine whether changes in relatedness were associated with change in self-determined motivation while accounting for within-team clustering of responses; and (3) to replicate the mediation model test performed in Study 1 on an independent sample of adult dragon boat participants. Expectations that participants in the cooperative intervention would experience increased social relationship and relatedness perceptions as compared to those in the individualistic intervention were not supported in this study. In addition, expectations that both interventions would be associated with enhanced autonomy, competence, self-determination, and positive affect were not supported. Changes in relatedness perceptions did predict changes in self-determined motivation over an eight-week period, and substantial intra-team clustering was demonstrated to support the use of mixed effects procedures with social and motivational variables in a study with intact teams. In addition, results of the mediation model test were similar to those of Study 1 in that self-determined motivation was found to be a partial mediator of the relationships between psychological need fulfillment and affect. This study was unique in its application of a learning structures intervention to an adult physical activity context within a SDT perspective, the consideration of intra-team clustering of social and motivational data, and in demonstrating that changes in satisfaction of the need for relatedness predicted changes in self-determined motivation as opposed to cross-sectional evidence of the relationships between these constructs. The study was limited by practical considerations including sample size, length of and adherence to the intervention, problems with the collection of attendance data, and missing data and measurement issues similar to those in study 1, but

still provide unique evidence that furthers the literature and practical knowledge on social relationships and motivation in adult physical activity settings.

4.5.1 Effects of the Interventions

Overall, social relationships increased marginally over the course of the study, resulting from a small increase in peer acceptance perceptions, but there was no effect of the intervention type on changes in social relationships. Need satisfaction also increased somewhat over time, with the intervention leading to increases in autonomy in the individualistic condition but not the cooperative condition. No changes were demonstrated in the measures of positive or negative affect or physical self-worth. These results clearly did not support the hypotheses of the study, but, aside from there being no true effect of learning structure interventions on the study variables, there are several possible contributing factors to this lack of support.

First, it is important to consider the changes that did occur among participants in this study. While the cooperative intervention clearly did not have the expected effect on social relationship variables, there was a small increase in peer acceptance among participants as a whole. There are two possible explanations for this time effect that cannot be substantively supported or ruled out without further study. First, it is possible that both interventions led to increases in peer acceptance among participants. This possibility is difficult to explain, as there is no mechanism that would be theoretically expected to affect peer acceptance perceptions resulting from the individualistic intervention. The second explanation is that peer acceptance may tend to increase among dragon boat groups over time, regardless of any intervention effect. Attempts were made in designing this study to minimize the effect that time spent together would have on changes in relatedness. The intervention began well into the dragon boat season so that teams had spent considerable time together already to form and develop relationships, and so the effect of initially getting to know a new group of people would not

confound the results. Given that social relationships are dynamic and constantly developing over time (Hymel, Vaillancourt, & McDougall, 2002), and a substantial proportion of participants (14%) were in their first year on the team and may have been still been in a period of rapidly getting to know other participants on their teams, it is impossible to rule out this explanation. In addition, the absence of a true control group who received no learning intervention treatment does not allow this possibility to be excluded.

The intervention condition seemed to have a small effect on need satisfaction. Need satisfaction increased over time, with the individualistic intervention leading to marginal increases in autonomy. Similarly to the time effect of peer acceptance, it is difficult to establish whether the time effect for need satisfaction resulted from similar effects occurring due to both interventions or simply changes in these variables over time despite the learning structure condition. Previous research using cross-sectional designs has found an association between general perceptions of a mastery climate and need satisfaction (Kowal & Fortier, 2000; Ntoumanis, 2001; Sarrazin et al., 2002; Standage et al., 2003). However, given that there were only marginal changes in the motivational climate indicators in this study, there is no strong support for the idea that similar changes in motivational climate in both groups lead to similar changes in need satisfaction.

Differential changes in autonomy perceptions do support the intervention effect on need perceptions, suggesting that the individualistic intervention lead to increased autonomy among participants, while the cooperative condition had no effect. This finding only partially supported the hypothesis that both conditions would lead to enhanced autonomy perceptions, but can be understood in that the individualistic condition clearly provided opportunities for individuals to work on their own and take personal responsibility and control for their dragon boat learning, while the cooperative condition placed this task on groups or partners within the

team, which may have put responsibility in the hands of the paddlers, but still diffused power over skill learning among multiple participants rather than imparting it on the individual. It is also possible that in the cooperative condition some individuals took leadership roles that enhanced their autonomy, while others felt that they were being controlled by fellow participants, diminishing their autonomy, resulting in no net change in autonomy among those in the cooperative group. This possibility was supported by anecdotal reports by some coaches and participants that within the cooperative condition some athletes become dominant, while others tend to be more passive.

Throughout the intervention attempts were made to help coaches facilitate all team members having a voice and contribution to the cooperative activities of the teams by helping coaches structure discussions and activities so that all participants contributed (e.g., in a drill activity, creating a goal that each group member try to provide feedback at least twice during the drill activity), but the length of the current intervention may not have been substantial enough to allow coaches to become comfortable with these techniques and for the interactions among team members to truly incorporate these intended patterns.

4.5.2 Changes in Relatedness Predicted Changes in Self-Determined Motivation

Most prior work examining the relationship between relatedness and self-determined motivation has been cross-sectional. While this type of design provides important information about the ability of relatedness to predict motivation, the evidence provided in this study that changes in relatedness are associated with changes in self-determined motivation is a much stronger endorsement of this theoretically predicted relationship. Even stronger evidence for this relationship would result from showing that experimental manipulations of relatedness cause changes in self-determined motivation changes. However, the learning structure manipulation used in this study did not have a substantial effect on these relationships, so the

evidence here is confined to the finding that they do vary together over time. Some prior work using daily diary methods and longitudinal mixed effects modeling has found that individual trajectories in positive affect in sport can be accounted for by variations in perceptions of relatedness (Gagne et al., 2003) which is consistent with the results of this study, as self-determined motivation is theoretically expected to be positively associated with positive affect. Their study did not examine the effects of relatedness on self-determined motivation specifically, which is a unique contribution of the present work.

The lack of support for the hypothesis that differences in the learning structure intervention used by coaches would account for team differences in the relationship between relatedness change and self-determined motivation change may have resulted from similar effects of both interventions, or changes over time unrelated to the intervention condition. As discussed previously, these alternate possibilities are impossible to rule out in the absence of a control group that did not experience any intervention treatment. Verbal and written feedback received from coaches and paddlers provides some anecdotal support that both interventions had a similar effect, as participants from both groups frequently made comments that they found the programs novel and beneficial in terms of focusing and learning new skills, regardless of which intervention condition they were assigned to. It is unclear from this feedback, however, how the interventions may have acted similarly on relatedness perceptions specifically, as feedback from the cooperative condition paddlers and coaches did include comments about their perceived positive effects of the activities on social interactions within their teams, but no such comments were made by participants in the individualistic condition. Ultimately, given that very few group changes were detected in the study overall, it is most likely that the intervention simply did not cause a substantial effect on participants' social or motivational perceptions.

A strength of this study is the use of change scores and mixed effects modelling analyses to examine associations between social relationships and motivation. Clustering of responses within teams is rarely accounted for in physical activity research, but the possibility of such within-group dependence of responses is especially pertinent to the study of social relationships where effects that are happening at a group level that are observed (level 2 predictors) or unobserved (unmeasured variables contributing to clustering within teams) are of key interest. The mixed effects modeling approach is very relevant in this work, as it allows investigators to account for this clustering, as well as examine the role of person-level (level 1) predictors and team-level (level 2) predictors on the dependent variable, in this case, motivation. In this study in particular, results of the intraclass correlation analysis showed that there was substantial clustering within teams. While in this study the team-level predictors included were not significant contributors to accounting for team effects, even the ability to model the within-team clustering makes using mixed effects modeling the most appropriate and unbiased choice. Using regular OLS regression methods with this data would involve violating the assumption of independent observations, which could result in underestimated standard error values (Thomas, 1993).

4.5.3 Self-Determination as a Partial Mediator

As noted in Study 1, there is no prior work examining the role of self-determined motivation as a mediator of the relationships between psychological need fulfillment and affective and behavioural outcomes in a physical activity context that fully tests mediation using a three-step model testing approach. The results of this test served to replicate the test done in Study 1 with an independent sample of adult dragon boaters, albeit without a measure of activity included. These results provided additional support for the role of self-

determination as a partial mediator in the model, but, unexpectedly, autonomy did not play a role in the model and competence was not a predictor of motivation.

The finding that autonomy did not play a significant role in this model was not entirely surprising, as its relationships with RAI and negative affect in Study 1 were quite weak. The lack of relationships between competence and RAI and competence and positive affect are more puzzling. Competence was a strong predictor of both of these variables in Study 1, and it is difficult to determine why those theoretically predicted and previously empirically supported relationships did not hold with this sample. The samples in the two studies were very similar, differing substantially only in that the sample in Study 2 contained more males, and they tended to practice more often and had been together as a team slightly longer than those participants in Study 1. There is no theoretical reason to expect that any of these differences would have an impact on the role of competence in motivational processes between the samples, however, so these differences are not readily explainable here. While the sample size in Study 2 was smaller, it is unlikely that power was an issue in detecting significant relationships with competence, as there were still 209 participants included in the analysis, which should be adequate to detect relationships of the magnitude expected between competence, RAI, and positive affect.

Most other relationships in the model were similar to those found in Study 1, but overall the results for the model test were not stable across the two studies. Relatedness was again a key predictor of motivation and positive affect, and competence predicted both negative affect and physical self-worth. RAI was a significant predictor of positive and negative affect, as found previously, but in this study it also predicted physical self-worth. This was contrary to the findings in Study 1, but in line with the initial hypothesis of the first study that physical self-worth would be an outcome of this model. These findings are not consistent, but point to

the possibility that the associations among these constructs may not be as clear or as stable as originally thought. Most clearly, these results again suggest that while self-determined motivation appears to be an important construct that has substantial associations with many variables in this model, it does not appear to completely mediate the relationships between psychological need fulfillment and affective outcomes. Understanding an individual's self-determination may not provide as much information about that person's likely affective outcomes as would knowledge about their perceptions of relatedness and competence, and possibly autonomy, in that context. Overall, it appears that a clearer understanding of both need fulfillment and motivation is needed to predict outcomes.

4.5.4 Limitations

The mixed effects modelling approach is not without limitations, and there were also limitations of the quasi-experimental design that must be considered when interpreting the results of this study. First, the use of change scores specifically, and two-wave data generally, has been hotly debated in the statistical literature as being inherently biased and unreliable (see Zumbo, 1999 for a review). In this study, it is argued that the use of change scores in relatedness and self-determined motivation was appropriate for two reasons. First, a key question of interest in this study was about whether people changed in relatedness and self-determined motivation, and whether those changes were associated. This type of question focuses on amount of change, rather than patterns or trajectories of change over time, and is therefore addressed by a two-wave design. Second, substantial arguments have been made against the inherent bias and unreliability of change scores and methods have been developed, and were used in this study, to help researchers decide on the most appropriate change scores to use to maximize reliability (Zumbo, 1999). For these reasons, the use of residualized change

scores in this study is not only acceptable, but one of the most appropriate ways to examine the question of interest.

The mixed effects modeling analysis also poses challenges that were exacerbated by limitations in the design of this study. Mixed effects modeling allows for examination of clustering within groups and analysis of team-level predictors, but places demands on the number of people (level 1 units) and teams (level 2 units) included in the study. While exact sample size limits are debatable, having only ten teams and 11-21 participants per team barely meets the most lenient recommendations for minimum sample size requirements. The sample size of this study was limited by practical considerations about the number of teams that could be recruited to participate and provided with the learning interventions, as well as limitations imposed by the natural size of in-tact dragon boat teams. Teams rarely have more than 22-24 members, as the boats themselves can only hold 20-22 paddlers at a time. In addition, this population of adult recreational athletes tend to have competing demands from jobs, family, etc. that can interfere with attendance, making it difficult to get all members of a team to complete both questionnaires. These limitations had an impact on the ability to examine a model with both level-1 and level-2 predictors, but the analysis was still valuable in that a within-team clustering effect was demonstrated, and the relationship between changes in relatedness and changes in motivation was detected, contributing to the literature in this area.

Limitations inherent in a quasi-experimental design impact the conclusions that may be drawn from this study. While this study employed pre-test and post-test measures, examined possible differences between the two group at Time 1, and randomly assigned teams to the intervention conditions, this study could not overcome the potential biases involved in assigning participants to intervention condition within their teams rather than randomly by individual. Individual random assignment was not possible in this study because the population

of interest was current adult dragon boat participants, and randomly assigning these participants to teams for eight weeks would have been overly disruptive to their goals and commitments in this activity. Conducting this study with existing teams enhances the external validity of this study, as it applied the interventions to current participants in a natural team environment.

The lack of individual random assignment is a threat to internal validity, however, as differences in characteristics such as motivation, social relationships, and coach characteristics on the teams could have resulted in different application of, receptiveness to, and effectiveness of the intervention protocols on different teams. Every effort was made to minimize and control for these differences, but this potential bias cannot be fully eliminated outside of a true experimental setting.

More generally, issues with length of and adherence to the interventions, problems with the collection of attendance data, and missing data and measurement issues similar to those in Study 1 may have had an impact on the results of this study. The intervention period was relatively short, suggesting that the effectiveness of the intervention may have been enhanced if it had extended for a longer period of time. Specifically, the effect of any intervention is likely proportional, at least to some degree, with the "dose" provided. The frequency of the intervention implementation was limited to the number of practices teams had each week. The amount of time spent on intervention activities each practice was likely approaching a maximum tolerated by teams and coaches, as they occupied at least 10-15 minutes of each 60-75 minute practice. Therefore, the only feasible way to increase the dose of the intervention would be to extend it over a longer time period.

The intervention period was limited to eight weeks due to considerations regarding social relationships among team members, length of the season, and summer holidays. First, it was decided to wait until practices had been underway for approximately one to two months to

allow teams to (re)acquaint themselves with their coaches and each other. This was done to minimize changes in social relationship variables due to participants initially getting to know new members. By leaving this period of time at the beginning of the season, however, the intervention period occurred concurrently with a heavy racing period in the dragon boat season. While coaches did complete the modules, many commented that they would have preferred to include these elements at the very beginning of the season, and that it is precisely in that "get to know you" time when they felt that the cooperative learning intervention in particular would have been the most helpful for their teams. Additionally, the length of the intervention was limited by summer holidays, as most teams have their best attendance in April-June, with attendance waning in the summer months due to holidays. To maximize participation and exposure to the intervention, efforts were made to have teams complete the eight week intervention by mid-July. Overall, it may have been more effective to have a longer intervention period, and to begin the intervention at the beginning of the dragon boat season, but this can only be investigated in future studies.

A major limitation related to concerns about exposure to the interventions was the inability to analyze attendance data. Some coaches provided this data, but in many cases it did not include information for every practice during the intervention period. In addition, some coaches did not provide this data at all, either because they forgot to collect it, or files were lost or not returned to the researcher. The possible inclusion of participants with low attendance may have weakened the ability to detect any effects of the interventions, but it was impossible to know who those individuals were, so no one was excluded for poor attendance. Having complete attendance data may not have helped reveal significant effects, however, as excluding more participants from the already small sample may have seriously undermined power, especially in the mixed effects modeling analyses. In future research, if resources are available,

it would be preferable to have the researcher or trained assistants collect attendance data directly at each practice to ensure complete data files.

Finally, many of the same issues with missing data and measurement properties of the SFQS were found in this study as in Study 1. The social relationships variables were again the major source of missing data, with conflict resolution again having to be excluded, and participants with low levels social support and no close friends in dragon boating disproportionately missing data on social variables. The SFQS again had poor fitting results to tests of both the five-factor and the two-factor structures. These findings suggest that some caution should be taken in interpreting the results of analyses involving social relationship variables, and they also reinforce the recommendation from the first study for future research to further explore appropriate friendship measures for adults in the physical activity context.

4.5.5 Strengths of the Current Study

This study was unique in its application of a learning structures intervention to an adult physical activity context within a SDT perspective, the consideration of intra-team clustering of social and motivational data, and in demonstrating that changes in satisfaction of the need for relatedness predict changes in self-determined motivation as opposed to cross-sectional evidence of the relationships between these constructs. Results demonstrated support for the idea that relatedness is an important predictor of self-determined motivation, and provided unique evidence of this relationship in its demonstration of a relationship between changes in these variables over time. This study did not find support for the hypothesis that the use of a cooperative as opposed to an individualistic learning structure intervention would account for team differences in the relationship between relatedness change and self-determined motivation change, provided only very limited support for hypotheses suggesting that the interventions would lead to positive motivational changes, and no support that the cooperative intervention

would contribute to enhanced social relationships and interactions. The use of change scores and mixed effects modelling analyses was supported as an appropriate method to investigate associations between social and motivational variables when the sample involves in-tact teams. Finally, some additional support was found for the partial mediation model found in Study 1, but inconsistencies between the two model tests suggest that further research is required regarding the role of self-determined motivation as a mediator of the effects of psychological need satisfaction on affective outcomes in dragon boat.

Future research in this area should continue to consider the role of social relationships in the SDT framework. Very little work has been done to link these construct theoretically and empirically, and even less effort has been made to explore whether practical interventions can be used to enhance social relationship and motivation perceptions in adult physical activity programs. While the intervention tested in this study was less than successful to that effect, insufficient evidence exists to discount the viability of social interventions having a positive motivational effect on activity, and more work is needed to explore different, more intensive, longer-term interventions tailored to the physical activity context. Evidence exists that social relationships can predict motivational variables both cross-sectionally and over time, but the question remains whether it is possible to design programs that more effectively meet adults' social needs and ultimately assist them in maintaining healthy physical activity levels.

CHAPTER V: GENERAL DISCUSSION AND CONCLUDING REMARKS

5.1 Discussion

The purpose of this project was to (a) examine antecedents and outcomes of relatedness among adults in the physical activity context of dragon boat; and (b) to determine whether social relationships, relatedness perceptions, and motivation could be facilitated through a learning structure intervention. Together, these two studies demonstrate that relatedness matters in motivational processes in adult dragon boating, and adds to the growing evidence that relatedness matters in a variety of physical activity contexts and with a range of populations of participants. Furthermore, many aspects of social relationships contribute to relatedness perceptions, providing a link between relatedness in SDT and much of the existing literature on social relationships in activity that may suggest new avenues for research and practical interventions. To further investigate these possibilities, however, more work is required in the area of measurement development and validation of social measures, particularly for use with an active adult population. While this study had limitations surrounding both the cross-sectional and quasi-experimental intervention study designs, both studies also provided unique evidence that adds to the body of knowledge on social relationships, relatedness, and self-determination that have implications for research and practice.

5.1.1 Synthesis of Findings from Studies 1 and 2

Together, Studies 1 and 2 provide new information about the role that relatedness plays in motivational processes from a SDT perspective among two samples of adult dragon boat participants. In particular, evidence was found regarding the antecedents and outcomes of relatedness in a predictive model; relationships with competence, autonomy, and self-determined motivation; and the role of self-determined motivation as a mediator in the model.

5.1.1.1 Antecedents of Relatedness

Evidence regarding the antecedents of relatedness was provided in Study 1, which suggested that peer acceptance was the strongest predictor of relatedness, with additional contributions provided by amount of social support, positive friendship quality, age, and social support network size. The finding that these different aspects of social relationships uniquely contributed to the prediction of relatedness is consistent with previous literature that has found friendship quality and peer acceptance to be unique constructs (e.g., Smith, 1999; Weiss & Smith, 2002). That peer acceptance was the most prominent predictor of relatedness is consistent with work finding it to be the key social predictor of constructs such as self-determined motivation, stress, and perceived competence (Ullrich-French & Smith, 2006). Research in this area is limited to date, however, and this study is the first attempt to predict relatedness from these social factors. Future research is needed to establish the consistency of these findings. In addition, previous research on friendship quality and peer acceptance in physical activity has focused on youth. Evidence that peer acceptance is the primary predictor of perceptions of relatedness in a physical activity context among adults extends this knowledge, and suggests that more studies on social factors among adults should consider the role of acceptance by one's peers.

Contrary to expectations, age and gender were not moderators of the associations between social relationship variables and relatedness. These null findings are useful knowledge, however, as they suggest that the associations between social relationships and relatedness are consistent across gender and age groups and they provide some insight into the difficulties with trying to intervene in a complex process such as social relationships. Previous research has demonstrated that there is consistency in relationships between peer acceptance, friendship quality, affect, physical self-worth, motivation, and physical activity, and that

maturity does not impact these relationships, at least among adolescents (Smith, 1999). The present study provides additional evidence that the associations between social relationships and relatedness perceptions among adults is also consistent across age and gender. This finding is important, as it suggests that the same social relationship issues tend to be pertinent for men and women of all ages, which has implications for intervention strategies.

This study was unsuccessful in establishing a causal link between cooperative learning interventions and relatedness perceptions. These findings may indicate that cooperative learning strategies and a cooperative motivational climate are not antecedents of relatedness, but this study had substantial limitations that may have influenced this result. It is possible that other cooperative learning intervention programs or a longer more intense implementation of the program used here. More work is needed to investigate intervention strategies that cause change in relatedness perceptions, as the cooperative and individualistic learning strategies did not have an effect on those perceptions.

5.1.1.2 Outcomes of Relatedness

Multiple findings in this project provided evidence about the motivational and affective outcomes of relatedness among adult dragon boat participants. Evidence from Study 1 demonstrated that relatedness was a key predictor of self-determined motivation, although competence was a stronger predictor. Relatedness did contribute significantly, however, and this relationship was not moderated by gender or age. Evidence from the mixed effects modelling analysis in Study 2 demonstrated that changes in relatedness significantly predict changes in self-determined motivation, providing stronger evidence for that link than the cross-sectional correlational evidence provided in Study 1. Furthermore, tests of the mediational model in Study 1 and 2 were consistent in finding that self-determined motivation partially mediated the relationship between relatedness and positive affect, but that relatedness also

significantly directly predicted positive affect. Together, these findings provide converging evidence that relatedness is important for motivation and positive affective outcomes in this population, and more work needs to be done to examine these affects and their role in adult activity.

Despite the encouraging findings that relatedness is linked to motivation and affect, this work did not demonstrate that social relationships, relatedness, motivation, and affective outcomes can be successfully manipulated through a cooperative learning structure intervention with adult dragon boat paddlers. Due to the limitations of the intervention study it would be extremely premature to rule out the possibility of a causal link or the potential to develop interventions to improve social relationships and motivation in adult sport. Aside from practical limitations such as the length of the intervention, sample size, and the quasi-experimental design, this study only tested intervention strategies based on principles of learning structures and motivational climate. Other methods of intervening socially may be more effective. For example, the results of the first study suggest numerous types of social relationship variables that are linked to relatedness perceptions. Rather than intervening at the level of coach-structured learning activities, creating an intervention designed to help participants enhance their feelings of acceptance by peers may be a more direct route to enhancing relatedness and self-determination. Likewise, work using cooperative learning interventions targeting groups that have a specific identified need for social intervention (e.g., newly formed groups, teams early in a season, or teams experiencing conflict) may prove more effective.

Contrary to expectations, age and gender did not moderate the relationship between relatedness self-determined motivation. This finding is consistent with work by Smith (1999) examining the links between social factors and motivation with youth using Harter's

competence motivation theory. He found that friendship and peer acceptance predicted affect, physical self-worth, motivation, and activity similarly for males and females, and that maturity was not a significant factor in the model among adolescents. Previous research has shown that men and women have differences in their social relationships (e.g., Berndt, Hawkins, & Hoyle, 1986; Ryan et al., 2005) and physical activity participation (Craig et al., 2001). However, this study provides evidence that there are no gender or age differences in the role of relatedness as a predictor of self-determined motivation. These findings provide support for the SDT position that relatedness is a universal need (Deci & Ryan, 2000), as it demonstrates that relatedness plays a role in motivation across gender and age groups.

Also contrary to the hypotheses originally put forth in this study, relatedness did not predict negative affect, physical self-worth, or physical activity either directly or via a mediator effect of self-determined motivation. This was unexpected, as SDT suggests that contexts that better meet an individual's needs for competence, autonomy, and relatedness should promote more positive affective and behavioural outcomes (Deci & Ryan, 1985; Deci et al., 1991). As discussed previously, it is possible that the difference in levels of generality in the questions for different variables contributed to the lack of a significant predictive effect. The Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 2000) suggests that variables at the same level of generality should be most closely linked. However, physical self-worth and physical activity were measured at the global level, while all other variables were measured at the contextual level. Specific to physical self-worth, there are likely many situations and contexts in an individual's life that contribute to their overall perceptions and evaluations of their physical attributes and abilities. Although their experience in dragon boat may be one of those contexts, it may only be one small aspect within a person's realm of relevant experience, and therefore is not a significant predictor. Similarly for physical activity, while psychological

need satisfaction and self-determined motivation may predict dragon boat participation well, these constructs did not account for need satisfaction and motivation experienced in other physical activity contexts that would contribute to total physical activity participation.

5.1.1.3 Relationships among Autonomy, Competence, and Self-Determination

In addition to the major findings regarding the role of relatedness, evidence was also provided concerning the role of autonomy, competence, and self-determination. Both studies found that autonomy was a weak or nonsignificant predictor of self-determined motivation and affective and behavioural outcomes. This finding is curious, as autonomy is generally considered to be the key predictor of self-determination (Deci & Ryan, 1985, 1991), and prior work has consistently supported autonomy as a key predictor of self-determination in the physical activity context (Gagne et al., 2003; Kowal & Fortier, 2000; Sarrazin et al., 2002; Wilson et al., 2002). One explanation is that the interdependent team sport context of dragon boat may have contributed to these findings. No previous research has examined these questions in this type of setting, and it is possible that features of the dragon boat context may emphasize social connectedness and de-emphasize autonomy as predictors of motivation in this population. Previous research has made the parallel argument in choosing to not measure relatedness, suggesting that relatedness is not important in individual, solitary activities because they de-emphasize social connectedness and emphasize autonomy and competence (Grouzet et al., 2004). SDT suggests that autonomy should predict motivation in any context (Deci & Ryan, 1985, 1991), and this was the case, at least in the first study. However, the interpersonal team nature of dragon boat may have contributed to the enhanced importance of relatedness as compared to previous studies. More work is needed with adults in group activities that involve some level of interdependence among members to achieve common goals to determine whether these differences are related to contextual factors.

As expected, competence was a significant predictor of motivation and outcomes in Study 1, and was linked to affective outcomes in Study 2. This finding was supported by SDT (Deci & Ryan, 1991) and empirical work in the sport setting linking competence to self-determination (Gagne et al., 2003; Kowal & Fortier, 1999, 2000; Sarrazin et al., 2002; Wilson et al., 2002) and motivation in from other theoretical perspectives (see Weiss & Williams, 2004 for a review). Unexpectedly, competence was not associated with self-determination in Study 2, a finding that was particularly curious given that the samples in the two studies were very similar, and competence was the strongest predictor of self-determined motivation in the first study. This finding does not have a ready theoretical or empirical explanation, but requires further study to examine the consistency of this relationship.

5.1.1.4 Self-Determined Motivation as a Mediator

Finally, both studies did not support self-determination as fully mediating the prediction of affective and behavioural outcomes by the three psychological needs as outlined in Vallerand and Losier's (1999) conceptual model. Self-determination did serve as a partial mediator of many of the relationships predicting positive and negative affect, but in almost all cases direct effects of the psychological needs on outcome measures were stronger than the indirect effect explained by mediation, or there was no mediational effect at all. These findings are not entirely at odds with SDT, as self-determined motivation and the three needs did contribute to the prediction of outcomes, but it does suggest that a more complex model than that presented by Vallerand and colleagues (Vallerand, 2000; Vallerand & Losier, 1999) may be necessary to adequately predict affect and behaviour. While the fit of a mediator model has been shown to be acceptable in this project and in previous work (Kowal & Fortier, 2000; Li, 1999; Ntoumanis, 2001; Sarrazin et al., 2002; Standage et al., 2003), the three-step test of

mediation demonstrated that more work needs to investigate alternate models to determine the most appropriate predictive model.

5.1.2 Methodological Implications

5.1.2.1 Measurement of Social Relationships

Most of the existing social relationship instruments were developed for youth, and few measures of relatedness developed to date have become widely accepted and tested in a variety of samples. The lack of a measure of friendship quality that has been validated with adults in a physical activity context was indeed a limitation of this study. The Sport Friendship Quality Scale is a well-designed instrument that demonstrates acceptable reliability and validity among youth, although some inconsistencies have been found in the factor structure of the scale between studies (McDonough & Crocker, 2005; Weiss & Smith, 1999, 2002). These problems with factor structure were even more pronounced in this study. While the SFQS provided an acceptable index of friendship quality for the purposes of this work, future research is needed to adapt or create new measures to assess friendship quality in adult sport.

5.1.2.2 Measurement of Psychological Needs

One of the major problems in testing hypotheses about the role of relatedness in the past has been the lack of a psychometrically sound measure of relatedness developed within the framework of SDT. Most prior research has used scales that are limited by problems with content validity of the items in the sport context (Reeve & Sickenius, 1994), problems with translating scales constructed in languages other than English (Richer & Vallerand, 1998), or lack of psychometric evidence (Ntoumanis, 2001; Sheldon & Bettencourt, 2002). These limitations may already be diminishing, however, as the literature on social relationships is growing rapidly, and new measurement tools such as the PNSE (Wilson et al., in press) used in

this study may provide common, accepted measures to investigate these questions. Indeed, the PNSE demonstrated adequate psychometric properties in this study.

5.1.2.3 Testing Mediation

A major concern raised by this study is the lack of true tests of mediation in studies testing motivational processes from an SDT perspective. A review of the literature yields support for the motivational sequence outlined by Vallerand and Losier (Vallerand & Losier, 1999). Empirical studies have shown that the mediator model fits well (Kowal & Fortier, 2000; Li, 1999; Ntoumanis, 2001; Sarrazin et al., 2002; Standage et al., 2003). However, no previous work has tested the mediation hypothesis adequately. It is necessary to use the three-step modeling approach advocated by Holmbeck (1997) in the structural equation modeling literature or Baron and Kenny (Baron & Kenny, 1986) in the multiple regression literature to fully demonstrate mediation. More work testing the motivational sequence proposed by SDT needs to use these methods to better explore whether self-determination acts as a full or partial mediator or whether direct effects models are more useful.

5.1.2.4 Modeling Within-Team Clustering of Social and Motivational Variables

While the sample size in Study 2 limited the types of mixed effects modeling tests that could be done with this data, the simple baseline model and test of intraclass correlation demonstrated that within-team clustering of relatedness and self-determination was considerable. This finding suggests that hierarchical forms of mixed effect modeling may be useful in studies examining social and motivational variables in the sport context, as these variables seem to have substantial within-team dependence. As the literature on social relationships in physical activity expands, it will become increasingly important to use statistical methodologies that account for clustering that is inherent in sport and in social relationships more generally. Mixed effects modeling allows researchers to model within-team

clustering, as well as investigate both individual level and group-level effects simultaneously. These methods place high demands on sample size both at the individual and the team levels, and so are not practical or appropriate for all types of studies. When they are employable, however, they help to minimize inflated alpha levels resulting from interdependent data (J. Cohen et al., 2003) and provide a more sophisticated analysis of individual and group level effects.

5.1.3 Practical Implications

The practical implication of this research is essentially that since relatedness matters in motivational processes among adult dragon boaters, more attention needs to be placed on social experiences of participants in order to contribute to motivation and positive affect. The evidence did not demonstrate a causal link or that social and motivational experiences could be facilitated through cooperative learning strategies. The evidence does suggest, however, that these links are plausible, and that more research is needed in this area to demonstrate or refute a causal link, and to examine intervention strategies that operate on social and motivational processes in this population. Although the research on social processes in adult sport is still at a relatively early stage, coaches, participants, and organizers should be aware that social processes on their teams can matter, and that participants who have more positive social experiences tend to be more motivated and have more positive affect associated with participation.

5.1.4 Future Research Recommendations

The present findings lead to suggestions for future work in the area of social and motivational processes among adults participating in sport and exercise programs. More investigations are needed into the questions of whether there is a causal relationship between relatedness and self-determined motivation, and to further knowledge about the characteristics

of participants and physical activity contexts where relatedness may play a more critical role in understanding and facilitating motivation. The questions investigated here regarding the role of social relationships in predicting relatedness could be expanded by incorporating other conceptualizations of social relationships such as sociometric status, popularity, cohesion and many other social variables not fully investigated here. Social relationships are complex, and a more thorough understanding of what they mean to adults and how they influence motivation will likely require the synthesis of knowledge from many conceptual perspectives. As mentioned previously, more complete tests of mediation are needed to investigate the role of self-determined motivation in the motivational process. Finally, methods of social intervention need to be created and tested, particularly if a causal link between relatedness and motivation and other affective and behavioural outcomes can be established to provide practical tools to help adults maintain participation and achieve desired affective outcomes.

5.1.5 Concluding Remarks.

In sum, this project is an initial step in addressing the need to expand research on relatedness from an SDT perspective (Frederick-Recascino, 2002) and to explore the effects of the immediate social environment on adult physical activity motivation. Clearly, social aspects are not the only predictors of motivation and activity, but they are important, and a more complete understanding of when and why they matter, and whether it is possible to change them to enhance motivation and activity levels may prove to be an effective strategy to fill in the gaps in the wider picture of adults' motivation to be active.

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APPENDIX A

Study 1 Initial Contact Letter

APPENDIX B

Study 1 Consent Form

The University of British Columbia

School of Human Kinetics

210 War Memorial Gym,
6081 University Boulevard
Vancouver, B.C. V6T 1Z1
Phone: (604) 822-0219

The Role of Relatedness in Physical Activity Motivation, Behaviour, and Affective Experiences: A Self-Determination Theory Perspective

Consent Form

Principal Investigator:
Peter R.E. Crocker, PhD
School of Human Kinetics
(604) 822-5580

Co-Investigator:
Meghan McDonough, PhD candidate
School of Human Kinetics
(604) 822-0219

Purpose:
The purpose of this study is to examine the relationships between social relationships and motivation, exercise behaviour, and affective experiences in dragon boating. You are being invited to take part in this research because you are a dragon boat participant over the age of 19. This research is part of the requirements of a doctoral degree, and results will be included in a doctoral dissertation by the co-investigator. This research is funded by doctoral fellowships from the Social Sciences and Humanities Research Council of Canada and the Michael Smith Foundation for Health Research.

Study Procedures:
- You will be asked to complete one questionnaire. The questionnaire will take approximately 30-40 minutes to complete. When you have completed it, please return it to the researcher.
- Please read the instructions provided in each section of the questionnaire and answer all items on the questionnaire honestly. There are no right or wrong answers to any of the questions.

Confidentiality
Information gathered in the questionnaires will be used for research purposes only. Any information that could be used to identify you or your dragon boat team will be kept confidential. Results of this study will be analyzed in group form and will be used only in the preparation of academic research publications and presentations. No persons other than the members of the research team will have access to the completed questionnaires, or any other supporting documentation, which will be securely stored for a minimum of five years as required by The University of British Columbia guidelines.

Benefits and Risks to Participants:
There are no known benefits or risks associated with participating in this study.

Contact information about the study:
If you have any questions or desire further information with respect to this study, you may contact Peter Crocker at (604) 822-5580 or Meghan McDonough at (604) 822-0219. A summary of the results of this study will be available to you upon request.

Contact for concerns about the rights of research subjects:
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

Consent:
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time with absolutely no penalty.

If you complete the questionnaire, it will be assumed that

- You have been informed of the objectives and procedures of this research study, as outlined above
- You have received a copy of this consent form for your records
- You consent to participate in this project, as outlined above.

APPENDIX C

Study 1 Questionnaire Package

C-1: Social Support Survey

C-2: Peer Acceptance Scale

C-3: Sport Friendship Quality Scale

C-4: Psychological Need Satisfaction Scale

C-5: Behavioural Regulation for Exercise Scale

C-6: Positive and Negative Affect Schedule

C-7: Physical Self-Worth Scale

C-8: Leisure Time Exercise Questionnaire

C-9: Demographic Questions

C-1: Social Support Survey

The following questions focus on individuals in your environment ***who provide you with help and/or support for your dragon boating.***

1. **Read the definition** of the type of support being considered in each question.
2. Think of all of the people in your life who provide you with that type of support for your dragon boating. These people can be inside and outside of dragon boat (such as a spouse, friend, parent, sibling, teammate, colleague, coach, etc.). **Write the initials of those people** in the space provided. **If you don't know of anyone who provides you with that type of support for your exercise, write "no one" in the space.**
3. For each person you identify in a category, **indicate the relation of that person to you** (i.e. spouse, friend, teammate, etc.), and indicate how much of that kind of support they give you by marking the appropriate box.
4. **At the bottom of each section, indicate how much of that type of support you receive overall.**

Information Support: People who provide you with advice or guidance concerning possible solutions to a problem related to your dragon boating.

	Initials of person	Relation to the person	Receive very little	Receive a little	Receive some	Receive quite a bit	Receive very much
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much <u>information</u> support do you receive from others?			☐	☐	☐	☐	☐

Emotional Support: People who you could turn to for comfort and security and lead you to feel that they are on your side in terms of your dragon boating							
	Initials of person	**Relation to the person**	**Receive very little**	**Receive a little**	**Receive some**	**Receive quite a bit**	**Receive very much**
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much <u>emotional</u> support do you receive from others?			☐	☐	☐	☐	☐

Esteem Support: People who bolster your sense of your own dragon boat ability. For example, these people give you positive feedback, compliment your ability, and publicly recognize your efforts.

	Initials of person	Relation to the person	Receive very little	Receive a little	Receive some	Receive quite a bit	Receive very much
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much esteem support do you receive from others?			☐	☐	☐	☐	☐

Tangible Support: People who share resources with you to help you manage difficult situations related to dragon boat. For example, loan or provide money, physically help with tasks, drive you to practice, and talk to others for you.

	Initials of person	Relation to the person	Receive very little	Receive a little	Receive some	Receive quite a bit	Receive very much
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much tangible support do you receive from others?			☐	☐	☐	☐	☐

C-2: Peer Acceptance Scale

The following are statements that allow you to describe yourself. Please read the entire sentence across.

First decide which one of the two parts of each statement best describes you;
Then go to that side of the statement and check whether that is just sort of true for you or really true for you.
You will check just ONE of the four boxes for each statement.

SAMPLE QUESTION:

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
☐	☐	Some people like to watch television.	**BUT**	Other people do not like to watch television.	☑	☐

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
1.	☐	☐	Some people are not satisfied with their social skills in dragon boat	**BUT**	Other people think their social skills in dragon boat are just fine	☐	☐
2.	☐	☐	Some people find it hard to make new friends in dragon boat	**BUT**	Other people are able to make new friends easily in dragon boat	☐	☐
3.	☐	☐	Some people like the way they interact with other people in dragon boat	**BUT**	Other people wish their interactions with other people in dragon boat were different	☐	☐
4.	☐	☐	Some people feel that they are socially accepted by many people in dragon boat	**BUT**	Other people wish more people accepted them in dragon boat	☐	☐

C-3: Sport Friendship Quality Scale

The items below have to do with you and a person you consider to be ***your best friend in dragon boat***. Think ***only*** about this individual as you answer the questions. They are about what you and your friend may do or say with each other. Think of the best friend you have in dragon boat. Write that person's first name or initials below:

My best friend in dragon boat is: _____

Check the answer below each statement that best indicates how you feel about you and ***the friend you named.***

	Not at all true	**A little true**	**Somewhat true**	**Pretty true**	**Really true**
1. My friend gives me a second chance to perform a skill	☐	☐	☐	☐	☐
2. My friend and I can talk about anything	☐	☐	☐	☐	☐
3. My friend and I have common interests	☐	☐	☐	☐	☐
4. My friend and I do fun things	☐	☐	☐	☐	☐
5. My friend and I make up easily when we have a fight	☐	☐	☐	☐	☐
6. My friend and I get mad at each other	☐	☐	☐	☐	☐
7. My friend and I praise each other for doing dragon boat well	☐	☐	☐	☐	☐
8. My friend and I stick up for each other in dragon boat	☐	☐	☐	☐	☐
9. My friend and I do similar things	☐	☐	☐	☐	☐
10. I like to dragon boat with my friend	☐	☐	☐	☐	☐

	Not at all true	A little true	Somewhat true	Pretty true	Really true
11. My friend and I try to work things out when we disagree	☐	☐	☐	☐	☐
12. My friend and I fight	☐	☐	☐	☐	☐
13. My friend looks out for me	☐	☐	☐	☐	☐
14. After I make mistakes, my friend encourages me	☐	☐	☐	☐	☐
15. My friend and I have the same values	☐	☐	☐	☐	☐
16. When we have an argument, my friend and I talk about how to reach a solution	☐	☐	☐	☐	☐
17. My friend and I dragon boat well together	☐	☐	☐	☐	☐
18. My friend and I have arguments	☐	☐	☐	☐	☐
19. My friend and I think the same way	☐	☐	☐	☐	☐
20. My friend and I tell each other secrets	☐	☐	☐	☐	☐
21. My friend and I spend time together	☐	☐	☐	☐	☐
22. My friend has confidence in me during dragon boat	☐	☐	☐	☐	☐

C-4: Psychological Need Satisfaction Scale

The following statements represent different experiences people have when they exercise. ***Please answer the following questions by considering how YOU TYPICALLY feel while you are dragon boating.***

	False	Mostly false	More false than true	More true than false	Mostly true	True
1. I feel that I am able to complete dragon boat activities that are personally challenging	☐	☐	☐	☐	☐	☐
2. I feel attached to my dragon boat companions because they accept me for who I am	☐	☐	☐	☐	☐	☐
3. I feel like I share a common bond with people who are important to me when we dragon boat together	☐	☐	☐	☐	☐	☐
4. I feel confident I can do even the most challenging dragon boat activities	☐	☐	☐	☐	☐	☐
5. I feel a sense of camaraderie with my dragon boat companions because we dragon boat for the	☐	☐	☐	☐	☐	☐
6. I feel confident in my ability to perform dragon boat activities that personally challenge me	☐	☐	☐	☐	☐	☐
7. I feel close to my dragon boat companions who appreciate how difficult dragon boat can be	☐	☐	☐	☐	☐	☐
8. I feel free to dragon boat in my own way	☐	☐	☐	☐	☐	☐
9. I feel free to make my own dragon boat program decisions	☐	☐	☐	☐	☐	☐

	False	Mostly false	More false than true	More true than false	Mostly true	True
10. I feel capable of completing dragon boat activities that are challenging to me	☐	☐	☐	☐	☐	☐
11. I feel like I am in charge of my dragon boat program decisions	☐	☐	☐	☐	☐	☐
12. I feel like I am capable of doing even the most challenging dragon boat exercises	☐	☐	☐	☐	☐	☐
13. I feel like I have a say in choosing the dragon boat activities that I do	☐	☐	☐	☐	☐	☐
14. I feel connected to the people who I interact with while we dragon boat together	☐	☐	☐	☐	☐	☐
15. I feel good about the way I am able to complete challenging dragon boat activities	☐	☐	☐	☐	☐	☐
16. I feel like I get along well with other people who I interact with while we dragon boat together	☐	☐	☐	☐	☐	☐
17. I feel free to choose which dragon boat activities I participate in	☐	☐	☐	☐	☐	☐
18. I feel like I am the one who decides what dragon boat activities I do	☐	☐	☐	☐	☐	☐

C-5: Behavioural Regulation for Exercise Scale

The following list identifies reasons why people dragon boat. **Please indicate on the scale provided how true each statement is for YOU.**

	Not true for me	Sometimes true for me	Moderately true for me	Often true for me	Very true for me
1. I get restless if I don't dragon boat regularly	☐	☐	☐	☐	☐
2. I think it is important to make the effort to dragon boat regularly	☐	☐	☐	☐	☐
3. I find dragon boat a pleasurable activity	☐	☐	☐	☐	☐
4. It's important to me to dragon boat regularly	☐	☐	☐	☐	☐
5. I get pleasure and satisfaction from participating in dragon boat	☐	☐	☐	☐	☐
6. I feel under pressure from my friends/family to dragon boat	☐	☐	☐	☐	☐
7. I dragon boat because it's fun	☐	☐	☐	☐	☐
8. I dragon boat because other people say I should	☐	☐	☐	☐	☐
9. I feel ashamed when I miss a dragon boat session	☐	☐	☐	☐	☐
10. I dragon boat because others will not be pleased with me if I don't	☐	☐	☐	☐	☐
11. I enjoy my dragon boat sessions	☐	☐	☐	☐	☐
12. I feel guilty when I don't dragon boat	☐	☐	☐	☐	☐
13. I take part in dragon boat because my friends/family/spouse say I should	☐	☐	☐	☐	☐
14. I value the benefits of dragon boat	☐	☐	☐	☐	☐
15. I feel like a failure when I haven't dragon boated in a while	☐	☐	☐	☐	☐

C-6: Positive and Negative Affect Schedule

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. ***Indicate to what extent you typically feel this way during dragon boat.*** Use the following scale to record your answers.

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1. Interested	☐	☐	☐	☐	☐
2. Irritable	☐	☐	☐	☐	☐
3. Distressed	☐	☐	☐	☐	☐
4. Alert	☐	☐	☐	☐	☐
5. Excited	☐	☐	☐	☐	☐
6. Ashamed	☐	☐	☐	☐	☐
7. Upset	☐	☐	☐	☐	☐
8. Inspired	☐	☐	☐	☐	☐
9. Strong	☐	☐	☐	☐	☐
10. Nervous	☐	☐	☐	☐	☐
11. Guilty	☐	☐	☐	☐	☐
12. Determined	☐	☐	☐	☐	☐
13. Scared	☐	☐	☐	☐	☐
14. Attentive	☐	☐	☐	☐	☐
15. Hostile	☐	☐	☐	☐	☐
16. Jittery	☐	☐	☐	☐	☐
17. Enthusiastic	☐	☐	☐	☐	☐
18. Active	☐	☐	☐	☐	☐
19. Proud	☐	☐	☐	☐	☐
20. Afraid	☐	☐	☐	☐	☐

C-7: Physical Self-Worth Scale

In the following questions you will be asked to think about yourself physically. **Answer each sentence quickly as you feel now.**

	False	**Mostly False**	**More False Than True**	**More True Than False**	**Mostly True**	**True**
1. I am satisfied with the kind of person I am physically.	☐	☐	☐	☐	☐	☐
2. Physically I am happy with myself	☐	☐	☐	☐	☐	☐
3. I feel good about the way that I look and what I can do physically	☐	☐	☐	☐	☐	☐
4. Physically I feel good about myself.	☐	☐	☐	☐	☐	☐
5. I feel good about who I am and what I can do physically	☐	☐	☐	☐	☐	☐
6. I feel good about who I am physically	☐	☐	☐	☐	☐	☐

C-8: Leisure Time Exercise Questionnaire

1. **Considering a 7-day period (a week), how many times on the average do you do the following kinds of exercise for *more than 15 minutes* during your free time? (write on each line the appropriate number).**

   (For example, if you jog for 30 minutes five days a week, you would write **5** on the strenuous exercise line)

	TIMES PER WEEK
a) **STRENUOUS EXERCISE (HEART BEATS RAPIDLY)** (i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)	_____
b) **MODERATE EXERCISE (NOT EXHAUSTING)** (i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	_____
c) **MILD EXERCISE (MINIMAL EFFORT)** (i.e. yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)	_____

2. Considering a **7-day period** (a week), during your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)? Please check **one** answer.

   ☐ OFTEN

   ☐ SOMETIMES

   ☐ NEVER/RARELY

C-9: Demographic Questions

1. Age (years) _____

2. Sex ☐ Male ☐ Female

3. Postal Code _____

4. Ethnicity (check all those that apply)

   ☐ Caucasian
   ☐ Asian
   ☐ Hispanic
   ☐ First Nations/Aboriginal
   ☐ African
   ☐ Other. Please specify: _____

5. What is your highest level of education? _____

6. Are you currently employed? If so, describe your occupation _____

   _____

7. What is your dragon boat team name? _____

8. How long have you been a member of this team? _____

9. How long have you been participating in dragon boat (including on this team, or any other team)? _____

10. How many times per week does your current team practice? _____

11. How many months per year does your current team practice? _____

APPENDIX D

Study 2 Initial Contact Letter

The University of British Columbia

School of Human Kinetics

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Meghan H. McDonough, M.Sc.
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Rm. 210, War Memorial Gym
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Vancouver, BC V6T 1Z1

The Role of Relatedness in Physical Activity Motivation, Behaviour, and Affective Experiences: Cooperative and Individualistic Learning Interventions

Dear Coach,

We are writing to request your cooperation and support on a research project. We are conducting an in-depth study to examine the relationships between social relationships and motivation, exercise behaviour, and affective experiences in dragon boating. Results of this research will provide valuable information to help design more effective physical activity programs for adults.

This study involves comparing the effect of two learning structures (cooperative and individualistic) employed by coaches on participants' social interactions, motivation, physical activity behaviour, and affective experiences.

(1) Coaches participating in this study will be randomly assigned to one of two conditions, cooperative or individualistic, by flipping a coin.
(2) Athletes on these coaches' teams will be recruited to participate in the project via a short (5 minute) presentation by the researcher at a practice to explain and answer questions about the study, and distribute consent forms to interested athletes.
(3) At a subsequent practice, the researcher will collect completed consent forms and administer questionnaires to athletes who volunteer for the study. Questionnaires take approximately 30-35 minutes to complete, and can be done before or after a practice, whatever is most convenient for each team.
(4) Coaches will then complete a one-hour module instructing them in about how to structure their practices based on their randomly assigned condition, and will complete a 3-5 minute feedback form about this session. Cooperative learning structures are activities that involve athletes working together to achieve common goals. Individualistic learning structures are activities that involve athletes working at their own level to achieve individual improvement. Coaches will be asked to structure their practices for eight weeks in accordance with the intervention procedures they learned, and keep a log of this on forms

APPENDIX E

Study 2 Coach Consent Form

The University of British Columbia

School of Human Kinetics

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Phone: (604) 822-0219

The Role of Relatedness in Physical Activity Motivation, Behaviour, and Affective Experiences: Cooperative and Individualistic Learning Interventions

Consent Form: Coaches

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Co-Investigator:
Meghan H. McDonough, Ph.D. student
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(604) 822-0219

Purpose:
The purpose of this study is to examine the effects of cooperative versus individualistic learning structures on social relationships, motivation, exercise behaviour, and affective experiences in dragon boating. We are asking for your participation in this research to help us assess the role of these variables in adults' sport experience, and to design more effective physical activity programs.
You are being invited to take part in this research because you are the coach of an adult dragon boat team. This research is part of the requirements of a doctoral degree, and results will be included in a doctoral dissertation by the co-investigator. This research is funded by doctoral fellowships from the Social Sciences and Humanities Research Council of Canada and the Michael Smith Foundation for Health Research.

Study Procedures:
- Your team will be randomly assigned to one of two conditions, cooperative learning or individualistic learning, by the researcher flipping a coin.
- You will be asked to allow the researcher to make a short (5 min.) presentation to the athletes on your team at one of your practices to describe the study, answer any questions, and distribute consent forms to athletes interested in participating.
- Athletes who volunteer to participate in the study will be asked to complete two questionnaires administered before or after a dragon boat practice: one at the beginning, and one at the end of an eight week period. The questionnaires will take approximately 30-35 minutes each to complete.

- Once athletes on your team have completed the first questionnaire, you will be asked to complete a 1 hour training module on how to structure your dragon boat practices using either a cooperative or an individualistic learning structure, based on the random assignment of your team described above. Cooperative learning structures are activities that involve athletes working together to achieve common goals. Individualistic learning structures are activities that involve athletes working at their own level to achieve individual improvement. This training module will be provided at a time and location that is convenient for you, within 1 week of the administration of the first questionnaire. The intervention is concerned with the structure of practices, and will not interfere with your plans for the workload or intensity of your team's training, or the technical components of your coaching.
- You will be asked to complete a 3-5 minute feedback form at the end of the training session.
- Your will be asked to incorporate the components of the training module into your practices, and keep a log of this for each practice. You will be provided with planning and log sheets that you will be asked to complete and return to the researcher at the end of the eight week period.
- You will be encouraged to contact the researcher at any point during the eight weeks if you have any questions regarding completing the intervention, or the study in general. In addition, the researcher will contact you by telephone each week during the eight week intervention to ask how the intervention is going, and whether you have any questions or feedback about the study.
- You will be asked to record the attendance of athletes on your team who are participating in this study during the eight week period, and provide this information to the researchers.
- At the end of the eight week period, participating members of your team will be asked to complete the second questionnaire. At this time, you will also be asked to complete a 5 minute questionnaire about your feedback about the program as a whole.
- When the study is completed, you will be given the option of completing the training module that you did not use during the study, if you wish.
- <u>In total, your participation in this project will involve the completion of the one hour education module, incorporating this knowledge into your practices, and completing the planning and log sheets (approximately 10 minutes per practice).</u>

Confidentiality

Information gathered from you in the planning and log sheets will be used for research purposes only. Any information that could be used to identify you, your dragon boat team, or any other participant in the study will be kept confidential. You are asked not to discuss the information provided to you in the training module with individuals outside of your team until after the study is complete. Results of this study will be analyzed in group form and will be used only in the preparation of academic research publications and presentations. No persons other than the members of the research team will have access to the completed questionnaires, or any other supporting documentation, which will be securely stored for a minimum of five years as required by The University of British Columbia guidelines.

Risks and Benefits

- You may benefit through your involvement in this study by developing an increased awareness of cooperative and individualistic learning structures, which may provide you with new ideas for planning practices and teaching skills in your role as a dragon boat coach.
- Athletes may or may not benefit from participation from this study, but may experience improved focus in practice, facilitated learning of skills, improved interpersonal interactions with team-mates, and improved motivation and positive affective experiences related to dragon boating.
- There are no known risks to participating in this research for either coaches or athletes.

Remuneration/Compensation:

In order to thank teams for their efforts in participating in this project, all participating teams will be offered a free one hour mental training workshop on a topic relevant to the team after the end of the eight week period. This workshop will be open to all team members even if they do not participate in the study or choose to withdraw from the study at any point.

Contact information about the study:

If you have any questions or desire further information with respect to this study, you may contact Peter Crocker at (604) 822-5580 or Meghan McDonough at (604) 822-0219. A summary of the results of this study will be available to you upon request.

Contact for concerns about the rights of research subjects:

If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

Consent:
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time with absolutely no penalty.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

Signature (participant):_____ **Date:** _____

Print Name (participant):_____

APPENDIX F

Study 2 Paddler Consent Form: Cooperative Learning Condition

The University of British Columbia

School of Human Kinetics

210 War Memorial Gym,
6081 University Boulevard
Vancouver, B.C. V6T 1Z1
Phone: (604) 822-0219

The Role of Relatedness in Physical Activity Motivation, Behaviour, and Affective Experiences: Cooperative and Individualistic Learning Interventions

Consent Form: Athletes, Cooperative Learning Intervention

Principal Investigator:
Peter R.E. Crocker, Ph.D.
School of Human Kinetics
(604) 822-5580

Co-Investigator:
Meghan H. McDonough, Ph.D. student
School of Human Kinetics
(604) 822-0219

Purpose:
The purpose of this study is to examine the effects of cooperative versus individualistic learning structures on social relationships, motivation, exercise behaviour, and affective experiences in dragon boating. We are asking for your participation in this research to help us assess the role of these variables in adults' sport experience, and to design more effective physical activity programs.
You are being invited to take part in this research because you are a dragon boat participant over the age of 19. This research is part of the requirements of a doctoral degree, and results will be included in a doctoral dissertation by the co-investigator. This research is funded by doctoral fellowships from the Social Sciences and Humanities Research Council of Canada and the Michael Smith Foundation for Health Research.

Study Procedures:
- Teams whose coaches have volunteered to participate in this study have been randomly assigned to one of two conditions, cooperative learning or individualistic learning, by flipping a coin. Your team has been assigned the cooperative learning condition.
- If you choose to take part in this study, you will be asked to complete two questionnaires, one at the beginning, and one at the end of an eight week period. The questionnaires will take approximately 30-35 minutes each to complete.

- Once you have completed the first questionnaire, your coach will be given training on how to structure your dragon boat practices using a cooperative learning structure. Cooperative learning structures are activities that involve athletes working together to achieve common goals. Your coach will be applying this knowledge in structuring your practices during the eight week period, and providing the researchers with a log of how they applied that knowledge in each practice. This study is concerned with the structure of practices, and will not interfere with your coach's plans for the workload or intensity of your training, or the technical components of his or her coaching.
- If you participate in this study, your coach will be recording your attendance at each practice during the eight week period, and providing that information to the researchers.
- At the end of the eight week period, you will be asked to complete the second questionnaire, including a feedback form about the program.
- At the end of the study, your coach will be given the option of receiving instruction in the individualistic learning structure that your team was not assigned to in the study if he or she wishes.
- In total, your participation in this project will involve the completion of the two questionnaires, as well as taking part in your usual dragon boating practices.

Confidentiality

Information gathered in the questionnaires will be used for research purposes only. Any information that could be used to identify you, your dragon boat team, or any other participant in the study will be kept confidential You are asked not to discuss the information you provide in the questionnaire with other individuals. Results of this study will be analyzed in group form and will be used only in the preparation of academic research publications and presentations. No persons other than the members of the research team will have access to the completed questionnaires, or any other supporting documentation, which will be securely stored for a minimum of five years as required by The University of British Columbia guidelines.

Risks and Benefits

- You may or may not benefit from participation from this study, but may experience improved focus in practice, facilitated learning of skills, improved interpersonal interactions with team-mates, and improved motivation and positive affective experiences related to dragon boating.
- Your coach may benefit through your involvement in this study by developing an increased awareness of cooperative and individualistic learning structures, which may provide them with new ideas for planning practices and teaching skills in dragon boat.
- There are no known risks to participating in this research.

Remuneration/Compensation:
In order to thank teams for their efforts in participating in this project, all participating teams will be offered a free one hour mental training workshop on a topic relevant to the team after the end of the eight week period. This workshop will be open to all team members even if they do not participate in the study or choose to withdraw from the study at any point.

Contact information about the study:
If you have any questions or desire further information with respect to this study, you may contact Peter Crocker at (604) 822-5580 or Meghan McDonough at (604) 822-0219. A summary of the results of this study will be available to you upon request.

Contact for concerns about the rights of research subjects:
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

Consent:
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time with absolutely no penalty.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

Signature (participant):_____ **Date:** _____

Print Name (participant):_____

APPENDIX G

Study 2 Paddler Consent Form: Individualistic Learning Condition

The University of British Columbia

School of Human Kinetics

210 War Memorial Gym,
6081 University Boulevard
Vancouver, B.C. V6T 1Z1
Phone: (604) 822-0219

The Role of Relatedness in Physical Activity Motivation, Behaviour, and Affective Experiences: Cooperative and Individualistic Learning Interventions

Consent Form: Athletes, Individualistic Learning Intervention

Principal Investigator:
Peter R.E. Crocker, Ph.D.
School of Human Kinetics
(604) 822-5580

Co-Investigator:
Meghan H. McDonough, Ph.D. student
School of Human Kinetics
(604) 822-0219

Purpose:
The purpose of this study is to examine the effects of cooperative versus individualistic learning structures on social relationships, motivation, exercise behaviour, and affective experiences in dragon boating. We are asking for your participation in this research to help us assess the role of these variables in adults' sport experience, and to design more effective physical activity programs.
You are being invited to take part in this research because you are a dragon boat participant over the age of 19. This research is part of the requirements of a doctoral degree, and results will be included in a doctoral dissertation by the co-investigator. This research is funded by doctoral fellowships from the Social Sciences and Humanities Research Council of Canada and the Michael Smith Foundation for Health Research.

Study Procedures:
- Teams whose coaches have volunteered to participate in this study have been randomly assigned to one of two conditions, cooperative learning or individualistic learning, by drawing the names of teams from a hat. Your team has been assigned the individualistic learning condition.
- If you choose to take part in this study, you will be asked to complete two questionnaires, one at the beginning, and one at the end of an eight week period. The questionnaires will take approximately 30-35 minutes each to complete.

- Once you have completed the first questionnaire, your coach will be given training on how to structure your dragon boat practices using an individualistic learning structure. Individualistic learning structures are activities that involve athletes working at their own level to achieve individual improvement. Your coach will be applying this knowledge in structuring your practices during the eight week period, and providing the researchers with a log of how they applied that knowledge in each practice. This study is concerned with the structure of practices, and will not interfere with your coach's plans for the workload or intensity of your training, or the technical components of his or her coaching.
- If you participate in this study, your coach will be recording your attendance at each practice during the eight week period, and providing that information to the researchers.
- At the end of the eight week period, you will be asked to complete the second questionnaire, including a feedback form about the program.
- At the end of the study, your coach will be given the option of receiving instruction in the cooperative learning structure that your team was not assigned to in the study if he or she wishes.
- In total, your participation in this project will involve the completion of the two questionnaires, as well as taking part in your usual dragon boating practices.

Confidentiality

Information gathered in the questionnaires will be used for research purposes only. Any information that could be used to identify you, your dragon boat team, or any other participant in the study will be kept confidential You are asked not to discuss the information you provide in the questionnaire with other individuals. Results of this study will be analyzed in group form and will be used only in the preparation of academic research publications and presentations. No persons other than the members of the research team will have access to the completed questionnaires, or any other supporting documentation, which will be securely stored for a minimum of five years as required by The University of British Columbia guidelines.

Risks and Benefits

- You may or may not benefit from participation from this study, but may experience improved focus in practice, facilitated learning of skills, improved interpersonal interactions with team-mates, and improved motivation and positive affective experiences related to dragon boating.
- Your coach may benefit through your involvement in this study by developing an increased awareness of cooperative and individualistic learning structures, which may provide them with new ideas for planning practices and teaching skills in dragon boat.
- There are no known risks to participating in this research.

Remuneration/Compensation:
In order to thank teams for their efforts in participating in this project, all participating teams will be offered a free one hour mental training workshop on a topic relevant to the team after the end of the eight week period. This workshop will be open to all team members even if they do not participate in the study or choose to withdraw from the study at any point.

Contact information about the study:
If you have any questions or desire further information with respect to this study, you may contact Peter Crocker at (604) 822-5580 or Meghan McDonough at (604) 822-0219. A summary of the results of this study will be available to you upon request.

Contact for concerns about the rights of research subjects:
If you have any concerns about your treatment or rights as a research subject, you may contact the Research Subject Information Line in the UBC Office of Research Services at 604-822-8598.

Consent:
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time with absolutely no penalty.

Your signature below indicates that you have received a copy of this consent form for your own records.

Your signature indicates that you consent to participate in this study.

Signature (participant):_____ **Date:** _____

Print Name (participant):_____

APPENDIX H

Study 2 Questionnaire Package

H-1: Social Support Survey

H-2: Peer Acceptance Scale

H-3: Sport Friendship Quality Scale

H-4: Psychological Need Satisfaction Scale

H-5: Behavioural Regulation for Exercise Scale

H-6: Positive and Negative Affect Schedule

H-7: Physical Self-Worth Scale

H-8: Group Environment Questionnaire (Social Subscales)

H-9: Perceived Motivational Climate in Sport Scale-2 (Mastery Climate Subscales)

H-10: Demographic Questions

The Role of Relatedness in Physical Activity Motivation, Behavior, and Affective Experiences: Cooperative and Individualistic Learning Interventions

Meghan McDonough, M.Sc. & Peter Crocker, Ph.D.
(604) 822-0219

The purpose of this questionnaire is to gather information on your social relationships, motivation, exercise behaviour, and affective experiences in dragon boating. Collecting this data will help us to assess the role of these variables in adults' sport experience, and to design more effective physical activity programs.

This questionnaire booklet contains 16 pages including this cover page. It will take **approximately 30-35 minutes to complete**. Please carefully read the instructions at the top of each section as they change throughout the questionnaire. Also, please review your questionnaire at the end to be sure you completed all questions.

All of your responses will remain confidential. No persons other than the members of the research team will have access to your responses.

There are no right or wrong answers. Be as honest and as accurate as you can be.
When you have completed the questionnaire, please return it to the researcher.
You may choose not to participate in this study at any point without penalty.

H-1: Social Support Survey

Your Name:_____

The following questions focus on individuals in your environment ***who provide you with help and/or support for your dragon boating.***

1. **Read the definition** of the type of support being considered in each question.
2. Think of all of the people in your life who provide you with that type of support for your dragon boating. These people can be inside and outside of dragon boat (such as a spouse, friend, parent, sibling, teammate, colleague, coach, etc.). **Write the initials of those people** in the space provided. **If you don't know of anyone who provides you with that type of support for your exercise, write "no one" in the space**.
3. For each person you identify in a category, **indicate the relation of that person to you** (i.e. spouse, friend, teammate, etc.), and indicate how much of that kind of support they give you by marking the appropriate box.
4. **At the bottom of each section, indicate how much of that type of support you receive overall.**

Information Support: People who provide you with advice or guidance concerning possible solutions to a problem related to your dragon boating.

	Initials of person	Relation to the person	Receive very little	Receive a little	Receive some	Receive quite a bit	Receive very much
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much <u>information</u> support do you receive from others?			☐	☐	☐	☐	☐

Emotional Support: People who you could turn to for comfort and security and lead you to feel that they are on your side in terms of your dragon boating							
	Initials of person	**Relation to the person**	**Receive very little**	**Receive a little**	**Receive some**	**Receive quite a bit**	**Receive very much**
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much <u>emotional</u> support do you receive from others?			☐	☐	☐	☐	☐

Esteem Support: People who bolster your sense of your own dragon boat ability. For example, these people give you positive feedback, compliment your ability, and publicly recognize your efforts.

	Initials of person	Relation to the person	Receive very little	Receive a little	Receive some	Receive quite a bit	Receive very much
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much esteem support do you receive from others?			☐	☐	☐	☐	☐

Tangible Support: People who share resources with you to help you manage difficult situations related to dragon boat. For example, loan or provide money, physically help with tasks, drive you to practice, and talk to others for you.							
	Initials of person	**Relation to the person**	**Receive very little**	**Receive a little**	**Receive some**	**Receive quite a bit**	**Receive very much**
a.			☐	☐	☐	☐	☐
b.			☐	☐	☐	☐	☐
c.			☐	☐	☐	☐	☐
d.			☐	☐	☐	☐	☐
e.			☐	☐	☐	☐	☐
f.			☐	☐	☐	☐	☐
g.			☐	☐	☐	☐	☐
h.			☐	☐	☐	☐	☐
Overall, how much tangible support do you receive from others?			☐	☐	☐	☐	☐

H-2: Peer Acceptance Scale

The following are statements that allow you to describe yourself. Please read the entire sentence across.

First decide which one of the two parts of each statement best describes you;
Then go to that side of the statement and check whether that is just sort of true for you or really true for you.
You will check just ONE of the four boxes for each statement.

SAMPLE QUESTION:

Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
☐	☐	Some people like to watch television.	**BUT**	Other people do not like to watch television.	☑	☐

	Really True for Me	Sort of True for Me				Sort of True for Me	Really True for Me
1.	☐	☐	Some people are not satisfied with their social skills in dragon boat	**BUT**	Other people think their social skills in dragon boat are just fine	☐	☐
2.	☐	☐	Some people find it hard to make new friends in dragon boat	**BUT**	Other people are able to make new friends easily in dragon boat	☐	☐
3.	☐	☐	Some people like the way they interact with other people in dragon boat	**BUT**	Other people wish their interactions with other people in dragon boat were different	☐	☐
4.	☐	☐	Some people feel that they are socially accepted by many people in dragon boat	**BUT**	Other people wish more people accepted them in dragon boat	☐	☐

H-3: Sport Friendship Quality Scale

The items below have to do with you and a person you consider to be ***your best friend in dragon boat***. Think ***only*** about this individual as you answer the questions. They are about what you and your friend may do or say with each other. Think of the best friend you have in dragon boat. Write that person's first name or initials below:

My best friend in dragon boat is: _____

Check the answer below each statement that best indicates how you feel about you and ***the friend you named.***

	Not at all true	**A little true**	**Somewhat true**	**Pretty true**	**Really true**
1. My friend gives me a second chance to perform a skill	☐	☐	☐	☐	☐
2. My friend and I can talk about anything	☐	☐	☐	☐	☐
3. My friend and I have common interests	☐	☐	☐	☐	☐
4. My friend and I do fun things	☐	☐	☐	☐	☐
5. My friend and I make up easily when we have a fight	☐	☐	☐	☐	☐
6. My friend and I get mad at each other	☐	☐	☐	☐	☐
7. My friend and I praise each other for doing dragon boat well	☐	☐	☐	☐	☐
8. My friend and I stick up for each other in dragon boat	☐	☐	☐	☐	☐
9. My friend and I do similar things	☐	☐	☐	☐	☐
10. I like to dragon boat with my friend	☐	☐	☐	☐	☐
11. My friend and I try to work things out when we disagree	☐	☐	☐	☐	☐

	Not at all true	A little true	Somewhat true	Pretty true	Really true
12. My friend and I fight	☐	☐	☐	☐	☐
13. My friend looks out for me	☐	☐	☐	☐	☐
14. After I make mistakes, my friend encourages me	☐	☐	☐	☐	☐
15. My friend and I have the same values	☐	☐	☐	☐	☐
16. When we have an argument, my friend and I talk about how to reach a solution	☐	☐	☐	☐	☐
17. My friend and I dragon boat well together	☐	☐	☐	☐	☐
18. My friend and I have arguments	☐	☐	☐	☐	☐
19. My friend and I think the same way	☐	☐	☐	☐	☐
20. My friend and I tell each other secrets	☐	☐	☐	☐	☐
21. My friend and I spend time together	☐	☐	☐	☐	☐
22. My friend has confidence in me during dragon boat	☐	☐	☐	☐	☐

H-4: Psychological Need Satisfaction Scale

The following statements represent different experiences people have when they exercise. ***Please answer the following questions by considering how YOU TYPICALLY feel while you are dragon boating.***

	False	Mostly false	More false than true	More true than false	Mostly true	True
1. I feel that I am able to complete dragon boat activities that are personally challenging	☐	☐	☐	☐	☐	☐
2. I feel attached to my dragon boat companions because they accept me for who I am	☐	☐	☐	☐	☐	☐
3. I feel like I share a common bond with people who are important to me when we dragon boat together	☐	☐	☐	☐	☐	☐
4. I feel confident I can do even the most challenging dragon boat activities	☐	☐	☐	☐	☐	☐
5. I feel a sense of camaraderie with my dragon boat companions because we dragon boat for the same reasons	☐	☐	☐	☐	☐	☐
6. I feel confident in my ability to perform dragon boat activities that personally challenge me	☐	☐	☐	☐	☐	☐
7. I feel close to my dragon boat companions who appreciate how difficult dragon boat can be	☐	☐	☐	☐	☐	☐
8. I feel free to dragon boat in my own way	☐	☐	☐	☐	☐	☐
9. I feel free to make my own dragon boat program decisions	☐	☐	☐	☐	☐	☐

	False	Mostly false	More false than true	More true than false	Mostly true	True
10. I feel capable of completing dragon boat activities that are challenging to me	☐	☐	☐	☐	☐	☐
11. I feel like I am in charge of my dragon boat program decisions	☐	☐	☐	☐	☐	☐
12. I feel like I am capable of doing even the most challenging dragon boat exercises	☐	☐	☐	☐	☐	☐
13. I feel like I have a say in choosing the dragon boat activities that I do	☐	☐	☐	☐	☐	☐
14. I feel connected to the people who I interact with while we dragon boat together	☐	☐	☐	☐	☐	☐
15. I feel good about the way I am able to complete challenging dragon boat activities	☐	☐	☐	☐	☐	☐
16. I feel like I get along well with other people who I interact with while we dragon boat together	☐	☐	☐	☐	☐	☐
17. I feel free to choose which dragon boat activities I participate in	☐	☐	☐	☐	☐	☐
18. I feel like I am the one who decides what dragon boat activities I do	☐	☐	☐	☐	☐	☐

H-5: Behavioural Regulation for Exercise Scale

The following list identifies reasons why people dragon boat. **Please indicate on the scale provided how true each statement is for YOU.**

	Not true for me	Sometimes true for me	Moderately true for me	Often true for me	Very true for me
1. I get restless if I don't dragon boat regularly	☐	☐	☐	☐	☐
2. I think it is important to make the effort to dragon boat regularly	☐	☐	☐	☐	☐
3. I find dragon boat a pleasurable activity	☐	☐	☐	☐	☐
4. It's important to me to dragon boat regularly	☐	☐	☐	☐	☐
5. I get pleasure and satisfaction from participating in dragon boat	☐	☐	☐	☐	☐
6. I feel under pressure from my friends/family to dragon boat	☐	☐	☐	☐	☐
7. I dragon boat because it's fun	☐	☐	☐	☐	☐
8. I dragon boat because other people say I should	☐	☐	☐	☐	☐
9. I feel ashamed when I miss a dragon boat session	☐	☐	☐	☐	☐
10. I dragon boat because others will not be pleased with me if I don't	☐	☐	☐	☐	☐
11. I enjoy my dragon boat sessions	☐	☐	☐	☐	☐
12. I feel guilty when I don't dragon boat	☐	☐	☐	☐	☐
13. I take part in dragon boat because my friends/family/spouse say I should	☐	☐	☐	☐	☐
14. I value the benefits of dragon boat	☐	☐	☐	☐	☐
15. I feel like a failure when I haven't dragon boated in a while	☐	☐	☐	☐	☐

H-6: Positive and Negative Affect Schedule

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. ***Indicate to what extent you typically feel this way during dragon boat.*** Use the following scale to record your answers.

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1. Interested	☐	☐	☐	☐	☐
2. Irritable	☐	☐	☐	☐	☐
3. Distressed	☐	☐	☐	☐	☐
4. Alert	☐	☐	☐	☐	☐
5. Excited	☐	☐	☐	☐	☐
6. Ashamed	☐	☐	☐	☐	☐
7. Upset	☐	☐	☐	☐	☐
8. Inspired	☐	☐	☐	☐	☐
9. Strong	☐	☐	☐	☐	☐
10. Nervous	☐	☐	☐	☐	☐
11. Guilty	☐	☐	☐	☐	☐
12. Determined	☐	☐	☐	☐	☐
13. Scared	☐	☐	☐	☐	☐
14. Attentive	☐	☐	☐	☐	☐
15. Hostile	☐	☐	☐	☐	☐
16. Jittery	☐	☐	☐	☐	☐
17. Enthusiastic	☐	☐	☐	☐	☐
18. Active	☐	☐	☐	☐	☐
19. Proud	☐	☐	☐	☐	☐
20. Afraid	☐	☐	☐	☐	☐

H-7: Physical Self-Worth Scale

In the following questions you will be asked to think about yourself physically. **Answer each sentence quickly as you feel now.**

	False	**Mostly False**	**More False Than True**	**More True Than False**	**Mostly True**	**True**
1. I am satisfied with the kind of person I am physically.	☐	☐	☐	☐	☐	☐
2. Physically I am happy with myself	☐	☐	☐	☐	☐	☐
3. I feel good about the way that I look and what I can do physically	☐	☐	☐	☐	☐	☐
4. Physically I feel good about myself.	☐	☐	☐	☐	☐	☐
5. I feel good about who I am and what I can do physically	☐	☐	☐	☐	☐	☐
6. I feel good about who I am physically	☐	☐	☐	☐	☐	☐

H-8: Group Environment Questionnaire (Social Subscales)

The following are a few questions about your dragon boat experience. **Please respond by circling a numerical response for each question.**

	Strongly Disagree								**Strongly Agree**
1. I do not enjoy being a part of the social activities of this team.	1	2	3	4	5	6	7	8	9
2. I am not going to miss the members of this team when the season ends.	1	2	3	4	5	6	7	8	9
3. Some of my best friends are on this team.	1	2	3	4	5	6	7	8	9
4. I enjoy other parties more than team parties.	1	2	3	4	5	6	7	8	9
5. 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
6. Members of our team would rather go out on their own than get together as a team.	1	2	3	4	5	6	7	8	9
7. Our team members rarely party together.	1	2	3	4	5	6	7	8	9
8. Our team would like to spend time together in the off season.	1	2	3	4	5	6	7	8	9
9. Members of our team do not stick together outside of practices and games.	1	2	3	4	5	6	7	8	9

H-9: Perceived Motivational Climate in Sport Scale-2 (Mastery Climate Subscales)

Please read each of the statements below and respond to each in terms of how you view your dragon boat team. Reflect on the totality of your experiences with your coaches and teammates.

	Strongly Disagree	**Disagree**	**Not Sure/ Neutral**	**Agree**	**Strongly Agree**
1. On this team, the coach wants us to try new skills.	☐	☐	☐	☐	☐
2. On this team, each player contributes in some important way.	☐	☐	☐	☐	☐
3. On this team, the coach believes that all of us are crucial to the success of the team.	☐	☐	☐	☐	☐
4. On this team, players feel good when they try their best.	☐	☐	☐	☐	☐
5. On this team, players at all skill levels have an important role on the team.	☐	☐	☐	☐	☐
6. On this team, players help each other learn.	☐	☐	☐	☐	☐
7. On this team, the coach makes sure players improve skills they're not good at.	☐	☐	☐	☐	☐
8. On this team, players feel successful when they improve.	☐	☐	☐	☐	☐
9. On this team, each player has an important role.	☐	☐	☐	☐	☐
10. On this team, trying hard is rewarded.	☐	☐	☐	☐	☐
11. On this team, the coach encourages players to help each other.	☐	☐	☐	☐	☐
12. On this team, the coach emphasizes always trying your best.	☐	☐	☐	☐	☐
13. On this team, players are encouraged to work on their weaknesses.	☐	☐	☐	☐	☐
14. On this team, the focus is to improve each game/practice.	☐	☐	☐	☐	☐
15. On this team, the players really 'work together' as a team.	☐	☐	☐	☐	☐
16. On this team, each player feels as if they are an important team member.	☐	☐	☐	☐	☐
17. On this team, the players help each other to get better and excel.	☐	☐	☐	☐	☐

H-10: Demographic Questions

1. Age (years) _____

2. Sex ☐ Male ☐ Female

3. Postal Code _____

4. Ethnicity (check all those that apply)

   ☐ Caucasian
   ☐ Asian
   ☐ Hispanic
   ☐ First Nations/Aboriginal
   ☐ African
   ☐ Other. Please specify: _____

5. What is your highest level of education? _____

6. Are you currently employed? If so, describe your occupation _____

   _____

7. What is your dragon boat team name? _____

8. How long have you been a member of this team? _____

9. How long have you been participating in dragon boat (including on this team, or any other team)? _____

10. How many times per week does your current team practice? _____

11. How many months per year does your current team practice? _____

Thank-you for your participation.
Please check to make sure you did not miss any questions.

APPENDIX I

Study 2 Cooperative Learning Coach Manual

Cooperative Learning For Dragon Boat

Coach Manual

Meghan McDonough 2005

Introduction

- This package contains the materials you need to structure your dragon boat practices following the cooperative learning procedures of this study.
- It is important that you complete each component as outlined.
- So as not to compromise the results of the study, you are asked not to share or discuss the contents of this package or any aspect of the study with anyone outside of your team until after the eight weeks are completed.
- If you have any questions or problems completing any of the components, please **contact Meghan at (778)227-4280** for assistance.

Table of Contents

Cooperative Learning Principles

This program is based on cooperative learning principles. Cooperative learning is defined as a learning environment where participants work in collaboration to achieve learning goals, and are rewarded and evaluated as a group. Cooperative learning has been shown in studies in education to be associated with enhanced learning, motivation, and social interactions among group members. To achieve these positive outcomes, however, it is necessary to include five key components in a cooperative learning program:

1. **Positive Interdependence**: Each person can only succeed if everyone succeeds. Every participant's efforts benefit everyone in the group.
2. **Face-to-Face Interaction**: Group members must participate in direct verbal interaction. That is, it is not sufficient that everyone contributes a piece of the task while working independently side-by-side.
3. **Individual Accountability**: The work done must be equitably distributed among group members, and individual group members must be evaluated individually on their efforts and contributions to the group. One person cannot be allowed to "coast" on the contributions of others while contributing nothing themselves.
4. **Communication Skills Training**: Specific training in positive social interaction and collaborative skills is required prior to cooperative tasks being assigned so that participants are equipped to work together in a positive manner.
5. **Opportunity for Feedback**: Participants must be given the opportunity to evaluate and discuss among themselves how the group is functioning.

Overview of Program Components

In order to incorporate all of those five principles into your dragon boat practices, the following four activities have been developed. In combination, they address all five components.

1. **Teambuilding Activity**
2. **Pre-Practice "Park" Exercise**
3. **Cooperative Learning Drills**
4. **Post-Practice Learning Recap**

Each of these activities is detailed in the following sections, including when it is to be scheduled into practices (**when**), instructions on how to lead the activity (**what**), and a rationale for why it is included in the program (**why**).

PART 1: TEAM-BUILDING ACTIVITY

When: Prior to going on the water for your first practice in the eight week period. Schedule about 10-15 minutes for this activity.

What: Explain to the group that you are going to lead them in a group teambuilding activity for the following purpose:
In dragon boating, you often need to communicate with other team members in order to function effectively as a team. There are more and less effective ways to communicate. This activity provides you with an opportunity to practice three effective communication skills:

1. **Make eye contact**: Making eye contact with the person you are speaking or listening to demonstrates that you are listening.
2. **Use "I" statements**: When you want to tell someone something, phrasing it as an "I" statement rather than a "You" statement is less confrontational, acknowledges that what you are saying is your own opinion or point of view, and decreases the tendency of the person you are speaking with to respond defensively. For example, instead of saying, "You keep hitting me at the catch," try, "I'm noticing we are colliding at the catch."
3. **Hear them out, without interrupting**: Listen to what the other person has to say in its entirety. We don't always say the most critical information or ideas first so you may miss their point by cutting them off, and interrupting shows a lack of respect for the speaker.

The activity: Human Knot, With a Twist.

- Everyone stands in a circle, shoulder to shoulder, and clasps hands with two different people, who are not standing immediately next to them.
- The goal is for the group to work together to untangle the knot, without anyone letting go of hands. You are done when you are all in one circle, holding hands.
- The twist: You must observe the three communication rules while working together to untangle the knot:
    1. You must maintain eye contact while speaking to others. If someone is talking to you without maintaining eye contact, do not respond to what they asked you to do.
    2. You must begin all statements with the name of the person you want to speak to, followed by "I," and then the rest of your message (e.g. "John, I would like you to step through here."). If someone addresses you without using this format, do not respond to what they asked you to do.
    3. If you hear anyone interrupting you or anyone else, make the game show buzzer noise (have everyone practice this together). If you get "buzzed" you must stop talking and hear the other person out before you continue.
- GO! If you have time and the group enjoyed it, you may repeat the game before moving on to the rest of your practice.
- **Wrap-up:** Explain to the group that while these three rules were very strict and probably a bit stiff and unnatural in the game, the basic ideas behind them, to

make eye contact, use "I" statements, and not interrupt when communicating with others, are good habits to get into to improve how they work together as a team.

Why: This whole intervention program is designed to incorporate cooperative learning into your practices, which requires team members to interact while learning skills and completing training activities. One of the major principles of cooperative learning is that in order for people to work well together in learning and training tasks, they have to first learn principles of effective communication. This activity introduces some of these principles, raising awareness of and skill in interpersonal communication.

Set Up: Clasping hands with two people who are not standing directly beside you.

Untangling the knot

PART 2: PRE-PRACTICE DISTRACTION "PARK"

When: At the beginning of each practice for the entire eight weeks, once you are in the boats. This activity can be done at the dock or once you are clear from the dock, wherever you will have the fewest distractions.

What: Ask seat-mates to partner up. Provide them with 2-3 minutes (60-90 seconds for each partner) to do the following:
Tell your partner one distraction you have on your mind from your "pre-practice" day that you need to "park" or "shelve" or put out of your mind to deal with later, so that you can fully focus on your dragon boat practice. They may be things that are important, but that you cannot deal with during practice. Since dwelling on them will only distract you from what you want to achieve in practice, tell it to your partner, and then let it go. You can pick it up again after practice and deal with it then. Make eye contact and actively listen to what your partner has to say, but not to enter into an extended discussion. If you do not have anything distracting you, or do not want to share it, you do not have to, but please still act as a listener for your partner.
Provide the team with a signal when the time is half over so that they can switch, and when the time is up, and it is time to start the practice.

Why: This exercise allows participants to acknowledge and set aside distractions, and more fully focus on training, while at the same time providing an opportunity for face-to-face interaction.

PART 3: COOPERATIVE DRILLS

When: Do one cooperative drill at some point during every practice during the eight week period.

What: Cooperative drills serve the same technical or tactical purposes of any other drills used in dragon boating, but are structured to meet the principles of cooperative learning. In order to help you incorporating cooperative drills into your practices, eight drills that meet the guidelines and also address commonly taught themes in dragon boat have been designed and are described below.

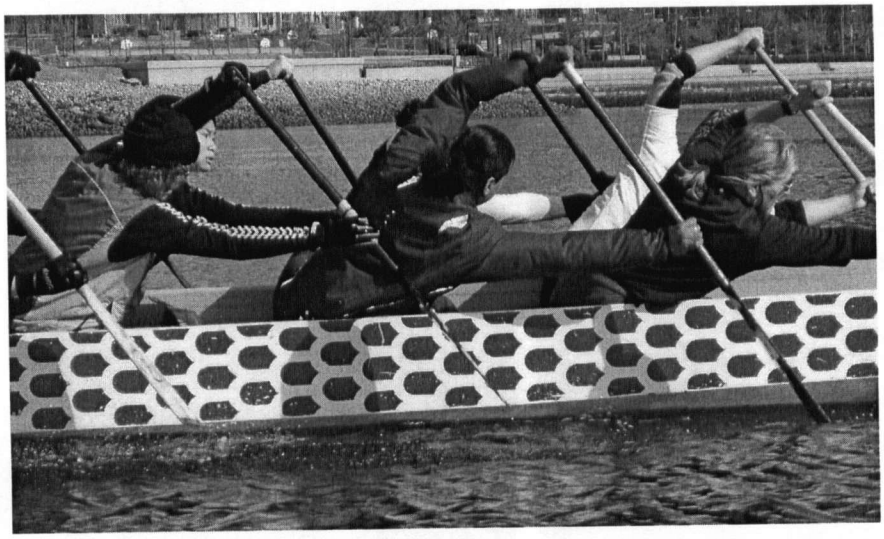
You are asked to include one drill in each practice, but which drills you choose is up to you. You may use all of the drills, or do some drills multiple times throughout the eight weeks, just as long as you do one at each practice. If you do not find a drill in this package that meets the technical or tactical needs of your group, please contact Meghan to help devise a new drill, based on the guidelines, that will suit your team. Please do not make up and use your own drills to fulfill this requirement without first discussing it with Meghan.

Why: The interaction involved in cooperative drills enhances skill learning by facilitating on-task interaction among team members, discussion of complex skills that aids understanding, and personal attention to each participant by another teammate.

The Drills:

1. Getting full reach and rotation
2. Catch: Top arm drive
3. Pull: Sequence of muscle group engagement
4. Recovery: Relaxing the neck and shoulders
5. Timing
6. Posture
7. Interval work
8. Working explosively, but in time, at the start

1. **Getting Full Reach and Rotation**
   a. Choose clear landmarks to serve as start and finish lines. You may choose any distance that you want your crew to work on that practice, as long as each piece is the same distance over the same stretch of water. This drill works especially well with pieces that are about 1-2 minutes in length, so that they are long enough so that the paddlers' technique will start to deteriorate if they do not make an effort to maintain appropriate technique.
   b. Have the team line up at the start line, and do a piece at full effort ending at the finish line. The drummer or coach should count the strokes (silently), and tell the team the total at the end of the piece.
   c. Paddle back to the start line as rest.
   d. Provide them with technical instruction for getting full reach and rotation. If they improve their reach and rotation, they should get more distance out of each stroke, and be able to complete the same distance they just did in fewer strokes, which will be the goal of the next piece.
   e. Assign seatmates as partners, and tell them that in the next piece, you are responsible for keeping an eye on your partner's reach and rotation technique, and if you see them faltering during the piece, tell them so that they can correct it. Partners should discuss what cues they will give each other during the piece if they notice their partner's technique deteriorating before the piece begins.
   f. Do a second piece, identical to the first with seatmates responsible for watching out for each other and giving them cues when their technique begins to falter regarding full reach. The drummer or coach counts the strokes again, and announces the number of strokes after the piece. During the rest interval, seatmates discuss feedback, what worked/didn't, where they experienced the most challenges, and what they could do for the next piece to improve.
   g. Paddle back to the start again and repeat, as many times as you want your crew to do this practice.

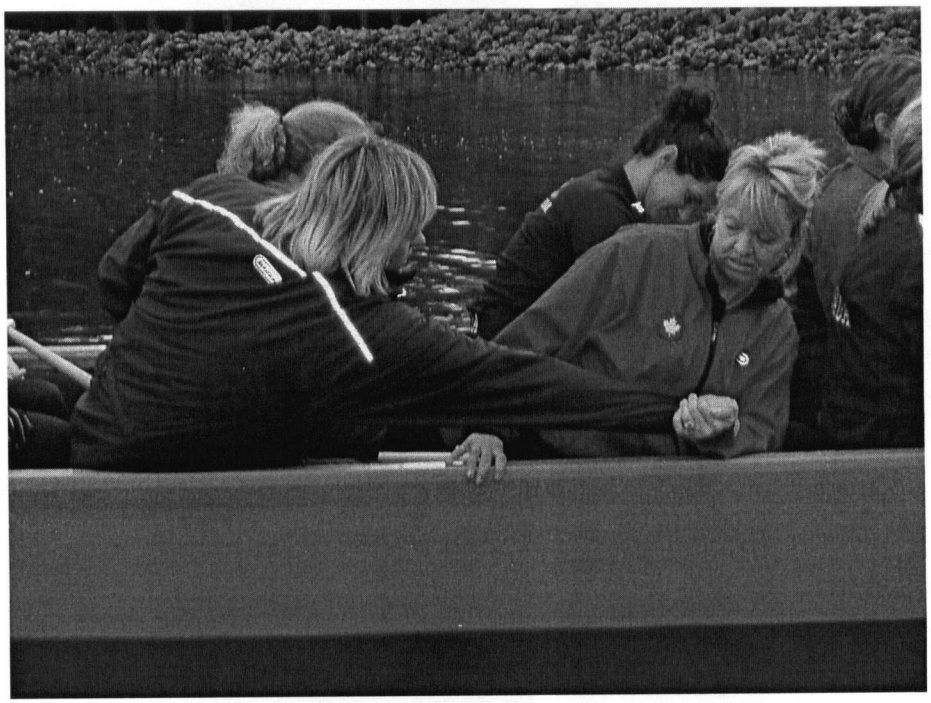


2. Catch: Top Arm Drive

a. Assign seat-mates as partners
b. Odd lefts and even rights begin as the learners/paddlers, and their seatmates begin as the learning assisters
c. Paddlers find their set-up position, while the coach gives pointers about the top hand positioning at the set up (e.g. 135 degree static bend at the elbow of the top arm, hand above elbow above shoulder, hand over gunwale), and their seat-mates observe.
d. The coach then explains the goal movement of the top hand drive (e.g. hand drops to chin level, and maintains this height through the pull) and the paddlers go through the motion of the catch slowly.
e. Assisters make a fist with one hand, and place it in a position where the paddler should touch, but not move, their fist if they maintain an appropriate top arm position throughout the pull.
f. Have the paddlers (odd lefts and even rights) paddle slowly, with their partners providing the tactile cue with their fist, and verbal feedback on their top arm level during the catch and pull phases of the stroke.
g. Gradually have them pick up the pace somewhat.
h. Switch roles, with even lefts and odd rights begin as the learners/paddlers, and their seatmates begin as the learning assisters
i. When the drill is over, let the boat run, and ask for feedback on the drill before moving on to the next element in your workout plan.

3. Pull: Sequence of Muscle Group Engagement

a. Provide verbal instruction on the correct order of muscle group engagement during the pull phase of the stroke (i.e. leg drive, hip rotation, trunk rotation, and arm flexion in that order).
b. Assign paddlers into partners on the same side of the boat as follows: 1&2 left, 1&2 right, 3&4 left, etc.
c. Everyone places their paddles into the middle of the boat along the centerline so they are out of the way.
d. The paddler sitting behind in the pair will be the "learner," the paddler in front is the "assister."
e. The assister turns toward the gunwale side of the boat so that they can hook their inside hand with the outside hand of their partner (the learner), so that the learner is holding it somewhat like they would hold their paddle. The learner grips this hand at a height approximate to if it were a paddle, at the catch position, before the pull is initiated.
f. Learners must then experiment with using their muscle groups to pull (legs, hips, trunk, etc.), with the assister providing some resistance, and feedback about when they have the best pull, and discussion about how to improve. Good pulls are strong, consistently strong from start to finish, and should be best with a leg extension-hip rotation-trunk rotation-arm flexion sequence.
g. To allow the assisters and learners a chance to switch, get seat 1 to walk to the back of the boat (or the last seat to walk to the front), and then have 1&2L, 3&4L, etc. together again (this should now work that the roles are reversed).
h. When the drill is over, let the boat run, and ask for feedback on the drill before moving on to the next element in your workout plan.



4. Recovery: Relaxing Neck and Shoulders

a. Assign paddlers into partners on the same side of the boat as follows: 1&2 left, 1&2 right, 3&4 left, etc.
b. The paddler sitting behind in the pair will be the "learner," the paddler in front is the assister.
c. The assister stows their paddle along the midline of the boat, out of the way.
d. The coach provides verbal instructions about how in the recovery phase of the stroke, you want your shoulders and neck to be as relaxed as possible, providing a short break, and conserving energy in the recovery phase. However, often we rely on a shoulder-shrug motion to do the exit and recovery, leading to very tense shoulder and neck muscles. This drill will help practice relaxing shoulder and neck muscles through the recovery phase of the stroke.
e. Assisters place their outside hand on the shoulder of the paddler in front of them.
f. As a demonstration of tension vs. relaxation, the paddler tenses the neck and shoulders for about 3-5 seconds, pulling the shoulders up towards the ears and clenching the muscles, followed by a full relaxation of neck and shoulder muscles.
g. Paddlers then paddle for (at least) 1 minute at a moderate pace, trying to keep their shoulders relaxed through the exit and recovery. The assisters provide feedback about the tension or relaxation of the shoulder muscles throughout the piece (assisters may have to move forward on their seat a bit to be able to reach their partner's shoulder throughout the whole stroke).
h. To allow the assisters and learners a chance to switch, get seat 1 to walk to the back of the boat (or the last seat to walk to the front), and then have 1&2L, 3&4L, etc. together again (this should now work that the roles are reversed).
i. When the drill is over, let the boat run, and ask for feedback on the drill before moving on to the next element in your workout plan.

5. Timing

a. Begin this drill with the boat stopped, and everyone sitting with their paddle across their lap.
b. Ask everyone to close their eyes, and that for this drill, they are only allowed to say the word "hit."
c. Once you are finished explaining, everyone is going to start paddling, but with no count in from the coach or from anyone else in the boat. However, when you feel your paddle touch the water at the catch, you will say "hit." You are to do this, while at the same time listening for all of the other "hits" from your teammates, and try to adjust so that you are all saying "hit" together. No one is the lead stroke in this exercise, everyone should be trying to adapt to everyone else. The coach should time how long it takes for the group to be paddling in sync.
d. Once everyone is paddling in sync, stop the exercise, and ask for feedback about how the drill went, and what the group could do to improve their time.
e. Repeat the drill, with the goal of everyone being in sync in less time than it took the first round.
f. If this exercise was easy for your crew, you may choose to do it again, but this time without saying "hit."

6. Posture

a. Choose clear landmarks to serve as start and finish lines. You may choose any distance that you want your crew to work on that practice, as long as each piece is the same distance. This drill works especially well with pieces that are about 1-2 minutes in length, so that they are long enough so that the paddlers' technique will start to deteriorate if they do not make an effort to maintain appropriate technique.

b. Have the team line up at the start line, and do a piece at full effort ending at the finish line. The drummer or coach should count the strokes, and tell the team the total at the end of the piece.

c. Paddle back to the start line as rest.

d. Provide them with technical instruction about proper posture (e.g. back straight, 5 degree lean forward, lean out so chin is over the gunwale, pulling your belly button to your backbone). If they improve their posture, they should get more distance out of each stroke, and be able to complete the same distance they just did in fewer strokes, which will be the goal of the next piece.

e. Assign seatmates as partners, and tell them that in the next piece, you are responsible for keeping an eye on your partner's posture, and if you see them faltering during the piece, tell them so that they can correct it. Partners should discuss what cues they will give each other during the piece if they notice their partner's posture deteriorating before the piece begins.

f. Do a second piece, identical to the first with seatmates responsible for watching out for each other and giving them cues when their posture begins to falter. The drummer or coach counts the strokes again, and announces the number of strokes after the piece. During the rest interval, seatmates discuss feedback, what worked/didn't, where they experienced the most challenges, and what they could do for the next piece to improve.

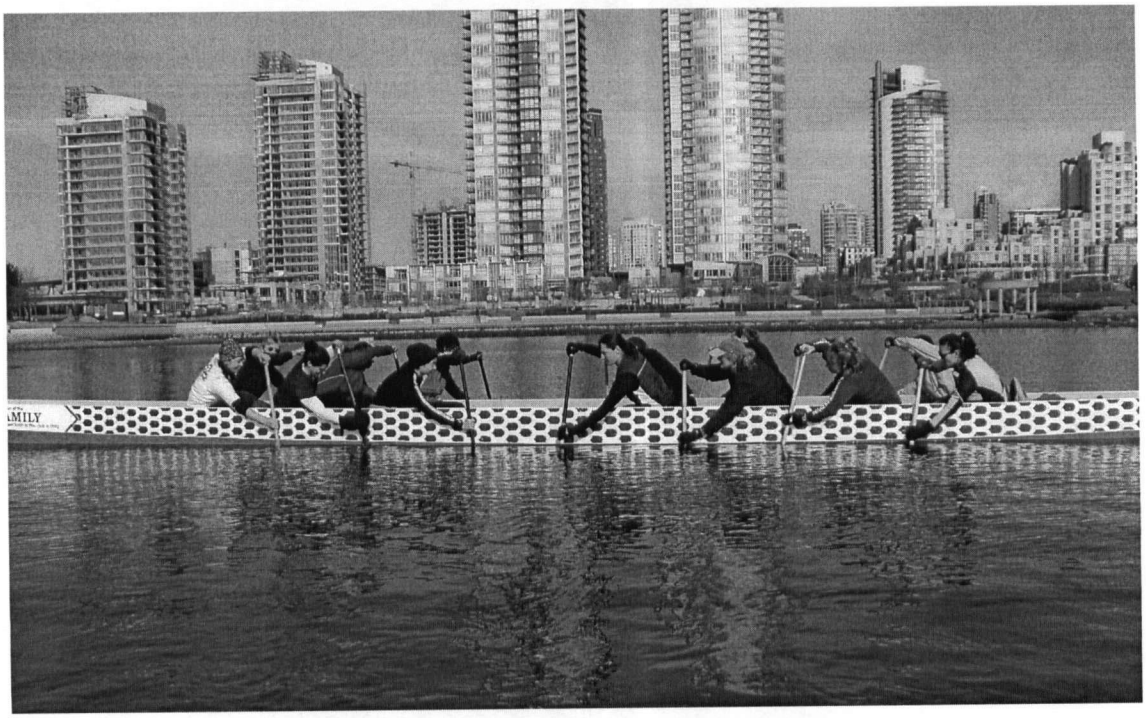
g. Paddle back to the start again and repeat, as many times as you want your crew to do this practice.

7. Interval Work

a. This drill works with a practice where you are planning to do many short intervals of the same length at high intensity with long breaks
b. Divide the team into pods…roughly equally into fronts/middles/backs.
c. Explain to the team that the pods are expected to work together to provide feedback and suggestions for improvement for each successive piece, and come to a consensus on what they will do on the next piece to improve their performance.
d. Do the first piece, and then during the rest period between each piece, allow the pods to discuss their strategy for the next piece, with one rule: every person must contribute something to this discussion at least once every second rest break. They should have at least 2 minutes to discuss, up to as long as you would like them to have as rest between intervals.

8. Working Explosively, but in Time at the Start

a. To set this drill up, have the front half of the boat all move one seat towards the front, switch sides, and turn around so that they are facing the backs, and have the backs also move one seat back. There should be 2 empty seats in the middle of the boat, the front half should be facing the back half, and everyone should be paddling on their favorite side. The steersperson should have the steering oar out of the water once this drill is underway.
b. Explain that you are going to call a start, and that the piece will continue for as long as it takes for one side to overpower the other, so that the boat begins to move one way or the other. Explain that to overpower the other crew, you have to be explosive, but also in time, so that each group must work together.
c. Call a start and stop them once there is a clear winner.
d. Allow the groups time to discuss and strategize on how to improve for the next piece.
e. Do another round. If the same team overpowers again, but the first team worked together better and fought them off for longer, be sure to praise that improvement, even if that team did not win.
f. Continue for as many rounds as you wish, recognizing that this drill is high intensity work for your crew.
g. When you are done, while everyone is going back to their places, ask for feedback about how the drill went, and what they discovered.



PART 4: Post-Practice Learning Recap

When: At the end of each practice for the entire eight weeks, once you are finished your practice, but before you get out of the boats. Can be before you get to the dock, or at the dock, wherever you will have the least distractions from other crews.

What: Ask seat-mates to partner up. Provide them with 2-4 minutes (1-2 minutes for each partner) to tell their partner one thing that they have learned or are struggling with understanding or doing from that day's practice. Encourage partners to actively listen to what their partner has to say, to ask questions and for clarifications, and to discuss points that they don't agree with. Provide the team with a signal when the time is half over so that they can switch, and when the time is up, and it is time to end the practice. Encourage paddlers to continue their discussion after practice if they are not done.

Why: This activity provides an opportunity for each athlete to verbalize and clarify what they are learning or struggling with, which helps them identify and retain what they have learned at practice and analyze and identify where they are struggling. It also provides another opportunity for on-task face-to-face interaction among teammates.

Coach Planning and Logging

When: You (the coach) are asked to complete these at some point before and after each practice for the eight weeks.

What: This package contains a planning/log sheet for each practice (see Appendix) to help you plan to include these components in your practices, and to report on how each part went. Complete the planning portion of each sheet before each practice, along with your regular practice planning. Complete the log portion as soon after each practice as possible. At the end of the eight weeks, these logs are to be returned to the researcher.

Why: These logs provide you with a simple, organized method of following the study protocols, and provide the researchers with a record of how closely you followed the procedures in your practices, and your feedback on how this program worked with your team.

Questions and Follow-up with the Researchers

In order to help you integrate this program into your practices, Meghan will be available for questions, help, and to track how this program is going with your team in two ways:

1. **Weekly Phone Calls:** Meghan will be calling you once a week during the eight weeks to ask you some brief questions about how the program is going. You may also take this opportunity to ask any questions you may have, or to provide feedback.

2. **Contact Meghan:** You may contact Meghan at any point during the 8 weeks if you have questions or need help with carrying out the program by phoning her at **(778)227-4280** or by email at **meghanmcdonough@telus.net.**

Thank you very much for your efforts in participating in this research!

Appendix: Coach Planning and Log Sheets

Coach Name: _____

Date: _____

PRACTICE PLAN	**LOG**
Dry land warm-up: Team-building exercise: The Human Knot with a Twist (Day 1 only)	Included ☐ Not included ☐ Comments:
"Park" exercise:	Included ☐ Not included ☐ Comments:
Warm-up:	
Main Practice: (include 1 cooperative drill)	Drill Included ☐ Not included ☐ Name of Drill: Comments:
Cool-down:	
Post-Practice Learning Recap:	Included ☐ Not included ☐ Comments:

Attendance

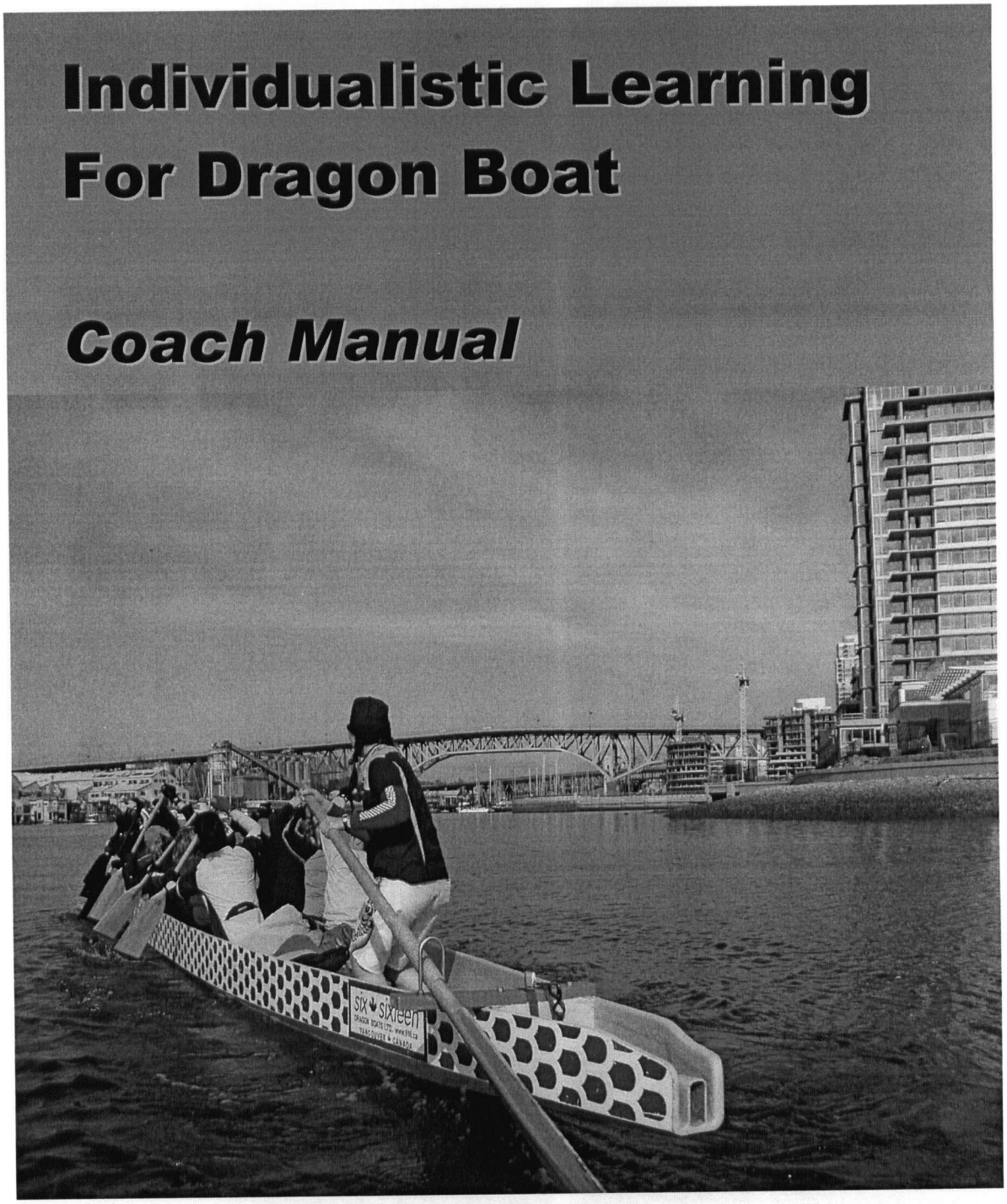
Name	Check if Present

APPENDIX J

Study 2 Individualistic Learning Coach Manual

Individualistic Learning For Dragon Boat

Coach Manual



Meghan McDonough 2005

Individualistic Learning Principles

This program is based on individualistic learning principles. Individualistic learning is defined as a learning environment where participants are evaluated and rewarded based on their individual effort and progress. Individualistic learning has been shown in studies in education to be associated with enhanced learning and motivation. To achieve these positive outcomes, however, it is necessary that two conditions are fulfilled in an individualistic learning program:

6. The focus in on **personal improvement** of skill and ability, and individuals are rewarded for their individual effort and improvement.

7. The activities require **no or minimal interaction** among participants.

Overview of Program Components

In order to incorporate those principles into your dragon boat practices, the following three activities have been developed. In combination, they address these components.

5. **Pre-Practice "Park" Exercise**
6. **Individualistic Learning Drills**
7. **Post-Practice Learning Recap**

Each of these activities is detailed in the following sections, including when it is to be scheduled into practices (**when**), instructions on how to lead the activity (**what**), and a rationale for why it is included in the program (**why**).

PART 1: PRE-PRACTICE DISTRACTION "PARK"

When: At the beginning of each practice for the entire eight weeks, once you are in the boats. This activity can be done at the dock or once you are clear from the dock, wherever you will have the fewest distractions.

What: Provide paddlers with 2-3 minutes to do the following:
Reflect on one distraction you have on your mind from your "pre-practice" day that you need to "park" or "shelve" or put out of your mind to deal with later, so that you can fully focus on your dragon boat practice. They may be things that are important, but that you cannot deal with during practice. Since dwelling on them will only distract you from what you want to achieve in practice, put it down for now, and then let it go. You can pick it up again after practice and deal with it then.
Provide the team with a signal when the time is up, and it is time to start the practice.

Why: This exercise allows participants to acknowledge and set aside distractions, and more fully focus on training.

PART 2: INDIVIDUALISTIC DRILLS

When: Do one individualistic learning drill at some point during every practice during the eight week period.

What: Individualistic learning drills serve the same technical or tactical purposes of any other drills used in dragon boating, but are structured to meet the principles of individualistic learning. In order to help you incorporating individualistic drills into your practices, eight drills that meet the guidelines and also address commonly taught themes in dragon boat have been designed and are described below.

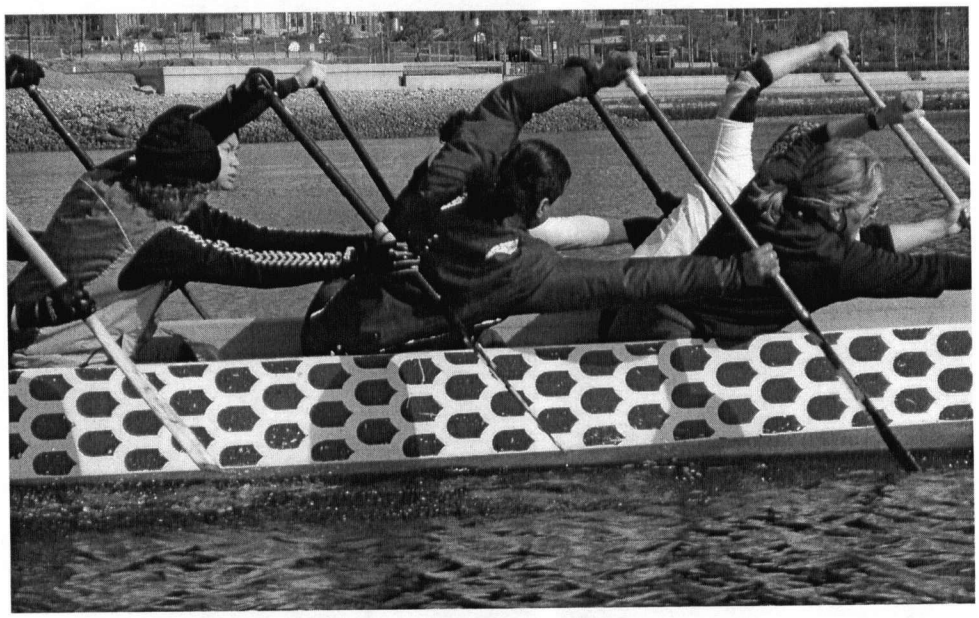
You are asked to include one drill in each practice, but which drills you choose is up to you. You may use all of the drills, or do some drills multiple times throughout the eight weeks, just as long as you do one at each practice. If you do not find a drill in this package that meets the technical or tactical needs of your group, please contact Meghan to help devise a new drill, based on the guidelines, that will suit your team. Please do not make up and use your own drills to fulfill this requirement without first discussing it with Meghan.

Why: Individual learning drills enhance skill learning that is focused on personal improvement for each participant, regardless of their starting skill level.

The Drills:

9. Getting full reach and rotation
10. Catch: Top arm drive
11. Pull: Sequence of muscle group engagement
12. Recovery: Relaxing the neck and shoulders
13. Timing
14. Posture
15. Interval work
16. Working explosively, but in time, at the start

1. **Getting Full Reach and Rotation**
   a. This drill works in conjunction with an interval workout where you want your paddlers to focus on maximizing their reach and rotation. It works especially well with pieces that are at least 1-2 minutes in length, so that they are long enough so that the paddlers' technique will start to deteriorate if they do not make an effort to maintain appropriate technique.
   b. Have the team do a piece at full effort.
   c. During the rest period, provide them with technical instruction for getting full reach and rotation. In particular, give them one or two key cues to focus on to get the most reach and rotation (e.g. ensure they are showing their back to the shore as they reach forward; feel like they are fully extending their outside arm at the elbow and from the shoulder socket). If they improve their reach and rotation, they should get more distance out of each stroke, and be able to paddle more efficiently, which will be the goal of the next piece.
   d. In the next piece, you (the coach) will be calling out "Check" intermittently (leave about 15-30 seconds between calls). When they hear this, each paddler should do a personal check to see if they are meeting the one or two key cues that were given before the piece and if not, to correct themselves.
   e. You may continue this drill for three or more pieces if you wish. You may also choose to assign a new one or two things to "Check" for each new piece, as long as this is fully explained during the rest period.



2. Catch: Top Arm Drive

a. Paddlers find their set-up position, while the coach gives pointers about the top hand positioning at the set up (e.g. 135 degree static bend at the elbow of the top arm, hand above elbow above shoulder, hand over gunwale)
b. The coach then explains the goal movement of the top hand drive, that the top hand drops to chin level, and maintains this height through the pull, and the paddlers go through the motion of the catch slowly.
c. Have the paddlers paddle slowly, paying attention to the visual cue of not letting their top hand drop below their chin level at any point during the stroke.
d. Gradually have them pick up the pace, with the priority being never letting the top hand drop below chin level.
e. Rest, and repeat.

3. Pull: Sequence of Muscle Group Engagement

a. Provide verbal instruction on the correct order of muscle group engagement during the pull phase of the stroke (i.e. leg drive, hip rotation, trunk rotation, and arm flexion in that order).

b. Have paddlers do the push-pull drill: Everyone starts with their paddle buried, at the very end of the stroke, at the point just before they would initiate the exit. When the coach calls "push" everyone pushes their paddle forward in the water to the catch position, keeping it fully buried at all times. Allow a pause of about 1-2 seconds, and then the coach calls "pull", and everyone pulls their paddle back toward the exit position (the same position where they started this drill). Repeat this for about 5-10 cycles, and let it run.

c. After a short rest, do the push-pull drill again, this time asking everyone to focus on the order of muscle group engagement (leg drive, hip rotation, trunk rotation, and arm flexion in that order) when they are doing the "pull" phase of the drill, and noticing how they can get the most power when they use this sequence.

d. Repeat one more time after a short rest.

Push

Pull

4. Recovery: Relaxing Neck and Shoulders

a. The coach provides verbal instructions about how in the recovery phase of the stroke, you want your shoulders and neck to be as relaxed as possible, providing a short break, and conserving energy in the recovery phase. However, often we rely on a shoulder-shrug motion to do the exit and recovery, leading to very tense shoulder and neck muscles. This drill will help practice relaxing shoulder and neck muscles through the recovery phase of the stroke.

b. As a demonstration of tension vs. relaxation, have the paddlers tense the neck and shoulders for about 3-5 seconds, pulling the shoulders up towards the ears and clenching the muscles, followed by a full relaxation of neck and shoulder muscles.

c. Paddlers then paddle for (at least) 1 minute at a moderate pace, trying to keep their shoulders relaxed through the exit and recovery.

d. Take a break, repeat the tensing the neck and shoulders exercise, and do a second piece, focusing again on keeping the neck and shoulders relaxed through the exit and recovery.

5. **Timing**
   a. Begin this drill with everyone paddling at a moderate pace.
   b. Ask them to check their timing in reference to each of the following cues, allowing them about 10-15 strokes to focus on each one:
      a. Top hand of the stroke on the opposite side
      b. Paddle of the paddler directly in front of you on the same side
      c. Top hand of the paddler one seat ahead of you on the opposite side
      d. Hip rotation of the paddler directly in front of you.
      e. Hip rotation of the paddler on seat ahead of you on the opposite side.
      f. Your seatmate's catch
      g. Your seatmate's exit
      h. The sound of the paddles (with eyes closed)
      i. The rhythm of the boat (with eyes closed)

6. Posture

a. This drill works in conjunction with an interval workout where you want your paddlers to focus on their posture. It works especially well with pieces that are at least 1-2 minutes in length, so that they are long enough so that the paddlers' technique will start to deteriorate if they do not make an effort to maintain appropriate technique.
b. Have the team do a piece at full effort.
c. During the rest period, provide them with technical instruction for good paddling posture (e.g. back straight, 5 degree lean forward, lean out so chin is over the gunwale, pulling your belly button to your backbone). If they improve their posture, they should paddle more efficiently, which will be the goal of the next piece. Give them one or two key cues related to good posture for them to focus on in the next piece.
d. In the next piece, you (the coach) will be calling out "Check" intermittently (leave about 15-30 seconds between calls). When they hear this, each paddler should do a personal check to see if they are meeting the one or two key cues that were given before the piece and if not, to correct themselves.
e. You may continue this drill for three or more pieces if you wish. You may also choose to assign a new one or two things to "Check" for each new piece, as long as this is fully explained during the rest period.

7. Interval Work

a. This drill works with a practice where you are planning to do many short intervals of the same length at high intensity with moderate to long breaks
b. Do the first piece, and then during the rest period between each piece, allow each person some quiet individual reflection time to think about what they could improve for the next piece. They should have at least 1 minute of non-paddling rest time to think about this. The coach can field questions from paddlers if they are struggling with what they should do or how they can accomplish what they want to do, but allow each person to come up with their own thing that they need to work on, rather than telling them what they should do during this drill.
c. Do a second piece, and allow for another reflection period and individual identification of what they want to improve the next piece.
d. Do at least 3 pieces in total, up to as many as you would like to include in your practice.

8. Working Explosively, but in Time at the Start

a. Explain that you are going to do a full start (you may choose how long this should be, but it will work best if it is in the 15-30 second range). Explain that to be the most efficient in the start, you have to be explosive, but also in time.
b. Call the start and the end of the piece.
c. Ask each person to individually reflect on what they could do to improve their performance on the next piece.
d. Do at least 4 intervals, but you can continue for as many rounds as you wish, recognizing that this drill is high intensity work for your crew.

PART 3: Post-Practice Learning Recap

When: At the end of each practice for the entire eight weeks, once you are finished your practice, but before you get out of the boats. Can be before you get to the dock, or at the dock, wherever you will have the least distractions from other crews.

What: Provide paddlers with 1-2 minutes to individually reflect on one thing that they have learned or are struggling with understanding or doing from that day's practice. Provide the team with a signal when the time is up, and it is time to end the practice.

Why: This activity provides an opportunity for each athlete to clarify and reinforce in their own minds what they are learning or struggling with, which helps them identify and retain what they have learned at practice and analyze and identify where they are struggling

Coach Planning and Logging

When: You (the coach) are asked to complete these at some point before and after each practice for the eight weeks.

What: This package contains a planning/log sheet for each practice (see Appendix) to help you plan to include these components in your practices, and to report on how each part went. Complete the planning portion of each sheet before each practice, along with your regular practice planning. Complete the log portion as soon after each practice as possible. At the end of the eight weeks, these logs are to be returned to the researcher.

Why: These logs provide you with a simple, organized method of following the study protocols, and provide the researchers with a record of how closely you followed the procedures in your practices, and your feedback on how this program worked with your team.

Questions and Follow-up with the Researchers

In order to help you integrate this program into your practices, Meghan will be available for questions, help, and to track how this program is going with your team in two ways:

3. **Weekly Phone Calls:** Meghan will be calling you once a week during the eight weeks to ask you some brief questions about how the program is going. You may also take this opportunity to ask any questions you may have, or to provide feedback.

4. **Contact Meghan:** You may contact Meghan at any point during the 8 weeks if you have questions or need help with carrying out the program by phoning her at **(778)227-4280** or by email at **meghanmcdonough@telus.net.**

Thank you very much for your efforts in participating in this research!

Appendix: Coach Planning and Log Sheets

Coach Name: _____

Date: _____

PRACTICE PLAN	**LOG**
Dry land warm-up:	
"Park" exercise:	Included ☐ Not included ☐ Comments:
Warm-up:	
Main Practice: (include 1 individualistic drill)	Drill Included ☐ Not included ☐ Name of Drill: Comments:
Cool-down:	
Post-Practice Learning Recap:	Included ☐ Not included ☐ Comments:

Attendance

Name	Check if Present

APPENDIX K

Study 2 Coach Training Checklist

Training Session Checklist for Researcher

Name of Coach:_____

Check that each of the following components was included in the coach training session:

- ☐ Greet coach and ask them if they have any questions or concerns about the study up to this point
- ☐ Provide coach with manual and my business card (in manual)…may want to provide this ahead of time so they can pre-read if they wish
- ☐ Overview the importance of them understanding and feeling competent in carrying out the intervention at the end of this session, so they should feel free to ask questions or discuss at any point, and point out my contact information.
- ☐ Overview the importance of not discussing the program with others outside their team until after the 8 weeks is over
- ☐ Review the manual/training session: principles, components of program, and logging
- ☐ Explain principles of learning structure.
- ☐ Review teambuilding exercise (coop only)
- ☐ Review park exercise
- ☐ Review drills (can include demo and role play)
- ☐ Point out laminated practice cards
- ☐ Discuss potential to create new drills
- ☐ Review recap exercise
- ☐ Review coach planning and logging procedures
- ☐ Explain importance of us knowing exactly how the program is carried out
- ☐ Go over planning/log/attendance sheets, pointing out labels for each practice
- ☐ Explain that sheets should be saved to return to me at the end of the 8 weeks
- ☐ Explain the weekly phone call follow-ups
- ☐ Obtain best phone number and time/day to phone
- ☐ Review again how to contact me
- ☐ Ask if there are further questions
- ☐ Ask them to complete the training session evaluation form
- ☐ Thank them for their participation
- ☐ Confirm time that they should expect first follow-up phone call

APPENDIX L

Study 2 Post-Training Questionnaire for Coaches

Training Session Feedback from Coaches

Name: _____

Please answer each of the following questions about the training session.

	Not at all	A little	Moderately	Quite a bit	Extremely
1. Are you confident in your ability to carry out this program?	☐	☐	☐	☐	☐
2. Do you feel that you have the knowledge necessary to carry out this program?	☐	☐	☐	☐	☐
3. Do you feel that this training session was clearly presented?	☐	☐	☐	☐	☐
4. Do you feel that the materials are clear?	☐	☐	☐	☐	☐
5. Do you believe that this program will be helpful for your team? If so, how?	☐	☐	☐	☐	☐

If you have any feedback or comments about this training session, the program, or your experience with the study so far, please explain below (you may continue on the back of the page if necessary):

APPENDIX M

Study 2 Post-Training Log Sheet for the Researcher

Post-training Session Log Sheet for Researcher

Name of coach: _____

	Not at all	A little	Moderately	Quite a bit	Extremely
1. How well did the training session go overall?	☐	☐	☐	☐	☐
2. How receptive do you feel the coach was to the training session?	☐	☐	☐	☐	☐
	Poor	**Fair**	**Adequate**	**Very Good**	**Excellent**
3. How do you rate your own quality of delivery?	☐	☐	☐	☐	☐
4. How do you rate the communication between you and the coach during the training session?	☐	☐	☐	☐	☐

5. Did you experience any barriers to communication, or ideas that were difficult to communicate in the session?
   Yes ☐ No ☐
   If yes, please explain.

6. Did the coach identify any potential problems that they may have to deal with?
   Yes ☐ No ☐
   If yes, please list.

7. Did you discuss any potential modifications or new drills with the coach during the training session?
   Yes ☐ No ☐
   If yes, please list.

APPENDIX N

Study 2 Question Sheet for Weekly Phone Calls to Coaches

Weekly Phone Call with Coach Questions

Name of coach:_____ Date of Call:_____

1. Were you able to carry out the program with your team this week?
   Yes ☐ No ☐
   If no, please explain.

2. Did you include all components?
   ☐ Human Knot (coop group, 1st practice only)
   ☐ Park
   ☐ Drill: (names)_____
   ☐ Recap

   If you did not include anything:
   a. Why not?

   b. Do you anticipate not including that component for that reason again?

   c. Is there anything we can do to help you include that component in future practices?

3. Is there anything else that you are struggling with, or that is making it difficult for you to carry out the program?

4. Do you have any feedback on how we could improve this program?

5. Do you have any questions about the program or any of its components?

6. Do you have adequate choice of drills to select from for your purposes for next week?

7. Do you have anything else you want to add?

8. (Confirm time/date of next phone call)

APPENDIX O

Study 2 Post-Call Log Sheet for Weekly Phone Calls to Coaches

POST CALL: JOURNAL

Name of coach:_____ Date of Call:_____

	Poor	Fair	Adequate	Very Good	Excellent
1. How well did the phone call go overall?	☐	☐	☐	☐	☐
2. How receptive do you feel the coach was to the training session?	☐	☐	☐	☐	☐
3. How do you rate your own quality of delivery?	☐	☐	☐	☐	☐
4. How do you rate the communication between you and the coach during the phone call?	☐	☐	☐	☐	☐

5. Were there any barriers to communication, or ideas that were difficult to communicate in the phone call?
   Yes ☐ No ☐
   If yes, explain.

6. Is there anything that I need to do following this call to support this coach?
   Yes ☐ No ☐
   If yes, explain

APPENDIX P

Study 2 Paddler Feedback Questionnaire: Cooperative Learning Intervention

Post-Intervention Feedback: Athletes (Cooperative Learning Group)

Name:_____

Over the last 8 weeks, you were part of a program incorporating cooperative learning into your dragon boat practices. Please answer the following questions about that program as accurately as possible.

1. In the first week of the program, you may have done a teambuilding exercise called ***the human knot***. Considering that activity:
   a. Do you remember doing the human knot? Yes ☐ No ☐
      If no, please go to question #2.

   b. Do you think this activity was beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought it was beneficial, what did you find helpful about it?

   c. How involved or engaged were you in the activity?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

2. You may have done an exercise at the beginning of practices called ***the pre-practice distraction "park" exercise*** where you told your partner something from your day that was distracting you from focusing on practice. Considering that activity:
   a. Do you remember doing the pre-practice distraction "park"? Yes ☐ No ☐
      If no, please go to question #3.

   b. How often was it included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

   c. Do you think this activity was beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought it was beneficial, what did you find helpful about it?

   d. How involved or engaged were you in the activity?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

3. You may have done ***cooperative learning drills*** during practices where you learned or worked on improving something in your dragon boating that involved you interacting with your teammates. Considering those activities:
   a. Do you remember doing cooperative learning drills? Yes ☐ No ☐
      If no, please go to question #4.

   b. How often were they included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

   c. Do you think these activities were beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought they were beneficial, what did you find helpful about them?

   d. How involved or engaged were you in the drills?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

4. You may have done an exercise at the end of practices called ***the post-practice learning recap*** where you told your partner something from practice that you had learned or that you were struggling with learning. Considering that activity:
   a. Do you remember doing the post-practice learning recap exercise? Yes ☐ No ☐
      If no, you are finished this questionnaire. Please return it to the researcher.

   b. How often was it included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

   c. Do you think this activity was beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought it was beneficial, what did you find helpful about it?

   d. How involved or engaged were you in the activity?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

APPENDIX Q

Study 2 Paddler Feedback Questionnaire: Individualistic Learning Intervention

Post-Intervention Feedback: Athletes (Individualistic Learning Group)

Name:_____

Over the last 8 weeks, you were part of a program incorporating individualistic learning into your dragon boat practices. Please answer the following questions about that program as accurately as possible.

1. You may have done an exercise at the beginning of practices called ***the pre-practice distraction "park" exercise*** where you reflected on something from your day that was distracting you from focusing on practice. Considering that activity:
   a. Do you remember doing the pre-practice distraction "park"? Yes ☐ No ☐
      If no, please go to question #2.

   b. How often was it included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

   c. Do you think this activity was beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought it was beneficial, what did you find helpful about it?

   d. How involved or engaged were you in the activity?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

2. You may have done ***individualistic learning drills*** during practices where you learned or worked on improving something in your dragon boating that involved you working independently or individually. Considering those activities:
   a. Do you remember doing individualistic learning drills? Yes ☐ No ☐
      If no, please go to question #4.

   b. How often were they included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

   c. Do you think these activities were beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

      If you thought they were beneficial, what did you find helpful about them?

d. How involved or engaged were you in the drills?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

3. You may have done an exercise at the end of practices called ***the post-practice learning recap*** where you reflected on something from practice that you had learned or that you were struggling with learning. Considering that activity:

a. Do you remember doing the post-practice learning recap exercise? Yes ☐ No ☐
If no, you are finished this questionnaire. Please return it to the researcher.

b. How often was it included in your practices?

Never	Once	2-4 times	weekly	every practice
☐	☐	☐	☐	☐

c. Do you think this activity was beneficial for you team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

If you thought it was beneficial, what did you find helpful about it?

d. How involved or engaged were you in the activity?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

APPENDIX R

Study 2 Coach Feedback Questionnaire

Post-Intervention Feedback: Coaches

Name:_____

Please answer each of the following questions about the program.

1. Do you feel this program was helpful for your team?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

If so, how?

2. How difficult was if for you to carry out the program?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

3. Did you feel confident to carry out the program, given the training you had?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

4. Did any of the following things make carrying out the program challenging or difficult?
   a. Time?
      Yes ☐ No ☐
      If yes, please explain:

   b. Trying to integrate the program into your practices?
      Yes ☐ No ☐
      If yes, please explain:

   c. Athlete receptiveness to the program?
      Yes ☐ No ☐
      If yes, please explain:

   d. Conflict with your coaching philosophy or teaching style?
      Yes ☐ No ☐
      If yes, please explain:

   e. Access to support from the researcher?
      Yes ☐ No ☐
      If yes, please explain:

5. Considering the ***manual***, did you find it:
   a. Helpful?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   b. Clear?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   c. Easy to use?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   d. How often did you refer to the manual during the program?

Never	1-2 times during the program	1-2 times a month	1-2 times a week	More than twice a week
☐	☐	☐	☐	☐

   e. Do you have any feedback about the manual to help improve it for future use?

6. Considering the ***training session***, did you find it:
   a. Helpful?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   b. Clear?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   c. Useful in helping you carry out the program?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   d. Do you have any feedback about the training session to help improve it for future use?

7. Considering the ***contact you had with the researcher*** throughout the program, did you find it:
   a. Helpful?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   b. Useful in helping you carry out the program?

Not at all	A little	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

   c. Do you have any feedback about the contact you had with the researcher throughout the program to help improve it for the future?

If you have any additional feedback or comments about this program, please explain below:

APPENDIX S

UBC Research Ethics Board Certificates of Approval