SOCIAL INTERACTIONS AND WELL-BEING:

THE SURPRISING POWER OF WEAK TIES

by

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ABSTRACT

Can acquaintances contribute to our happiness, or are they inconsequential compared to close friends and family? This dissertation expands the focus of study within social psychology, which has been almost exclusively directed towards strong ties, to include examination of weak ties (i.e., acquaintances). A broad sample of Americans reported the number of weak ties they had in their social network, and rated their own happiness (Study 1). People with more weak tie relationships reported being happier. Switching the focus from social relationships to social interactions, students kept track of their interactions with weak tie classmates during a particular class, and reported their happiness after class (Study 2). During classes when they had more interactions with weak tie classmates than usual, they were happier. Expanding the scope to include all daily interactions, students kept track of their interactions with weak ties (Study 3). As before, on days when they had more interactions with weak ties than usual, they were happier. Given that people trim their social networks as they age, and interact with fewer acquaintances starting in their late teens, we replicated this study with a community sample (Study 4). People again reported positive consequences on days when they interacted with more weak ties. The last two studies were experimental, rather than correlational. In a field study at Starbucks, people who were assigned to have a genuine social interaction with the cashier, thus treating them more like a weak tie than a stranger, experienced a more positive mood than people who were assigned to have an efficient interaction with the cashier (Study 5). Finally, participants were instructed to increase the number of daily weak tie interactions for ten days, to test whether this would cause sustained increases in happiness (Study 6). Although people experienced an increase in flourishing, and reported a somewhat greater decrease in loneliness over time than people

in the control condition, there were no broad changes in happiness or belonging. These studies – the first in social psychology to explicitly focus on weak ties – consistently find a relationship between weak ties and happiness.

PREFACE

I am the primary author of the work presented in this dissertation. I was responsible for designing the experiments, collecting and analyzing the data, and writing the manuscripts. Additional contributions for each chapter are described below.

Chapter 1 – Introduction

I am the primary author of this chapter, with intellectual contributions from E. Dunn.

Chapter 2 - Are Weak Tie Relationships Associated With Happiness?

A version of this chapter has been submitted for publication: Sandstrom, G.M., Schaller, M. Judged by the (Amount of) Company You Keep: How the Size of Someone's Social Network Influences Perceptions of Personality. I designed the experiments, collected the data, conducted the analyses and prepared the manuscript. M. Schaller provided intellectual contributions and edited the manuscript. J. Biesanz provided statistical advice.

Chapter 3 - Are Interactions With Weak Ties Associated With Happiness?

A version of this chapter is being prepared for publication. Sandstrom, G.M., & Dunn, E.W. Social interactions and well-being: The surprising power of weak ties. I designed the experiments, supervised data collection, conducted the analyses and prepared the manuscript. E. Dunn provided intellectual contributions and edited the manuscript. C. Falk provided statistical advice.

Chapter 4 - Are Interactions With Weak Ties Associated With Happiness?: Generalizability

I designed the experiments, supervised data collection, conducted the analyses and prepared the manuscript, with intellectual contributions from E. Dunn.

Chapter 5 - Do Interactions With Weak Social Ties Cause Short-Term Happiness?

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Chapter 6 - Do Interactions With Weak Social Ties Cause Long-Term Happiness?

I designed the experiments, supervised data collection, conducted the analyses and prepared the manuscript, with intellectual contributions from E. Dunn.

Chapter 7 - General Discussion

I am the primary author of this chapter, with intellectual contributions from E. Dunn.

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- H11-01816, Social Networks and Personality (Study 1)
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 – INTRODUCTION

"Human felicity is produced not so much by great pieces of good fortune that seldom happen, as by little advantages that occur every day."

- Benjamin Franklin

Imagine that you were to move to a new city, where you didn't know anyone. You would surely miss your close friends and family, and make great efforts to keep in touch with them, feeling happier on days when you connected with them. But moving to a new place would also separate you from a network of people who you might not make any attempts to keep in touch with. People like the receptionist at the tennis club, and the players on the league team, who you would call up for a match. People like the neighbors who would occasionally mow your lawn or feed your cat while you were away. People like the pet store owner, who would ask how your cat was doing, and the waiter at the local restaurant who knew your regular breakfast order. Might you feel unanchored without this network of acquaintances? Could establishing a new network in the new city contribute to your subjective well-being and feelings of belonging?

This dissertation focuses on these low intimacy relationships that abound in our daily lives. In this introductory chapter, I examine the central role that social relationships play in contributing to our well-being, and argue that much of the past research has focused on close relationships, ignoring the relationships on the periphery of our social networks. I introduce the concept of weak social ties, and consider how relationships with weak ties might also contribute to our happiness and feelings of belonging. Then I shift to discussing social interactions, which form the basis of social relationships. Again, I argue that much of the past research has focused

on interactions with close others, and suggest that interactions with weak ties might also have positive consequences. Finally, I formulate several hypotheses, and describe the research I ran, along with my co-authors, to test these hypotheses.

Social Relationships and Well-being

People need other people; psychologically speaking, social relationships are a necessity, not a luxury. In his classic hierarchy of needs, Maslow (1943) proposed that humans' need for love (affection, belonging) was secondary only to satisfying physiological and self-protection motives. When Kenrick and colleagues (2010) re-worked this hierarchy to better reflect modern evolutionary theory, they included several separate needs that are filled by different kinds of social relationships: affiliation, mate acquisition, mate retention and parenting.

Despite being objectively linked to many people, individuals thrive only when they subjectively fulfill this need for relatedness or belonging (Baumeister & Leary, 1995; Ryan & Deci, 2000). Feeling integrated in one's social network has implications for physical health. In a seminal study, researchers found that people who were married, had frequent contact with close others, and participated in groups (including attending church) had lower mortality rates, even after controlling for differences in socioeconomic status, initial health, and health behaviors such as smoking and exercise (Berkman & Syme, 1979). Copious studies in the vast literature on social support have now shown that the quantity and quality of one's social relationships affect physical health, and thus morbidity and mortality (Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

Feeling connected to others promotes not only physical health and well-being, but also emotional well-being. Students in an exchange program reported less emotional distress while studying abroad when they had developed adequate close relationships in the foreign

environment (Furukawa, Sarason, & Sarason, 1998). Supportive social relationships do not only reduce emotional distress - they also increase emotional well-being. On days when people feel more connected to others, they experience more positive affect – one of the main components of subjective well-being (Reis, Sheldon, Gable, Roscoe, & Ryan, 2000). More broadly, the extent to which a person has positive relations with others is associated with various measures of subjective well-being (Ryff, 1989). Very happy people report more satisfying personal relationships with friends, and spend more time with friends and family, compared to people who are moderately happy (Diener & Seligman, 2002). Indeed, meta-analyses show that the link between happy people and high quality social relationships is extremely robust (Lyubomirsky, King, & Diener, 2005).

Although the link between social relationships and subjective well-being is well established, past research is limited in that it has focused nearly exclusively on particular kinds of relationships – those with close friends and family. Social network researchers have examined various kinds of networks: networks of significant others (people who are important in one's life), exchange/support networks (people to whom one provides support, or from whom one receives support), interactive networks (people with whom one interacts on a regular basis), and global networks (everyone that one knows; Allan, 2006). Researchers examining the association between social relationships and happiness have primarily focused on the first two. A meta-analysis by Lyubomirsky and colleagues (2005) lists 56 effect sizes quantifying the association between social relationships and happiness. More than half of these effect sizes (31) pertain to the marital relationship (e.g., the relationship between marital status and life satisfaction), and seven others explicitly refer to close friendships or romantic relationships (e.g., the correlation between the number of close friends and morale). Although the majority of past studies have thus

focused on networks of significant others, six studies in the meta-analysis explicitly referred to the support network (e.g., the relationship between support from neighbors and happiness). Examination of the interactive network and the global network has generally been neglected, despite the fact that evidence shows that companionship may provide many of the same benefits as social support (Rook, 1987). A few of the studies in the meta-analysis examined the social relationships associated with specific kinds of interactions (e.g., visiting with a person, or having them over for dinner), but none directly examined the association between the broader interactive network and subjective well-being. In other words, no past studies have looked at relationships like the ones with the tennis club receptionist or the pet store owner.

Weak Ties

The fact that past research on social relationships and happiness has focused on relationships with close friends and romantic partners belies the vast number of social relationships that a person maintains. How large is a typical person's social network? Dunbar (1992) found that the size of the neocortex correlates with social group size in primates, leading to a prediction that humans should be able to maintain contact with about 150 people (Dunbar, 1993). However, a person's global social network may be much larger than that; including people with whom one is not in contact on a regular basis will expand this number dramatically. In one study, when 27 people with different occupations and social classes were asked to keep records of everyone that they spoke with, however briefly, over the course of 100 days, they reported interacting with a mean of 440 different people (Pool & Kochen, 1979). With modern technology allowing for more methods of keeping in touch with others, people may have more peripheral relationships (Allan, 2006; Boase & Wellman, 2006). Facebook studies have found that people have an average of anywhere from 185 to 395 online "friends" (Burke, Marlow, &

Lento, 2010; Tong, Van Der Heide, Langwell, & Walther, 2008). Given that people report being extremely close with somewhere between 4 and 10 people, and somewhat close with between 12 and 40 people (Hammer, 1980; Roberts, Dunbar, Pollet, & Kuppens, 2009), past research suggests that there are large numbers of people in the periphery of one's social network.

Who are these people who fall on the periphery of one's social network? Sociologist Mark Granovetter (1973) brought attention to these relationships, dubbing them "weak ties". Granovetter suggested that weak ties generally involve less frequent contact, lower emotional intensity and limited intimacy. However, these qualities need not all be true of every weak tie relationship; one can have a weak tie with someone who one sees frequently (e.g., co-worker, neighbor, classmate; Fingerman, 2004). Further, one can experience strong reactions to weak ties, as in feeling annoyed by someone who one is compelled to see every day. Thus, perhaps the most notable distinction between weak ties and strong ties is in the level of intimacy. Although social relationships differ along several dimensions, such as volition (voluntary vs. exogenously established) and power (equitable vs. non-equitable), the intimacy dimension (close vs. superficial) may be the most important (VanLear, Koerner, & Allen, 2006); in one study, intimacy explained about 50% of the variance in relationship variables across 100 different relationship roles (Marwell & Hage, 1970). In another study, closeness, or intensity, predicted tie strength better than frequency of contact, duration of contact or relationship type (e.g., kinship, neighbor; Marsden & Campbell, 1984). Thus, whether or not someone is considered a weak tie depends on a subjective judgment of closeness, rather than on the type of relationship; some cousins may be strong ties, whereas others may be weak ties. The receptionist at the tennis club, the neighbor who looks after the cat and the waiter who remembers one's breakfast order would likely all be considered weak ties, but so might a colleague who one sees every day. The

definition of "weak tie" thus encompasses a wide variety of relationships, which might differ in important ways that warrant specific investigation. However, given that past research examining the association between relationships and well-being has focused primarily on strong ties, using a broad definition of weak ties allows us to investigate a preliminary, fundamental question: can these more peripheral relationships contribute to one's subjective well-being?

Before turning to the current research, which asks whether weak ties are associated with happiness, it is helpful to examine the advantages of weak ties that have already been established. Granovetter (1973) argued that weak ties provide bridges between different social circles, thus allowing access to new information, rather than the stale news and views of people who are all similar and tend to know each other. For example, Granovetter (1973) found that job-seekers were more likely to find employment through information gleaned from weak ties rather than strong ties. Harvard professor Stanley Milgram encountered this strength of weak ties when he studied the "small-world problem" (Milgram, 1967). He selected two target people in the Boston area and then enlisted help from randomly chosen people in Kansas and Nebraska – places that seemed psychologically removed from Boston. The Midwesterners were provided with limited information about one of the targets, and were asked to deliver a folder to that person. If they didn't know the target personally, they were to mail the folder to a personal acquaintance who would be more likely than them to know the target person. Dozens of folders were successfully delivered to the targets, often through weak ties. Milgram concluded that a person's circle of acquaintances allows them to connect to a far-ranging network of people, whereas the folders might go in circles if people just passed them to strong ties. This access to a broader range of people with diverse attitudes and ideas may explain why weak ties have been linked to creativity. Whether tie strength was assessed by closeness, duration of the relationship,

or frequency of contact, employees who had more weak ties at work were judged by their supervisors to be more creative (Perry-Smith, 2006).

Returning to the goal of this dissertation, we examine whether weak ties might be related to subjective well-being and belonging. Supportive evidence comes from a series of studies by Fowler and Christakis examining longitudinal social network data from the Framingham Heart Study. In these studies, people who are surrounded by happy people are more likely to become happy (Fowler & Christakis, 2008), and people who are surrounded by lonely people are more likely to become lonely (Cacioppo, Fowler, & Christakis, 2009). Importantly, both the effects of happiness and loneliness extend to three degrees of separation; in other words, if friends of one's friends, or even friends of friends of one's friends are happy or lonely, then one is more likely to become happy or lonely. To the extent that these people can be considered weak ties in one's own network, these studies suggest that even the people who are peripheral to one's social network can impact one's happiness and loneliness.

Social Interactions and Well-being

The mere presence of strong and weak ties in one's social network may have positive consequences for subjective well-being, but the active presence of these ties in one's daily life may unlock the greatest benefits. Social interactions form the core of social relationships (Reis, Collins, & Berscheid, 2000), building the foundation to establish and maintain social relationships. People enjoy socializing; studies using several different methodologies converge on this conclusion. Studies using daily diary methods, in which participants recall their interactions at the end of the day (or every few hours), have found that people report more positive affect on days when they participate in social events (Clark & Watson, 1988; Vittengl &

Holt, 1998a; Watson, Clark, McIntyre, & Hamaker, 1992), on days when they have more social interactions (Berry & Hansen, 1996), and on days when they feel more connected to others (Reis, Sheldon, et al., 2000). Comparing social interactions to other activities (e.g., solo events, school events), Clark and Watson (1988) found that social events generated the greatest increase in positive affect. Studies using the Day Reconstruction Method (DRM; Kahneman, Krueger, Schkade, Schwarz, & Stone, 2004) have also found that people enjoy socializing. The DRM builds upon the daily diary method, providing a means of prompting one's ability to recall events that occurred throughout the day; participants break the day up into chunks called episodes, and then recall what happened during each episode and how they felt at that time. In a study of more than 1000 employed women, participants reported spending, on average, more than 2 hours each day socializing, and reported experiencing more positive affect during that activity than during any other activity, with the exception of "intimate relations" (Kahneman et al., 2004). Similarly, people reported experiencing more positive affect while socializing than during most other activities in a phone survey version of the DRM (Krueger, Kahneman, Schkade, Schwarz, & Stone, 2009). Memory issues, which are less prevalent in the DRM than in daily diary studies, do not pose a problem with experience sampling methods. With experience sampling, participants report what they are doing and how they are feeling in real-time, when they receive a prompt (e.g., an alarm on a wristwatch, a pager message). Experience sampling studies also find that people enjoy socializing. In one study, people reported more positive affect when they were engaged in social activities rather than non-social activities (Pavot, Diener, & Fujita, 1990).

Just as past research on the association between social relationships and happiness has focused on relationships with strong ties, two methodological features suggest that past research on the association between social interactions and happiness has also focused on strong ties.

First, many of the past studies used either daily diary or DRM methods, which require a participant to remember all of the interactions they had throughout the day. There is reason to believe that people will be more likely to remember interactions with close friends and family than to remember interactions with weak ties. By definition, interactions with weak ties are expected to have less emotional intensity (Granovetter, 1973), which makes them less memorable; long-term memory is better for high arousal stimuli (Bradley, Greenwald, Petry, & Lang, 1992). Indeed, when asked to list the names of all of their friends and acquaintances, people tend to remember those to whom they are close, and with whom they have more frequent contact (Fu, 2005). Additionally, people are more accurate remembering how much time they spent with friends than they are remembering how much time they spent with non-friends (Eagle, Pentland, & Lazer, 2009). Second, several studies only asked participants to report interactions that were of a substantial duration (e.g., 15 minutes; Berry & Hansen, 1996; Reis, Sheldon et al., 2000; Watson et al., 1992). Given that conversations with one's best friend are likely to be longer, on average, than conversations with the tennis club receptionist, this may have resulted in people reporting predominantly their interactions with strong ties.

The fact that methodological features have likely resulted in under-reporting of weak ties sheds doubt on any analyses comparing the effects of strong ties and weak ties. However, comparing the effects of strong ties and weak ties has not been the purpose of any past studies. Most past studies have treated all interactions equally, not asking participants to report the closeness of their interaction partners. One study reported that 21% of interactions were with weak tie partners, but the researchers did not report any analyses broken down by this factor (Berry & Hansen, 1996). Thus, whether or not one's network of weak ties contributes to their subjective well-being, above and beyond the effects of strong ties, remains an empirical question.

In addition to being associated with subjective well-being, there is theoretical and empirical evidence to suggest that interactions with strong ties are associated with feelings of belonging. When Baumeister and Leary (1995) proposed that humans have a need to belong, they proposed that frequent interactions with strong ties fulfill this need. They argued that close relationships without frequent interactions do not fully satisfy the need, nor do frequent interactions with less intimate others (i.e., weak ties). Some empirical evidence supports this assertion. People report more positive affect following social interactions with more familiar partners (Vittengl & Holt, 1998b). When people have more intimate, meaningful conversations, they report being less lonely (Wheeler, Reis, & Nezlek, 1983), more happy (Mehl, Vazire, Holleran, & Clark, 2010; Reis, Sheldon et al., 2000), and feel a greater sense of relatedness (Reis, Sheldon et al., 2000).

The fact that theory and past research link strong tie interactions to subjective well-being and belonging does not preclude the possibility that weak tie interactions might also be linked to subjective well-being and belonging. Indeed, there is evidence that interactions with strangers, which are even less intimate than those with weak ties, lead to greater subjective well-being. In one study, when people were randomly assigned to interact with a stranger, they enjoyed the interaction as much as people who were randomly assigned to interact with their romantic partner, although they did not predict that interacting with a stranger would be so enjoyable (Dunn, Biesanz, Human, & Finn, 2007). People experienced an unexpected source of enjoyment from putting their best face forward, as one does more often with strangers, and possibly weak ties.

Not only do people enjoy interacting with strangers more than they anticipate, but even the simple act of being acknowledged by a stranger has implications for feelings of belonging.

Participants in a field study reported feeling less disconnected from others when a confederate made eye contact with them as they walked past, rather than looking past them (Wesselmann, Cardoso, Slater, & Williams, 2012). In contrast, being forgotten by a research assistant lowers feelings of meaning in life (King & Geise, 2011). Thus, it seems that even acknowledgement by strangers, with whom one does not have a true social relationship, has consequences for subjective well-being and belonging. Given that interactions with strangers and strong ties are both related to subjective well-being and belonging, and given that weak ties fall between strangers and strong ties on a continuum of relationship intimacy, it follows that interactions with weak ties might also be linked to subjective well-being and belonging.

The Present Research and Hypotheses

Social relationships, and specifically the social interactions that form the core of social relationships, are strongly related to subjective well-being and feelings of belonging. However, past research has focused primarily on strong ties, with no work specifically examining weak ties. Fowler, Christakis and colleagues found that the peripheral members of one's social network influence one's happiness and loneliness (i.e., feelings of belonging; Cacioppo et al., 2009; Fowler & Christakis, 2008). Additionally, even minimal social interactions with strangers affect one's subjective well-being and feelings of connectedness. Thus, we hypothesize that weak ties, independent of the effects of strong ties, are related to subjective well-being and feelings of belonging. This dissertation presents six studies testing this hypothesis.

Starting with a focus on social relationships, Study 1 in Chapter 2 examined the association between strong and weak tie relationships and happiness. Participants reported how many strong and weak tie relationships they had, and reported how happy they were. In addition,

participants rated profiles of target individuals who were portrayed as having different numbers of strong and weak ties, drawing inferences about how happy they thought the target person would be. This allowed us to examine the intuitions people have about the extent to which a person's happiness is linked to the number of strong and weak ties they have, and to test whether those intuitions correspond to reality.

Switching focus to social interactions in Chapter 3 and Chapter 4, rather than social relationships, three studies investigated whether people report greater subjective well-being and belonging on days when they have more interactions with weak ties than they usually do. In Study 2, students were asked to monitor their interactions with classmates in a particular class. They reported their current mood and feelings of belonging, as well the number of interactions, by means of text messaging. Examining the research question more broadly, in Study 3 people kept track of all of their daily interactions using hand-held mechanical tally counters ("clickers"). In order to separate the effects of weak tie interactions from the effects of strong tie interactions, participants counted both kinds of interactions separately. At the end of each day, participants accessed an online survey and reported their subjective well-being and feelings of belonging, as well the number of strong and weak tie interactions. In Study 4 in Chapter 4, we replicated Study 3 with a community sample, in order to test whether the relationship between weak tie interactions and subjective well-being generalized to a broader population.

The studies in Chapter 3 and Chapter 4 tested whether interactions with weak ties were correlated with subjective well-being and feelings of belonging, but did not establish the direction of causality. It is possible that feeling happier leads people to reach out to weak ties, but we argue that interacting with weak ties leads people to feel happier. This hypothesis was first tested in Chapter 5. People were recruited outside of Starbucks and were assigned either to

have a genuine social interaction with the cashier (i.e., smile, make eye contact, have a brief conversation), or to be as efficient as possible and eschew unnecessary interaction. We hypothesized that treating the cashier like a weak tie, rather than a stranger, would result in a mood boost. In order to test the power and longevity of this effect, Study 6 in Chapter 6 tested whether having additional weak tie interactions each day would result in sustained increases in subjective well-being and feelings of belonging. Participants were asked either to have more strong tie interactions, more weak tie interactions, or to consume more traditional media ("traditional media interactions") every day for 10 days. Each day, participants completed an online survey, describing their extra interactions and reporting their subjective well-being and feelings of belonging.

In all the studies that asked participants to differentiate between strong ties and weak ties (i.e., Studies 1-4, and Study 6), similar definitions were provided, to assist participants in distinguishing between the two kinds of relationships. Given the past research showing that intimacy may be the most important dimension differentiating relationships (Marsden & Campbell, 1984; Marwell & Hage, 1970; VanLear, Koerner, & Allen, 2006), we referred to closeness in our definitions. We also drew upon past research defining confidantes as people who "you confide in or talk to about yourself or your problems" (Lowenthal & Haven, 1968). Finally, we drew upon past definitions of acquaintances as being people "whom you know, but not well", whereas friends are people "whom you know well" (Hotard, McFatter, McWhirter, & Stegall, 1989). Taken together, we defined a strong tie as "someone you are very close to, someone who you know really well and knows you really well, **someone who you confide in** or talk to about yourself or your problems". In comparison, a weak tie was defined as "someone

you are not very close to, who you don't know very well and who doesn't know you very well, someone who you consider a friend, but would be **unlikely to confide in"**.

As a result of these definitions, a "weak tie" means something different than in traditional work on social networks. Whereas in network terminology an "ego" is connected to an "alter" via a weak tie (or a strong tie), in this dissertation it is the alter to whom one is connected with a weak tie that is referred to as a "weak tie". This definition reflects the purpose of the current research: examining how the well-being of an individual is associated with that individual's interactions. Thus the current research does not specifically examine the relationships (i.e., ties) between people, but rather focuses on the network of people with whom an individual interacts, and with whom the individual perceives to have a low intimacy bond.

The studies in this dissertation all focus on subjective well-being as an outcome variable. Subjective well-being refers to a person's subjective evaluation of how happy they are, and includes global cognitive assessments of the quality of one's life, as well as measures of emotional experience (positive and negative affect; Diener, 1984). This can be contrasted with the broader concept of psychological well-being, which refers to fulfillment of a set of psychological needs (e.g., autonomy, sense of purpose; Ryff, 1989). When used without a prefix, well-being is an even broader term including physical health. This dissertation uses the terms happiness, well-being and subjective well-being interchangeably, all referring specifically to subjective well-being.

Together, these six studies provide foundational knowledge about the relationship between weak ties and subjective well-being and feelings of belonging. Limitations and directions for future research are discussed in Chapter 7.

CHAPTER 2 - ARE WEAK TIE RELATIONSHIPS ASSOCIATED WITH HAPPINESS?[1]

Chapter 1 described a program of research for studying weak ties and their relationship to well-being. The first objective was to study social relationships and determine if people report greater subjective well-being when they have more weak ties in their social networks. Further, we examined the extent to which people know about this relationship, by looking at inferences that people draw about someone's happiness based on knowledge about that person's social network.

STUDY 1: INTUITIONS ABOUT THE ASSOCIATION BETWEEN SOCIAL RELATIONSHIPS AND HAPPINESS

People make surprisingly accurate judgments about others' personalities on the basis of limited information. Traits are inferred not only from observations of individuals themselves (e.g., their appearance and actions), but also from information about the artifacts that individuals collect and create (e.g., their music collections, their Facebook pages, the contents of their bedrooms; Gosling, Ko, Mannarelli, & Morris, 2002; Rentfrow & Gosling, 2006; Vazire & Gosling, 2004) and which comprise their immediate ecological circumstances. While this growing body of research has revealed considerable information about how personality is inferred from details about a person's environment, little is yet known about how a person's dispositional happiness might be inferred from details about a person's environment.

In this study, we examined self-reports to establish the extent to which there is an association between the size of a person's social network (the number of friends and acquaintances that someone has) and how happy they are. We also asked whether people are

[1] A version of this chapter has been submitted for publication: Sandstrom, G.M., Schaller, M. Judged by the (Amount of) Company You Keep: How the Size of Someone's Social Network Influences Perceptions of Personality.

aware of the value of weak ties, by examining whether people draw inferences about another person's happiness based on that person's social environment – specifically, the size of a person's social network (the number of friends and acquaintances that someone has).

Inferring Others' Happiness

Little work has examined the inferences that people make about another person's happiness. One reason for this may be that it is generally agreed that happiness is subjective (Campbell, 1976; Diener, 1984; Lyubomirsky & Lepper, 1999) – regardless of the positivity or negativity of their life circumstances, a person is happy if and only if they think they are. As a result, happiness is usually measured by self-report, since feelings are experienced internally and are not directly available to observers. However, given the drawbacks of relying upon self-reports (e.g., self-presentational concerns, the influence of current mood), researchers have attempted to validate self-report measures through the use of criterion variables such as non-verbal behavior (e.g., amount of smiling) and informant reports. If informant reports correlate with self-reports, it suggests that people are able to infer another person's happiness. Indeed, in several studies, informant reports correlate significantly ($.34 < r\text{'s} < .66$) with self-reports on the same measure, and on other self-report measures (Goldings, 1954; Lyubomirsky & Lepper, 1999; Pavot, Diener, Colvin, & Sandvik, 1991; Sandvik, Diener, & Seidlitz, 1993).

In opposition to the general convergence between informant and self-reports of happiness, there is also some evidence for a divergence between self-reports and inferences. Indeed, people believe that their friends misjudge their happiness; in one small study, six participants thought that their friends would underestimate their happiness, 12 thought that their friends would overestimate their happiness, and only two thought that their friends would accurately judge their happiness (Goldings, 1954). Some evidence suggests that these intuitions

may be true: people may indeed overestimate others' happiness. People expect their peers to experience positive events more often, and negative events less often than they do themselves (Jordan et al., 2011); consequently, people overestimate the extent to which their peers experience positive emotions, and underestimate the extent to which their peers experience negative emotions.

In the limited work investigating inferences about others' happiness, the people making the inferences have either been close friends and family (i.e., strong ties), or experts (e.g., clinicians or experimenters). When people do not have extensive knowledge about the target, they are limited to drawing upon their lay theories about happiness. Social inferences are guided by implicit personality theories of various sorts (e.g., Asch & Zukier, 1984; Dweck, Chiu, & Hong, 1995; Schneider, 1973), and it is hardly far-fetched to suppose that people might have plausible-but-unsubstantiated theories about the relation between happiness and the size of social networks. Indeed, people strongly endorsed the lay theory that social support (a factor measured with questions like "They have many friends they like", and "They have close friends/confidants") contributes to happiness (Furnham & Cheng, 2000). However, their intuitions might be more nuanced. For example, because people may tacitly assume a trade-off between quantity and quality in the domain of friendship, they might consequently judge a person with a very large number of casual acquaintances to be less happy (because if they spend lots of time maintaining ties with acquaintances, then they must have less time to spend on close friends, which matter the most for happiness).

How Might Social Network Size Influence Inferences About Happiness?

There are several reasons to expect that information about the size of someone's social network will impact the impressions that people form about that person's personality. One line of

reasoning relates to the importance of social networks in governing individuals' outcomes in various life domains. Even peripheral members of social networks may influence the jobs that individuals get, the people that they marry, their long-term health and happiness, and a variety of other important life outcomes (e.g., Berkman & Syme, 1979; Berscheid & Reis, 1998; Cacioppo et al., 2009; Christakis & Fowler, 2007; Christakis & Fowler, 2008; Fowler & Christakis, 2008; Granovetter, 1973; Sprecher, Felmlee, Orbuch, & Willetts, 2002; Uchino et al., 1996). It's not merely the quality of social interactions that matters, it's the *quantity* too: the sheer size of someone's social network also has implications for health, happiness, and other outcomes (e.g., Oishi & Kesebir, in press; Pressman, Cohen, Miller, Barkin, & Rabin, 2005). The role that social network size plays in contributing to these outcomes may be noticed by laypeople because, as perceivers, people attend to and draw inferences from information that has functionally important consequences (e.g., Haselton & Funder, 2006; Schaller, Park, & Kenrick, 2007; Zebrowitz & Montepare, 2006). The overall implication is that, because the size of someone's social network is functionally consequential, it may be inferentially consequential too.

People might use information about social network size when drawing inferences about someone's happiness not only because social networks (and, specifically, the size of social networks) are important, but also because social networks might actually be related to a person's happiness. This line of reasoning draws on research showing that people are sensitive to cues that actually do correlate with underlying dispositional tendencies and, as a consequence, draw inferences based on those cues (Kenny, Albright, Malloy, & Kashy, 1994; Penton-Voak, Pound, Little, & Perrett, 2006; Zebrowitz & Collins, 1997). There is some evidence that the size of someone's social network may indeed be diagnostic of happiness; in one study, social network size was correlated with positive affect (Pressman et al., 2005). Further, there is evidence

suggesting that people experience more positive affect on days when they have more social interactions (Berry & Hansen, 1996). To the extent that having more social interactions is related to having a larger social network, this indirectly suggests the diagnosticity of social network size in predicting happiness. Thus, because the size of someone's social network is related to chronic happiness, perceivers may use information about social network size to inform the inferences they draw about others' happiness.

The present empirical investigation was designed to systematically address the research questions identified above. To address the primary research question (How does social network size influence inferences about happiness?) we conducted an experiment in which participants were presented with written profiles of target individuals. The profiles systematically varied both the number of close friends and the number of casual acquaintances that constituted the target individual's social network. Participants rated target individuals on dispositional happiness.

In order to assess the extent to which the resulting inferences corresponded to reality, participants reported their own happiness, and also self-categorized according to their own numbers of strong ties and weak ties. These measures were designed to be methodologically analogous to those used in the experiment. The results therefore allowed us to conduct additional analyses comparing the dispositional inferences that are drawn on the basis of social network size to the actual relations between happiness and social network size.

Method

Participants

A total of 289 participants (143 males and 146 females) were recruited on Amazon's Mechanical Turk website and paid $0.20 to fill out an online questionnaire. (Responses were identified by IP address; we removed 32 additional responses because 16 IP addresses appeared

twice, suggesting duplicate responses.) These participants completed target-rating procedures that provided data on the dispositional inferences that perceivers draw from the size of other individuals' social networks.

An additional 611 American participants (306 males and 304 females, 1 unknown) were recruited on Amazon's Mechanical Turk website and paid $0.10 to fill out an online questionnaire. (Responses were identified by IP address; we removed 10 additional responses because 5 IP addresses appeared twice, suggesting duplicate responses.) These participants completed self-report procedures that provided data on actual relationships between happiness and the size of social networks.

Procedures Assessing Inferences About Others' Traits Based on the Size of Their Social Networks

Nine target profiles described a person who had either a Low, Moderate, or High number of strong ties, and either a Low, Moderate, or High number of weak ties. For example: "Mary has a few close friends (about 4) and has a lot of casual friends/acquaintances (about 100)." The three levels of the number of strong ties variable were conveyed as follows: *Low* = "doesn't have a lot of close friends (about 1)"; *Moderate* = "has a few close friends (about 4)"; *High* = "has a lot of close friends (about 20)." The three levels of the number of weak ties variable were conveyed as follows: *Low* = "doesn't have a lot of casual friends/acquaintances (about 5)"; *Moderate* = "has a few casual friends/acquaintances (about 20)"; *High* = "has a lot of casual friends/acquaintances (about 100)." The numerical values used to convey Low, Moderate, and High numbers of strong ties and weak ties were designed to be realistic; these values were informed by pretesting done within our own lab, and also by the results of previous research describing the sizes of individuals' social network (e.g., Roberts et al., 2009). Each profile was

presented with either a common female name (Mary, Patricia, Linda) or a common male name (James, Robert, Michael).

Each participant (N = 289) was presented with one of six sets of three target profiles. Each set of profiles was presented with either all female names or all male names. These sets were generated by a quasi-random process that was constrained to ensure that each of the nine profiles appeared in exactly two of the six sets. Participants were assigned by an arbitrary procedure (based on participants' self-reported birth month) to a particular set of profiles.

Before recording their inferences, participants were presented with the following instructions: "When we get to know people, we learn about their friends (we see them hanging out/talking to other people). Over time, we get an impression of their social network." They were then shown all three profiles that they would be rating, along with a further instruction that clarified the distinction between "close friends" and "casual friends/acquaintances": "A close friend is someone you are very close to, someone who you know really well and knows you really well, someone who you confide in or talk to about yourself or your problems." Each profile was then presented again, individually, and participants proceeded to make ratings indicating their inferences about the disposition of each target person.

Participants reported inferences about dispositional happiness. For each target profile, they were presented with a single item from the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) that asked them to rate how happy a person the target individual was (1 = "Not a very happy person"; 7 = "A very happy person").

Procedures Assessing Actual Relations Between Traits and the Size of Social Networks

Participants (N = 611) reported their own dispositional happiness on a single item from the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) that asked them to rate the extent to which they were a happy person (1 = "Not a very happy person"; 7 = "A very happy person").

Subsequently, participants categorized themselves according to the approximate size of their own social network, by indicating whether they had a Low, Moderate, or High number of strong ties, and also indicating whether they had a Low, Moderate, or High number of weak ties. These self-categorization procedures used wordings and numerical approximations that closely mimicked those in the dispositional inference task described above.

Results

Inferences About Others' Happiness Based on the Size of Their Social Networks

Because participants rated multiple profiles, the ratings data violate assumptions of statistical independence. Therefore, in order to statistically analyze these data, we employed hierarchical linear modeling (using the *lme4* package in *R*, under restricted maximum likelihood; R Development Core Team, 2009; Bates & Sarkar, 2007), in which profile ratings were nested within participants. We constructed a regression model that simultaneously tested for the existence of linear effects of the Number of Strong Ties and the Number of Weak Ties on inferences about targets' happiness. Contrast coefficients were used to specify linear (-1, 0, 1) effects associated with the three levels (Low, Moderate, High) of each manipulated variable. Table 1 summarizes the results of these regression analyses, along with means illustrating the exact nature of these effects.

The number of strong ties ($p < .001$) and the number of weak ties ($p < .01$) exerted independent, statistically significant linear effects on inferences about happiness (see Table 1). Target individuals were judged to be happier when they had more strong ties, but also when they had more weak ties.

Actual Relations Between Happiness and the Size of Social Networks

Each of the 611 participants self-identified as having Low, Moderate, or High numbers of close friends, and as having Low, Moderate, or High numbers of acquaintances. As a consequence, participants self-categorized into one of nine distinct friendship profiles directly analogous to the artificial profiles presented to participants who completed the dispositional inference task. Sample sizes associated with each of these nine self-categorized profiles were highly variable. (E.g., 224 participants self-identified as having a moderate number of both close friends and acquaintances, whereas only 1 participant indicated a high number of close friends and a low number of acquaintances.) This variability is due, in part, to a positive correlation between the self-identified numbers of close friends and acquaintances, $r(611) = .42$, $p < .001$.

Given the extremely small size of one cell of the 3 x 3 matrix of self-categorized friendship profiles, it is difficult to reliably estimate interaction effects involving numbers of close friends and numbers of acquaintances. However, the marginal *N*'s were all substantial: The number of participants who self-identified as having Low, Moderate, and High numbers of close friends were 165, 410, and 36, respectively; the number of participants who self-identified as having Low, Moderate, and High numbers of acquaintances were 111, 303, and 197, respectively. Given these substantial marginal *N*'s, it is possible to reliably estimate linear relations between these social network variables and happiness.

We constructed a regression model that tested simultaneously for the existence of linear effects of the self-identified Number of Strong Ties and Number of Weak Ties on self-reported happiness. Contrast coefficients were used to specify linear (-1, 0, 1) effects associated with the three levels (Low, Moderate, High) of each variable. Both participants' number of strong ties ($p = .01$) and participants' number of weak ties ($p < .001$) were independently, significantly linearly related to happiness (see Table 1). Both people who had more strong ties and people who had more weak ties reported being happier.

Given that extraverted individuals tend to be happier (Pavot et al., 1990), we tested that the effects remain after controlling for extraversion. With extraversion (centered) included in the model, participants' number of weak ties remained significantly linearly related to happiness ($p = .002$), but participants' number of strong ties became marginally linearly related to happiness ($p = .09$).

Comparison of Inferred Relations with Actual Relations

Perceivers inferred that people with larger social networks are happier; and, indeed, people with larger social networks actually are happier. We conducted additional statistical analyses designed to more systematically articulate specific ways in which perceivers' inferences do, and do not, correspond with the actual relations between happiness and the size of social networks.

One way to conceptualize correspondence between inferred and actual dispositions is to focus on means. For each of the nine different friendship profiles presented to participants in the dispositional inference task, we computed the mean target happiness rating (e.g., the mean happiness rating for a target with a few close friends and very few casual friends/acquaintances was 4.86). For the self-reports, the number of friends and number of acquaintances that

participants chose to represent their own social network placed them in one of the nine friendship profiles used in the inference task. For each profile, we computed the mean of the self-reports (e.g., the mean self-reported happiness for someone with a few close friends and very few casual friends/acquaintances was 4.21). Recall, however, that only one participant self-identified in one of those profile categories (high number of close friends paired with a low number of acquaintances), and means based on $N = 1$ cannot be considered meaningful. Still, there remain eight other profiles for which there exist relatively reliable means. The extent to which these two sets of means co-vary across the eight profiles provides one indication of the extent to which inferences correspond to reality. Results revealed a significant correlation, $r(8) = .73$, $p = .04$, indicating that inferences about targets' happiness correspond well with self-reports.

Another strategy for investigating the extent to which inferred relations correspond to (and deviate from) real relations is to focus not on means, but instead on effect sizes, here indexed by regression co-efficients. Table 1 lists two co-efficient estimates (b's) indicating the extent to which social network size actually is diagnostic of individuals' happiness, and a parallel set of two co-efficient estimates indicating the extent to which perceivers tacitly presume social network size to be diagnostic of happiness. The co-efficient of the number of strong ties on happiness inferences (b = .83) appears to be much larger than the co-efficient of the number of strong ties on self-reported happiness (b = .33), suggesting that people presume the number of strong ties to be more strongly diagnostic of happiness than it actually is. As for weak ties, the co-efficient of the number of weak ties on happiness inferences (b = .14) appears to be smaller than the co-efficient of the number of weak ties on self-reported happiness (b = .42), suggesting that people might underestimate the diagnosticity of the number of weak for predicting happiness.

Discussion

Results revealed that perceivers inferred that people with more strong ties are happier; these inferences correspond with self-report results showing that individuals with more strong ties actually are happier. Perceivers also inferred that a greater number of weak ties implied higher levels of happiness; and, in fact, people with more weak ties are happier. Across a range of friendship profiles, inferences about happiness correlated highly with actual self-reported levels of happiness.

Patterns of correspondence between inferences and reality showed a general tendency for perceivers to inferentially exaggerate the magnitude of relations between happiness and social network size for strong ties. Past studies have also shown analogous effects: Correlations between behavioral cues and perceived traits are larger than correlations between behaviors and actual traits (Gosling et al., 2002; Mehl, Gosling, & Pennebaker, 2006). One explanation is that, when judging others on the basis of limited information, perceivers' inferences are especially likely to be influenced by folk theories, stereotypes, and other expectation-based heuristics. Even when based on kernels of truth, such expectations tend to exaggerate the magnitude of statistical relationships (Trolier & Hamilton, 1986).

Implications, Limitations, and Directions for Future Research

These findings complement and extend the growing body of research documenting ways in which perceivers draw inferences about a person's personality based on the contents of that person's immediate ecology (e.g., Gosling et al., 2002; Rentfrow & Gosling, 2006). Just as personality traits are inferred from someone's collections of music and mugs and books and board games, trait happiness is also inferred from someone's collection of friends and acquaintances. It is notable, perhaps, that these inferences are so readily drawn even in the

absence of any substantive knowledge about the qualities of those friends and acquaintances; these inferences are informed by the sheer *quantities* of friends and acquaintances.

The results also contribute to broader literatures on person perception and social stereotypes. People develop stereotypes about many different kinds of superficial features and the dispositional tendencies that are assumed to co-vary with those features. Once formed, those stereotypes have important consequences for inferences about and actions toward individuals characterized by those features. Most work in this literature has focused on stereotypes pertaining to common demographic features such as sex, age, and ethnic background, or to other features of a person's physical appearance (Dovidio, Hewstone, Glick, & Esses, 2010). But people readily form stereotypes pertaining to many other identifying characteristics too, such as political party membership and dietary habits (Rahn, 1993; Vartanian, Herman, & Polivy, 2007). Thus, it is not surprising that people would also have stereotypes pertaining to the size of someone's social network. Our methods differed from the sorts of methods typically used to assess stereotypes (e.g., Correll, Judd, Park, & Wittenbrink, 2010). Nonetheless, by assessing trait inferences about individuals with different numbers of friends and acquaintances, our results provide indirect evidence indicating a specific personality trait (happiness) that seems to be stereotypically associated with different sizes of social networks. Stereotypes are comprised of more than just personality traits; given that actual social networking strategies co-vary with other variables too (e.g., Oishi & Kesebir, in press), there may be additional characteristics that are also stereotypically implied by the size of someone's social network. It remains for future research to more fully articulate the content of these stereotypes, to elucidate the mechanisms through which they are acquired, and to explore their additional implications for social cognition and interpersonal interaction.

Future research will also be required to address other limitations and constraints associated with our methodology. Although there are inferential benefits associated with our experimental methodology, this methodology required that we treat truly continuous variables (numbers of friends and acquaintances) in an artificially categorical manner (classifying these numbers as either low, moderate, or high). In order to more completely reveal both the actual and inferred relations between social network size and personality, it may be useful to also use correlational methods that sample the entire realistic range of these variables. Our methodology also discriminated between only two broad categories of people who comprise social networks – close friends and casual acquaintances. This distinction oversimplifies the true complexity of the many different kinds of relationships that individuals have with a variety of people who differ along a variety of dimensions. Given this complexity, various other categorical distinctions might fruitfully be explored as well (e.g. the distinction between communal and exchange relationships; Mills & Clark, 1982). One promising perspective (Roberts et al., 2009; Roberts, Wilson, Fedurek, & Dunbar, 2008) suggests that social networks are comprised of at least three distinct layers: A small "support clique" containing individuals from whom one seeks and to whom one provides advice and support, a larger "sympathy group" consisting of individuals with whom one maintains regular social contact, and an outer layer comprised of individuals with whom one has circumscribed and context-specific interactions (e.g., a tennis partner whom one does not socialize with off the court). It may be informative for future research to explore potentially different inferential implications associated with the numbers of people in each of these categories. Our conclusions are also constrained by the fact that our study focused just on the sheer size of social networks. In reality, social networks are defined by many additional variables as well (shape, density, etc.). It remains for future research to explore the possible

inferential implications of these other, more mathematically sophisticated variables that comprise the geometry of social networks.

Another limitation is that, although our results assess the degree of correspondence between actual and inferred correlations between social network size and personality traits, these results cannot address the question of inferential *accuracy*, per se. According to the manner in which accuracy is typically defined in the person perception literature (e.g., Biesanz et al., 2011; Funder, 1995), in order to establish the accuracy of trait inferences, these inferences must be compared to one or more criterion measures assessing the traits that actually do characterize target persons. Given our experimental methods, target persons were not actual people with actual personalities, and so trait inferences about these target persons could not be compared to criterion measures. To more directly address questions about accuracy, it will be necessary to use complementary methodological strategies in which perceivers are presented with real information about the social networks of real people.

In addition to addressing further the extent to which inferential outcomes are accurate, it will also be important for future research to examine more completely the set of psychological processes that influence inferential accuracy. According to Funder's (1995) Realistic Accuracy Model, inferential cues (such as social network size) provide a basis for accurate trait inferences only if they are *relevant* (social network size must actually be diagnostic of personality), *available* (information about a person's social network size must be available to perceivers), *detectable* (perceivers must detect the information about social network size that people make available), and *utilized* (perceivers must employ that information to draw trait inferences about target persons). Our results, along with the results of prior investigations (e.g., Pressman et al., 2005; Utz, 2010) address the topics of actual relevance and inferential utilization, but the topics

of availability and detectability remain unexplored. Exactly how do people make information about the size of their social networks available to others, and just how accurate is this information that they make available? Exactly what perceptual and/or inferential means do perceivers employ to detect this information, and what biases might disrupt this detection process? Plausible hypotheses that address these and other questions may be informed by a variety of scholarly sources, including research on the perceived structure of social networks (Krackhardt, 1987), and on socially-distributed social cognition (Smith & Collins, 2009).

As the old saying goes, we can't choose our relatives, but we can choose our friends. These friendship choices have implications for the impressions that others form about us. It is for this reason that another old saying reminds us that we are judged by the company that we keep. That saying is usually understood to imply that the specific qualities of our friends and acquaintances (their traits and attitudes and values) have implications for the impressions that others form about us. There is much research evidence that is consistent with that understanding of the aphorism (e.g., Hebl & Mannix, 2003; Neuberg, Smith, Hoffman, & Russell, 1994; Shapiro, Baldwin, Williams, & Trawalter, 2011; Skowronski, Carlston, Mae, & Crawford, 1998). Our research reveals a rather different way in which this aphorism might also be understood. The focus here is not on quality, but on quantity instead: We are judged also by the sheer amount of company that we keep.

Table 1. Mean happiness inferences and self-reports as a function of the number of friends (Low, Moderate, High), along with results of hierarchical linear modeling analysis (for inferences) and hierarchical regression analysis (for self-reports) in Study 1.

	Number of friends			Linear Effect	
	Low	Mod.	High	b	*p*
Inferences					
Strong ties	3.63	4.97	5.26	.83	<.001
Weak ties	4.51	4.65	4.68	.14	.01
Self-reports					
Strong ties	4.45	5.09	5.39	.33	.01
Weak ties	4.19	4.97	5.30	.42	<.001

CHAPTER 3 - ARE INTERACTIONS WITH WEAK TIES ASSOCIATED WITH HAPPINESS?[2]

In Chapter 2, we found that social relationships with weak ties are related to subjective well-being: people with more weak ties in their social network reported being happier. In Chapter 3, the focus shifts from social relationships to social interactions.

Imagine a day that starts with being greeted by your regular cashier at Starbucks. You get to work and run into a colleague from another department who you have not seen for a while, and chat about your weekend. After work you head to pilates class, where you exchange pleasantries with the girl whose hair is always a different color. Walking home afterwards, you stop to chat with the guy you always see walking the pug named Wilbur. None of these people may play an important role in your life, and yet a day without these kinds of interactions may seem a little emptier. Past research has shown that social interactions and positive affect are mutually reinforcing, but little research has examined specifically whether these "weak tie" relationships have any impact on our subjective well-being. Can interactions with the Starbucks cashier, work colleague, pilates classmate and dog owner contribute meaningfully to our happiness, or are they inconsequential compared to interactions with our close friends and family?

Evidence suggests that weak ties such as these – relationships involving less frequent contact, low emotional intensity and limited intimacy – confer some important benefits. In his seminal paper, Granovetter (1973) showed that people more often find a new job through information shared by weak ties rather than strong ties. More broadly, Granovetter (1973) proposed that weak ties are important for diffusion of information (such as news and innovations, as well as job openings) across a social network; without weak ties, this information would remain within

[2] A version of this chapter is being prepared for publication. Sandstrom, G.M., & Dunn, E.W. Social interactions and well-being: The surprising power of weak ties.

isolated clusters of strong ties (i.e., close friends and family). By providing this access to a breadth of perspectives and non-redundant information, weak ties have also been linked to greater creativity; employees who had more weak ties at work – whether assessed by closeness, duration of the relationship, or frequency of contact – were judged by their supervisors to be more creative (Perry-Smith, 2006). The present research examines another possible advantage of weak ties – we test whether social interactions with weak ties are related to subjective well-being.

Past research has not specifically examined weak ties, but studies using a variety of methods have uncovered a strong association between well-being and socializing, in general. One method for studying daily activities is the Day Reconstruction Method (DRM), which prompts people to recall their day, break it up into episodes, then report on how they felt during each episode (Kahneman et al., 2004). In one study using the DRM, women reported more enjoyment when socializing than during any of 13 other activities (Kahneman et. al, 2004). In another study, using a phone survey version of the DRM, people reported socializing as the third most enjoyable of 15 activities, after exercising and prayer (Krueger et al., 2009). In daily diary studies, people report more positive affect on days when they participate in social events (Clark & Watson, 1988; Vittengl & Holt, 1998a; Watson et al., 1992), days when they have more social interactions (Berry & Hansen, 1996), and days when they feel more connected to others (Reis, Sheldon et al., 2000). Indeed, Clark and Watson (1988) found that social events were related to a greater increase in positive affect than any other general class of activities. In experience sampling studies, people report more positive affect when they are engaged in social activities rather than non-social activities (Pavot et al., 1990). In sum, studies employing various methods

(DRM, daily diary, experience sampling) report convergent results: social interactions are associated with well-being.

Due to methodological reasons, we suspect that the evidence linking social interactions to well-being may be largely based on interactions with strong ties. For instance, several of the studies examine only interactions of substantial duration (e.g., Berry & Hansen, 1996; Reis, Sheldon et al., 2000; Watson et al., 1992). This may result in people reporting predominantly their interactions with close friends and family, since it seems likely that conversations with one's best friend would be longer, on average, than conversations with the Starbucks cashier or the guy walking Wilbur the pug. Furthermore, several past studies rely on retrospective reports (e.g., Clark & Watson, 1988; Vittengl & Holt, 1998a), which might be more likely to generate recollections of close friends and family than recollections of weak ties. For instance, when people are asked to list the names of all of their friends and acquaintances, they tend to remember close friends and people with whom they have more frequent contact (Fu, 2005). Also, when asked to report how much time they spent with other people, study participants are more accurate when reporting time spent with friends compared to time spent with non-friends (Eagle et al., 2009). This may be because long-term memory is better for high arousal stimuli (Bradley et al., 1992); given that interactions with weak ties can be expected to have less emotional intensity (Granovetter, 1973), they may be less memorable than interactions with close friends and family.

The fact that methodological differences have likely resulted in under-reporting of weak ties renders any comparisons between the effects of strong ties and weak ties suspect. However, few studies have examined weak tie interactions at all, let alone compared the effect of weak tie interactions to the effect of strong tie interactions. Many studies have examined interactions

more broadly, asking participants to report on all the interactions that occurred throughout the day. Most of these studies have treated all interactions equally, not asking participants to report the closeness of their interaction partners. In the only study we know of that did ask participants to rate the closeness of their interaction partners, the researchers did not report any analyses broken down by this factor, despite the fact that 21% of reported interactions were with weak tie partners (Berry & Hansen, 1996). Thus, whether or not our network of acquaintances contributes to our subjective well-being, above and beyond the effects of close friends and family, remains an empirical question.

In sum, due to the methods used and the lack of distinction based on closeness, it is possible that the positive effects of social interactions found in previous studies were driven solely by strong ties. Both theoretically and empirically, there is evidence to suggest that social interactions with close others should bring the greatest rewards. Theoretically speaking, Baumeister and Leary (1995) proposed that humans have a need to belong, and suffer negative consequences to their health and well-being when this need is not met. They proposed that this need to belong is satisfied by frequent interactions with close others; close relationships without frequent interactions do not fully satisfy the need, nor do frequent interactions with less intimate others (i.e., weak ties). Empirically speaking, in studies of daily interactions, people who report higher mean levels of familiarity with their interaction partners report more positive affect following interactions (Vittengl & Holt, 1998b), and people who report higher mean levels of intimacy in their interactions report being less lonely (Wheeler et al., 1983). Further, people who have more meaningful conversations report greater happiness (Mehl et al., 2010; Reis et al., 2000), and a greater sense of relatedness (Reis, Sheldon et al., 2000).

Social interactions with strong ties would be expected to fall at one end of the spectrum, in terms of closeness. At the other end of the spectrum are social interactions with strangers: people who one has never met before and does not expect to see again. There is reason to believe that interacting with strangers may also impact well-being. In one study, students felt more positive affect after interacting with a previously unknown classmate than they did before the interaction (McIntyre, Watson, Clark, & Cross, 1991). This suggests that interacting with a stranger might lead to greater well-being, though, due to expectations of future contact in the students' shared class, this interaction might differ from an interaction with a true stranger, who one does not expect to see again. In another study, people enjoyed interacting with a stranger as much as they enjoyed interacting with their romantic partner, though they predicted that they would enjoy interacting with their romantic partner more (Dunn et al., 2007). This is because putting one's best face forward, as one does with less familiar others, provides an unexpected source of enjoyment. Not only do people enjoy interacting with strangers more than they expect to, but even the simple act of being acknowledged by a stranger has implications for subjective well-being. In a field study, participants walked past a confederate who either made eye contact with them, or looked past them without making eye contact. Participants reported feeling less disconnected from others after being acknowledged by the confederate (Wesselmann et al., 2012). Given that strong ties and strangers, at either end of the spectrum in terms of closeness, both have consequences for well-being, we hypothesized that weak ties would also be associated with subjective well-being.

Current Research

In sum, past research has shown that people are happier on days when they socialize more, but the focus has been on interactions with strong ties, and no research has directly

assessed the unique effect of weak ties. We predicted that people would also experience greater well-being on the days when they interact with more weak ties.

In Study 2, we focused on the classroom context, asking students to report on their daily interactions with classmates, and to report their well-being. We predicted that students would report feeling happier on days when they interacted with more classmates. We broadened the context to include all daily interactions in Study 3, asking participants to keep track of their daily interactions with both strong ties and weak ties. We expected that the number of daily weak tie interactions would predict subjective well-being, above and beyond the salutary effects of interactions with strong ties.

STUDY 2: CLASSROOM WEAK TIE INTERACTIONS

Method

Participants

In total, 242 undergraduate students (82 male, 160 female; M_{age} = 19.07, SD_{age} = 1.78) were recruited from eight classes that had large enrollments (M = 260). They participated in exchange for money or course credit, and also received entries into a draw for each daily report.

Procedure

At the beginning of the study, all participants came to the lab and filled out measures of personality, subjective well-being and belonging, as well as reporting demographic details[3].

[3] This was part of a broader study designed as an experiment to study the effects of in-class interactions on happiness. Participants randomly assigned to the experimental condition attended a round-robin session in the lab, during which they had the opportunity to meet several other students taking the same class that they were. At the end of the round-robin session, and on several occasions during the semester, we encouraged students to keep in touch with one another. This manipulation was ineffective; there was no difference in the average number of daily in-class

On six different occasions, students were asked questions via text message right after their class ended. The EZTexting.com service was used to schedule and send the text messages.

At the end of the semester, as they entered the classroom, students received a questionnaire, asking them to list everyone that they knew in class. At the end of the class, students returned the questionnaires and were debriefed.

Measures

Personality. Past research has found that extraverted individuals tend to have more social interactions (Watson et al., 1992) and tend to be happier (Pavot et al., 1990). In order to control for this effect, we measured extraversion, as well as openness, conscientiousness, agreeableness and neuroticism, using the 44-item Big-Five Inventory (John & Srivastava, 1999). The subscales all demonstrated adequate reliability (α's > .76).

Text messages. Happiness was measured with a single question: "How are you feeling right now?" answered on a scale from 0 to 100 (Killingsworth & Gilbert, 2010). To measure the degree to which students felt like they were a part of the university community, students responded to a single item from the Sense-of-Community Scale (Davidson & Cotter, 1986): "I feel like I belong here". Students also reported how much they enjoyed class, using a single face-valid question: "I enjoyed class". These two items were measured on a scale from 1 (strongly disagree) to 5 (strongly agree)[4]. Finally, students reported how many people they had interacted

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interactions for the experimental group (M = 1.97, SD = 1.73) compared to the control group (M = 1.96, SD = 1.30), $t(240) = .06$, $p = .96$. As a result, the current study ignores the condition assignment.

[4] By asking one question on a 0 to 100 scale, and two questions on a 1 to 5 scale, we may have confused some of the participants; some of the responses appear to be on the wrong scale. Nine responses to the belonging question and four responses to the class enjoyment question were greater than 5, and were discarded from analysis. It is likely that many of these represent responses on a 0-100 scale, rather than a 1-5 scale, given that eight of the nine belonging responses and three of the four class enjoyment responses were greater than 50. Similarly, 16 responses to the happiness question were more than three standard deviations from the mean, and were removed from analyses as

with in class. They were instructed to count the number of times they interacted with someone in person right before, during or after class, even if it was a minimal interaction (see Appendix 1 for instructions). They were asked to exclude conversations that were part of a class requirement (e.g., "turn to the person sitting beside you and discuss…")[5].

Classmate questionnaire. Participants reported details about all the people that they knew in the class that they were recruited from. They listed each classmate's name (or a description), and indicated whether each was a strong tie or a weak tie (see Appendix 2 for instructions).

Results

Data Preparation and Descriptives

In order to ensure that any association between interactions and subjective well-being was due to weak tie interactions, and not strong tie interactions, we retained 133 students (42 male, 91 female; M_{age} = 19.00, SD_{age} = 1.93) who completed the classmate questionnaire and reported having no strong ties in class.

Data were mostly complete; only 1.1% of the reports were missing. Nine individuals completed only five reports; the remaining 124 participants completed all six reports.

Averaging across their six reports, participants interacted with a mean of 2.03 (*SD* = 1.83) weak tie classmates each day (see Table 2 for descriptives).

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outliers. It is likely that many of these represent responses on a 1-5 scale, rather than a 0-100 scale, given that nine of the 16 responses were less than or equal to 5.

[5]Due to length restrictions, we sent two text messages to each participant which, combined, looked like this: a)how r u feeling right now? 0= v bad to 100= v good b)i feel like i belong here. 1= st disagree to 5= st agree c)i enjoyed class(1-5) d)How many people did you interact with in class today?

Analytical Method

In order to model the hierarchical nature of our data, in which there are 6 measurements (text messages) nested within each participant, we analyzed the data using hierarchical linear modeling (HLM), which allows examination of both within-person and between-person effects. Indeed, HLM allows the slope of the relationship between the number of interactions and well-being to be different for each individual. HLM is also robust to missing data. Since our primary interest was in examining the within-person effects (e.g., examining whether people are happier on days when they interact with more classmates than usual), we used person-centered means for the number of interactions. In order to assess the between-person effects (e.g., whether people who have more daily interactions than others report being happier), we added back the person-level means as level two predictors (Kreft & de Leeuw, 1998).

The following equations were used to assess the relationships between the number of interactions and the happiness, belonging and class enjoyment outcome variables:

$$Y_{ij} = \beta_{0j} + \beta_{1j} Interactions_{ij} + \varepsilon_{ij} \quad (1)$$

$$\beta_{0j} = \beta_{00} + \beta_{01} Interactions_{j} + u_{0j}$$

$$\beta_{1j} = \beta_{10} + u_{1j} \quad (2)$$

At the day-level (i.e., within-subjects), the number of interactions (person-centered) was used to predict happiness, belonging and class enjoyment (equation 1). At the person-level (i.e., between-subjects), we added back the person-level means (grand-mean centered) (equation 2). All slopes were allowed to vary randomly.

Between-Person Differences in Social Interactions

We tested whether between-person differences in the number of average daily interactions were associated with subjective well-being. People who had, on average, a higher number of daily weak tie interactions than other individuals reported greater happiness, b = 1.50, $t(131) = 2.90$, $p = .004$, a greater sense of belonging, b = .13, $t(131) = 3.47$, $p = .001$, and greater class enjoyment, b = .11, $t(131) = 3.12$, $p = .002$ (see Table 3).

Given that extraverted individuals tend to have more social interactions (Watson et al., 1992) and tend to be happier (Pavot et al., 1990), we tested a model that included extraversion at the person-level (equation 2). With extraversion included in the model, the average number of weak tie interactions no longer predicted greater happiness, $p = .16$. However, people who had, on average, a higher number of daily weak tie interactions than other individuals still reported a greater sense of belonging, b = .09, $t(130) = 2.53$, $p = .01$, and greater class enjoyment, b = .11, $t(130) = 2.73$, $p = .01$.

Within-Person Differences in Social Interactions

A more stringent test of our hypothesis pertains to within-person effects: do people experience greater subjective well-being on days when they interact with more weak tie classmates than they usually do? Indeed, on days when people interacted with more weak tie classmates than usual, they reported marginally greater happiness, b = .88, $t(132) = 1.88$, $p = .06$, significantly greater feelings of belonging, b = .08, $t(132) = 3.27$, $p = .001$, and marginally greater class enjoyment, b = .06, $t(132) = 1.80$, $p = .08$ (see Table 3). This within-person analysis effectively controls for differences in personality and other between-person factors.

Discussion

The present results suggest both that students who usually interact with more weak tie classmates are happier and experience greater feelings of belonging, and that during classes when students interacted with more weak tie classmates, they were somewhat happier and experienced greater feelings of belonging. The current analyses only included those students who reported having no strong ties in class, thus ensuring that all of the interactions were with weak ties. In Study 3, participants separately counted both the number of interactions with strong ties and the number of interactions with weak ties, allowing us to examine the independent effects of each.

In Study 3, the context of the interactions was broadened; instead of limiting the focus to interactions within a single class, participants kept track of all of their interactions over the course of the day. Due to difficulties in asking participants to respond to a lot of lengthy questions via text message, Study 2 was constrained to short measures of happiness and belonging, but a broader range of well-being measures was gathered in Study 3.

STUDY 3: DAILY WEAK TIE INTERACTIONS

Method

Participants

A total of 58 first-year university students (15 males and 43 females, M_{age}=19.22, SD_{age} = 3.24) participated in the study[6]. We included only first-year students who had moved to a new city to start university, expecting that they would have few local social ties at the beginning of

[6] We discovered that one additional participant was not currently a student at the university and we terminated their involvement in the study immediately. One additional participant dropped out of university during the course of the study.

the study, which might make the relationship between social interactions and well-being more apparent. Participants received either course credit or $30 for completing the study.

Procedure

At the beginning of the semester, participants came to the lab to complete demographic and personality questions, and receive instructions. Participants learned that they would be keeping track of their social interactions on several days. They received a pair of mechanical tally counters ("clickers") and learned how to use them. They were given detailed instructions on how to distinguish between strong ties and weak ties, which they were to count using red and black clickers, respectively. We provided several possible criteria for distinguishing a strong tie: "Someone you are very close to", "someone who you know really well (and knows you really well)", or "someone who you confide in or talk to about yourself or your problems". For weak ties, criteria were: "Someone you are not very close to", "someone who you don't know really well (and who doesn't know you really well)", or "someone who you consider a friend, but would be unlikely to confide in".

For three days in a row in September, and three days in a row in November (a Tuesday, Wednesday and Thursday each time), participants were asked to keep track of all of their social interactions. Participants counted each time that they greeted someone in person, regardless of the length of the interaction. At the end of each clicker day, in addition to reporting the number of strong tie and weak tie interactions (i.e., the tallies from their clickers), participants reported their subjective well-being via an online questionnaire.

Measures[7]

Personality. Participants rated their openness, conscientiousness, extraversion, agreeableness and neuroticism using the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003; see Table 4 for reliability, sample items, response options).

Number of interactions. Participants reported the tallies from the clickers (i.e., the number of interactions with strong and weak ties).

Subjective well-being. We measured subjective well-being broadly, assessing positive and negative affect, and subjective happiness.

Affect. To measure positive affect (PA) and negative affect (NA), we used the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010). This scale was developed to measure affect at the trait-level, asking people to report the frequency of various feelings over the past four weeks. We adapted it to measure state-level affect, asking participants to: "think about what you have been doing and experiencing today."

Subjective happiness. Participants provided a global, subjective assessment of their own happiness, using the Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999). Although this measure assesses trait-level happiness, we expected to find daily fluctuations given past research showing that these kinds of measures are affected by current mood (Schwarz & Clore, 1983).

Subjective well-being composite. In order to address our broad hypothesis about the relationship between interactions and subjective well-being, we standardized the PA, NA (reverse-scored), and subjective happiness measures and averaged them to create a composite

[7] In addition to the measures listed, we also measured Flourishing (Diener et al., 2010) as an index of subjective well-being and Positive Relations with Others (Ryff, 1989) as an index of belonging. These measures were included on an exploratory basis, and were assessed only once on the third day, and once on the sixth day of data collection, rendering them unsuitable for analysis with HLM, which effectively requires at least three measurements.

measure (average $r = .52$; $\alpha = .91$). Past research has found that affective reports and global assessments of happiness are highly correlated and often form a single factor (Lyubomirsky, Sheldon, & Schkade, 2005).

Belonging. In order to assess participants' sense of belonging, we used several different measures that tap into different constructs.

Sense of community. We measured the degree to which participants felt like they were a part of the university community with the Sense-of-Community Scale (Davidson & Cotter, 1986). Though this scale was originally developed to look at sense of community within a city, we adapted it to measure sense of community at a university.

Social connectedness. More broadly, we assessed how connected participants felt to others in general (i.e., not limited to the university community), using the Social Connectedness Scale (Lee, Draper, & Lee, 2001). We selected items with the highest reported factor loadings on the common construct, but excluded items that referred to "friends" or "people I know", in order to tap into the idea of connectedness to people in general, not just those in one's social circle.

Loneliness. We measured loneliness using the UCLA Loneliness Scale, version 3 (Russell, 1996). We selected from amongst the items with the strongest reported item-total correlations for student samples, while not selecting questions that overlapped too much with other constructs that we were measuring. We selected questions that referred to people in general, rather than friends and family.

Social support. Students reported the extent to which they felt they had people they could count on by answering questions on the Interpersonal Support Evaluation List (Cohen, Mermelstein, Kamarck & Hoberman, 1985). Following previous research (Martire, Schulz,

Mittelmark, & Newsom, 1999), we selected five items measuring emotional, informational and instrumental support.

Belonging composite. In order to address our broad hypothesis about the relationship between interactions and belonging, we standardized the sense of community, social connectedness, loneliness (reverse-scored) and social support measures and averaged them to create a composite measure (average $r = .61$; $\alpha = .92$).

Results

Descriptives

Data were mostly complete; only 1.4% of the reports were missing. One individual completed only four reports, three individuals completed only five reports; the remaining 54 participants completed all six reports.

Averaging across their six reports, participants interacted with a mean of 9.65 strong ties (*SD* = 9.18) and 15.96 weak ties (*SD* = 9.45) each day (see Table 5 for descriptives).

Analytical Method

In order to model the hierarchical nature of our data, in which there are six measurements (daily clicker reports) nested within each participant, we again analyzed the data using hierarchical linear modeling (HLM). Since our primary interest was in examining the within-person effects (e.g., examining whether people are happier on days when they interact with more weak ties than they usually do), we used person-centered means for the number of strong and weak tie interactions. In order to assess the between-person effects (e.g., whether people who have a higher average number of daily weak tie interactions than others report being happier), we added back the person-level means as level two predictors (Kreft & de Leeuw, 1998).

We used the following equations in order to assess the relationships between the number of strong and weak tie interactions and the subjective well-being and belonging outcome variables:

$$Y_{ij} = \beta_{0j} + \beta_{1j} Strong_{ij} + \beta_{2j} Weak_{ij} + \varepsilon_{ij} \quad (3)$$

$$\begin{aligned} \beta_{0j} &= \beta_{00} + \beta_{01} Strong_j + \beta_{02} Weak_j + u_{0j} \\ \beta_{1j} &= \beta_{10} + u_{1j} \\ \beta_{2j} &= \beta_{20} + u_{2j} \end{aligned} \quad (4)$$

At the day-level (i.e., within-subjects), the number of strong tie interactions and the number of weak tie interactions (person-centered) were used to predict well-being and belonging (equation 3). By including both strong and weak tie interaction counts as predictors, we can assess the individual contribution of each. At the person-level (i.e., between-subjects), we added back the person-level means (grand-mean centered; equation 4). All slopes were allowed to vary randomly.

Between-Person Differences in Social Interactions

We tested whether between-person differences in the number of average daily interactions were associated with subjective well-being. People who had, on average, a higher number of daily weak tie interactions than other individuals reported greater average subjective well-being, b = .02, $t(55) = 3.03$, $p = .004$ (see Table 6), and greater average belonging, b = .02, $t(55) = 2.19$, $p = .03$ (see Table 7). Similarly, people who had, on average, a higher number of daily strong tie interactions than other individuals reported greater subjective well-being, b = .02, $t(55) = 2.71$, $p = .01$, and greater belonging, b = .03, $t(55) = 3.99$, $p < .001$.

With extraversion included in the model at the person-level, a higher average number of weak tie interactions was still related to greater average subjective well-being, b = .01, $t(54) =$

2.38, $p = .02$, but not greater average belonging, $p = .16$. A higher average number of strong tie interactions was still related to greater subjective well-being, b = .02, $t(54) = 2.11$, $p = .04$, and greater belonging, b = .03, $t(54) = 3.63$, $p = .001$.

Within-Person Differences in Social Interactions

A more stringent test of our hypothesis pertains to within-person effects: do people experience greater subjective well-being on days when they have more interactions than they usually do? Indeed, people reported greater subjective well-being on days when they interacted with more weak ties than usual, b = .02, $t(57) = 3.36$, $p = .001$, and on days when they interacted with more strong ties than usual, b = .01, $t(57) = 2.26$, $p = .03$ (see Table 6). Given that both weak tie interactions and strong tie interactions were entered simultaneously into the model, this suggests that effect of weak tie interactions is independent of the effect of strong tie interactions. Further, people reported a greater sense of belonging on days when they interacted with more strong ties than usual, b = .01, $t(57) = 2.22$, $p = .03$, but not on days when they interacted with more weak ties than usual, $p = .62$ (see Table 7). These within-person analyses effectively control for differences in personality and other between-person factors.

Discussion

The present results suggest that people who usually interact with more weak ties or more strong ties are happier and experience greater feelings of belonging. Further, on days when people interact with more weak ties or more strong ties than usual, they are happier. However, people only experience greater feelings of belonging on days when they interact with more strong ties than usual.

General Discussion

In both studies, people who tended to have more interactions, on average, than other individuals reported greater happiness and feelings of belonging. People reported somewhat greater happiness during classes when they interacted with more weak tie classmates (Study 2), and significantly greater feelings of happiness on days when they interacted with more weak ties (Study 3). Given the limited context of a single class, and the limited availability of interactions in that context, it is not surprising that the effect was weaker in Study 2.

In contrast, people reported greater feelings of belonging during classes when they interacted with more weak tie classmates (Study 2), but no difference in feelings of belonging on days when they interacted with more weak ties (Study 3). It is possible that belonging was interpreted differently in the different study contexts; in Study 2, belonging may have been interpreted with respect to a particular class, whereas in Study 3 it may have been interpreted with respect to the university in general. To the extent that a person is more likely to feel a stronger sense of community when the community is smaller and defined more concretely, we might expect people to report feeling a stronger sense of belonging within a particular class than within the university as a whole.

Given that happiness and belonging were moderately to highly related in both studies, the current studies provide initial, convergent evidence that weak tie interactions are associated with social and emotional well-being. These are the first studies in social psychology to focus explicitly on the association between weak tie interactions and happiness. Evidently, day-to-day interactions with even the peripheral members of one's social network are linked to subjective well-being.

Limitations and Future Directions

One limitation of these studies is that they both used student populations, thus restricting the generalizability of the findings. Past research has shown that social networks grow smaller as people age (Carstensen, 1992; Fredrickson & Carstensen, 1990), and that the reductions are mostly in the periphery of the social network (i.e., weak ties; Lang, 2000; Lang & Carstensen, 1994). Although often studied in samples of older adults, this reduction of weak ties may occur much earlier; in one study, the frequency of interaction with acquaintances was lower at age 30 than at age 17 (Carstensen, 1992). Therefore, it is imperative to test the generalizability of these findings by replicating the effects with a broader population.

Some readers may consider it a limitation that Study 3 used a wide variety of measures to assess subjective well-being. In the absence of past research on weak ties to drive more specific hypotheses, we chose to employ a broad range of measures of subjective well-being: positive affect, negative affect, and subjective happiness (a cognitive assessment of subjective well-being). In addition to theoretical arguments against distinguishing between different types of happiness (Kashdan, Biswas-Diener, & King, 2008), past empirical work has found substantial correlations between affective measures and more global assessments of happiness, and has shown that they form a single factor (Lyubomirsky et al., 2005). Indeed, several past studies have combined measures similar to ours into composites for analysis (Aknin, Dunn, Sandstrom & Norton, 2013; Lyubomirsky, Dickerhoof, Boehm, & Sheldon, 2011; Oishi & Kesebir, 2013). For transparency, we report the results on the individual measures as well as the composite measures.

For similar reasons, we also employed a broad range of measures of belonging: sense of community, social connectedness, social support and loneliness. Given that the social support

and loneliness measures refer to support relationships, which are often filled by close friends and family, we expected these measures to be related more robustly to strong ties than weak ties. In contrast, the sense of community and social connectedness measures refer to relationships more broadly, thus we expected these measures might be as robustly related to weak ties as to strong ties. Indeed, average daily social support and loneliness were associated with the average number of daily strong tie interactions, but not the average number of daily weak ties. Also confirming expectations, average sense of community and social connectedness were associated with the average number of daily weak tie interactions, and average social connectedness was also associated with the average number of daily strong tie interactions.

Several past studies investigating social interactions relied upon retrospective reports, and were thus more likely to elicit recollections about strong tie interactions. In Study 2, participants still reported retrospectively, but over a short time frame: right after class ended, they were asked to recall only those interactions that occurred during (or immediately before or after) a one or one and a half hour class. Issues related to recall were diminished even further in Study 3; participants counted their interactions as they occurred. However, it is possible that carrying around two clickers and remembering to use them to record each interaction was as difficult as remembering interactions at the end of the day[8]. Several past studies used the Rochester Interaction Record (RIR; Reis & Wheeler, 1991), which asks participants to report only those interactions that are at least 10 minutes long. Participants in one study using the RIR reported a

[8] Following debriefing, 12 of the 58 participants in Study 3 admitted to estimating the number of interactions (instead of using the actual tallies from the clickers) on at least one occasion. Analyses excluding these participants produced essentially the same results, though the results were somewhat weaker due to the lower degrees of freedom. People with, on average, more daily weak tie interactions were marginally happier and reported marginally greater belonging, whereas people with, on average, more daily strong tie interactions reported marginally greater happiness and significantly greater belonging. People reported greater happiness on days when they interacted with more weak ties or more strong ties, and reported marginally greater belonging on days when they interacted with more strong ties.

mean of 45 interactions over the course of a week, which is equivalent to 6.4 interactions per day (Berry & Hansen, 1996). Participants in another study reported not only interactions that were at least 10 minutes long, but also any emotionally arousing interactions; an average of 9.7 interactions were reported each day (Asendorpf & Wilpers, 1998). In Study 3, the number of daily strong tie interactions (approximately 9.5) is similar to the number of interactions recalled in these past studies, thus suggesting that participants remembered to use the clickers, at least as often as they were able to recall interactions at the end of the day. In addition, participants in Study 3 also reported interacting with weak ties each day (approximately 16). Thus, it appears that by explicitly asking participants to count weak tie interactions, we were successful at capturing more than double the number of social interactions that were reported in previous studies. Consideration of the effects of these interactions has been missing in previous research.

Although the number of interactions reported by the participants in the current studies was higher than in past studies, participants may still have forgotten to count certain interactions - it is difficult to remember to count every interaction that one has over the course of the day. Technological advances may help eliminate memory issues altogether. Computer scientists have developed mobile applications that are able to detect when and with whom people are talking (Choudhury & Basu, 2004). As social scientists begin to adopt this technology in diary studies, memory biases may no longer be an issue: participants could receive a notification after the end of each interaction and immediately answer questions about the interaction on their cell phone.

This technology would also address another limitation of these studies: the lack of information about the interactions that participants reported. By using the text message and clicker methods, we only had information about the number of interactions, and not about the length of the interactions, or the content or emotional quality of the interactions. In order to

address a wider range of research questions, it would be helpful to have a study design that retains the advantage of eliminating memory bias, while allowing for reporting of more information about each interaction. Mobile phone technology could allow participants to answer a series of questions immediately after each interaction, thus providing information about the content and emotional quality of each interaction. This would allow researchers to address questions such as determining the relative strength of positive and negative interactions on one's subjective well-being, and weighing the quantity of interactions against the quality.

Are weak ties and strong ties fundamentally different from one another, or are they fundamentally similar, differing only in the degree of intimacy? Given that the only information we collected was the number of interactions, the current studies provide no information to address this question. However, past research suggests that, along with the positive consequences that strong tie interactions have for subjective well-being, there may be negative consequences as well. People are more likely to express their emotions in close relationships, thus suggesting that interactions with strong ties may be more likely to include negative emotions (Reis, Collins et al., 2000). Further, in more interdependent relationships, people may be more likely to disagree (Reis, Collins et al., 2000). Finally, the disappointment and betrayal that can result from breaches in expected relational behaviors (Simpson & Tran, 2006) may be more common with strong ties, for whom people have strong expectations (Reis, Collins et al., 2000). In contrast, people have lower expectations for and lower emotional involvement with weak ties (Reis, Collins et al., 2000). This may explain why people are more likely to suppress negative emotions in less close relationships (Reis, Collins et al., 2000), and thus may be less likely to disagree, and less likely to experience disappointment and betrayal with weak ties. Consequently, interactions with weak ties may avoid some of the drawbacks of strong tie interactions. Future research is needed to

study the differences between weak tie and strong tie interactions, and the positive and negative consequences that result from each.

Implications

Our findings have implications for dealing with situations that disrupt social networks. When people start a new job, attend a new school, or move to a new place, they leave behind a network of weak ties. Each person may be replaceable, but losing a whole network of such connections, as happens during a transition like this, may be detrimental to one's well-being. People who establish strong ties in the new situation show signs of adjustment. New employees report greater feelings of attachment and inclusion at work when they have strong ties in their friendship network (Morrison, 2002). Students studying abroad experience less emotional distress when they have established strong tie relationships in the new environment (Furukawa et al., 1998), and less acculturative stress when they report more social support (Yeh & Inose, 2003). Immigrants report less depression when they have more friends who they can talk to frankly (Kuo & Tsai, 1986). Although strong ties may promote better adjustment, it is difficult and takes time to develop strong ties. In contrast, weak ties are easier and quicker to establish, and they may also promote adjustment. Past work has shown that the size of an employee's friendship network (Morrison, 2002) and feelings of greater social connectedness (Yeh & Inose, 2003) are associated with positive outcomes; to the extent that these phenomena include weak ties, as well as strong ties, these results may suggest indirectly that weak ties might promote adjustment. The current studies, which explicitly examined weak ties, suggest that people benefit from interacting with more weak ties. The sense of belonging and subjective well-being that come from establishing a social network of both strong and weak ties should, therefore, promote adjustment to a new environment.

The current research suggests that we should not underestimate the value of our acquaintances – interactions with weak ties are related to our subjective well-being. We found initial evidence that the more peripheral members of our social network are linked to our day-to-day happiness. So, chat with the Starbucks cashier, work colleague, pilates classmate and dog owner – there is initial evidence that these interactions, and not only interactions with our close friends and family, are associated with our happiness.

Table 2. Descriptives for text message responses in Study 2

Variable	Min	Max	Mean	SD
Happiness	20	100	74.04	16.40
Belonging	1	5	3.94	.89
Class enjoyment	1	5	3.84	.99
Interactions	0	12	2.03	1.83

Table 3. Hierarchical linear modeling analysis, predicting happiness, belonging and class enjoyment from the number of interactions in Study 2

	Happiness	Belonging	Class enjoyment
Person-level (between)			
Intercept	73.86 (1.00)***	3.94 (.06)***	3.83 (.05)***
Interactions (mean)	1.50 (.52)**	.13 (.04)**	.11 (.03)**
Text message-level (within)			
Interaction slope	.88 (.47)+	.08 (.03)**	.06 (.04)+

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 132 for the text message-level effects, and 131 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 4. Reliability, sample items and response options for the measures in Study 3

Measure	Reliability (alpha)	# of items	# of items reverse-scored	Sample item(s)	Response options
Personality	O: .35 C: .58 E: .70 A: .47 N: .39	O: 2 C: 2 E: 2 A: 2 N: 2	O: 1 C: 1 E: 1 A: 1 N: 1	"Extraverted, enthusiastic"; "Reserved, quiet"	1=Disagree strongly 7=Agree strongly
Subj. well-being composite	.91				
Positive affect	.90	6	0	"Pleasant"	1=Very rarely or never 5=Very often or always
Negative affect	.87	6	0	"Unpleasant"	1=Very rarely or never 5=Very often or always
Subjective happiness	.86	4	1	"In general I consider myself:"	1=Not a very happy person 7=A very happy person
Belonging composite	.92				
Community	.84	8*	2	"I feel like I belong here"	1=Strongly disagree 4=Strongly agree
Connectedness	.87	11*	7	"I am able to relate to my peers"	1=Strongly disagree 6=Strongly agree
Loneliness	.88	10*	5	"How often do you feel alone?"	1=Never 4=Always
Social Support	.73	5*	0	"When I need suggestions on how to deal with a personal problem, I know someone I can turn to"	1=Definitely false 4=Definitely true

NOTE: For the personality measure, reliability was assessed across the two items constituting each of the big-Five factors: openness (O), conscientiousness (C), extraversion (E), agreeableness (A), neuroticism (N). For the remaining measures, the alpha was averaged across the different times the measure was collected. The subjective happiness measure has different response options for each question; response options for one question are provided here. For the scales marked with an *, we selected a subset of the items. Due to experimenter error, connectedness was not collected on the first two days.

Table 5. Descriptives of happiness and belonging measures, for Study 3

	Min	Max	Mean	SD
Strong tie interactions	0	46	9.65	9.18
Weak tie interactions	2.80	54.83	15.96	9.45
Subjective well-being composite	-1.68	1.36	0	.65
Positive affect	1.92	4.61	3.61	.60
Negative affect	1.03	3.81	2.02	.60
Subjective happiness	2.88	6.92	5.08	1.00
Belonging composite	-1.74	1.42	0	.75
Community	2.08	3.98	3.23	.44
Connectedness	2.61	5.84	4.53	.84
Social Support	2.50	4.00	3.35	.40
Loneliness	1.12	3.03	2.08	.47

Table 6. Hierarchical linear modeling analysis, predicting the subjective well-being composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 3

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness
Person-level (between)				
Intercept	.0003 (.08)	3.61 (.07)***	2.02 (.07)***	5.08 (.12)***
Strong ties (mean)	.02 (.01)**	.01 (.007)*	-.001 (.005)	.04 (.01)**
Weak ties (mean)	.02 (.01)**	.01 (.01)*	-.02 (.01)***	.01 (.01)
Day-level (within)				
Strong tie slope	.01 (.005)*	.01 (.01)*	-.004 (.005)	.005 (.004)
Weak tie slope	.02 (.005)**	.03 (.01)***	-.02 (.005)**	.004 (.004)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 57 for the day-level effects, and 55 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 7. Hierarchical linear modeling analysis, predicting the belonging composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 3

Effect	Belonging composite	Sense of community	Social connectedness	Social support	Loneliness
Person-level (between)					
Intercept	.01 (.08)	3.23 (.05)***	4.53 (.10)***	3.35 (.05)***	2.08 (.05)***
Strong ties (mean)	.03 (.01)***	.01 (.005)	.03 (.01)***	.01 (.01)*	-.02 (.01)***
Weak ties (mean)	.02 (.01)*	.02 (.01)**	.02 (.01)*	.004 (.007)	-.01 (.005)+
Day-level (within)					
Strong tie slope	.01 (.003)*	.002 (.002)	.001 (.005)	.01 (.004)*	-.003 (.003)
Weak tie slope	.002 (.003)	.004 (.002)+	.003 (.005)	-.001 (.003)	.002 (.002)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 57 for the day-level effects, and 55 for the person-level effects.
+ p < .10, * p < .05, ** p < .01, *** p < .001

CHAPTER 4 - ARE INTERACTIONS WITH WEAK TIES ASSOCIATED WITH HAPPINESS?: GENERALIZABILITY

In Chapter 3, we found that students are happier on days when they interact with more weak ties than they usually do. In order to test the generalizability of this finding, we replicated Study 3 with a community sample.

Given that the size and composition of social networks change over the course of the lifespan, any relationship between weak tie interactions and subjective well-being might be dependent on age. It is widely accepted that social networks grow smaller as people age (Carstensen, 1992; Fredrickson & Carstensen, 1990). Research has shifted from validating this phenomenon, to understanding whether this diminution affects all types of social relationships equally. Indeed, both cross-sectional and longitudinal evidence suggests that the number of close relationships is relatively stable over time, and that it is primarily more distal relationships that shrink over time. In a study of people over the age of 70, age was negatively correlated with social network size (Lang & Carstensen, 1994). More specifically, however, the negative correlation between age and the number of very close partners was not significant, whereas the negative correlation between age and the number of less close partners was significant. In longitudinal studies of people over the age of 65, frequency of contact with close friends and family did not change over time (Martire et al., 1999), and more than 80% of the change in total network size occurred outside of the inner circle of closest social ties (Lang, 2000). Although often studied in samples of older adults, this reduction in the periphery of one's social network may begin much earlier. In one study, the rate of interaction with acquaintances dropped from age 17 to 30, stabilized between age 30 to 40, then dropped again from age 40 to 50 (Carstensen,

1992). Although the differences in social networks might be most apparent when comparing students to a sample of older adults, these results emphasize the importance of testing that the association between weak tie interactions and subjective well-being generalizes even to a middle-aged population.

In this study, we used a paradigm we developed in a previous study, in which participants used hand-held tally counters ("clickers") to keep track of their daily social interactions with both weak and strong ties. We recruited participants who were older than the average university student, in order to test whether the results of the daily social interactions study would generalize to a broader population. As before, we hypothesized that on days when people interacted with more weak ties, they would be happier and feel a greater sense of belonging.

STUDY 4: DAILY WEAK TIE INTERACTIONS, COMMUNITY SAMPLE

Method

Participants

Overall, 104 community members expressed interest in participating in the study. Several were ineligible because they did not have a computer, and thus could not complete the questionnaires at the end of the day. Additional people were ineligible because they were not planning to be in the city for the entire span of the study, and others could not be contacted.

Clickers were mailed to 53 community members who had completed the initial survey, which included the consent form. Three people claimed that they did not receive the clickers, and three people subsequently decided not to participate. Additionally, one person completed only one survey, and two people completed only two surveys, whereas three surveys is the practical minimum for use in hierarchical linear modeling. Finally, three people submitted the majority of

their reports in the morning, rather than at the end of the day, thus preventing us from seeing the effect of a day's interactions on that day's well-being[9]. After removing these participants from all analyses, the final sample was 41 community members (11 males and 30 females). They varied in age: 13 reported being 25-34 years old, 9 were 35-44 years old, 6 were 45-54 years old, 6 were 55-64 years old, and 7 were 65 or older. Participants received $30 for completing the study.

Procedure

Participants were recruited via three different methods. The same advertisement was posted both on Craigslist (a classified advertisement website; in the Community/Volunteers section), and in the classified section of a local newspaper (in the Community Notices/Volunteers section), both online and in the print edition. This advertisement targeted people who were at least 25 years of age, and mentioned that there would be an online survey (i.e., it implied that people would need access to a computer). As the study progressed, there were few participants over the age of 55, so we paid for a larger advertisement in the local newspaper, outside of the classified section, that strictly targeted people over the age of 55.

Each potential participant was phone screened by a research assistant to assess eligibility. People were considered eligible if they: 1) were over the age of 25 (i.e., older than the average university student), 2) had daily social interactions, and 3) had daily access to a computer, in order to complete the online questionnaires.

[9] The six participants who submitted at least one report, but who were excluded from analyses, did not appear to differ from the 41 participants who were retained in the analysis. There were no differences in age (p = .66), any personality traits (p's > .17), the number of strong (p = .22) or weak (p = .85) tie interactions, any of the individual subjective well-being composite measures (p's > .22) or any of the individual belonging composite measures (p's > .16).

If they were eligible to complete the study, they learned about the purpose of the study, the procedure and the payment and then decided if they were interested in and committed to completing the study. Upon confirmation, the procedures were explained in more detail, and the criteria for distinguishing between strong ties and weak ties were described.

After the phone call, but before being sent the clickers, participants completed an initial online questionnaire. They rated their personality and reported some demographic information, on the same measures used by the university sample during their lab visit in Study 3. This questionnaire was used to solicit consent, and to assess commitment towards the study before incurring the cost of shipping the clickers. After participants received the clickers, they used them for six days, counting all of their social interactions with both strong and weak ties. At the end of each day, participants filled out the same online questionnaire as the university sample in Study 3, reporting the clicker tallies and how they were feeling, on various measures of happiness and belonging.

Measures

Demographics. On the initial online questionnaire, participants reported their age by choosing from one of five options: “25-34”, “35-44”, “45-54”, “55-64”, “>65”.

Personality. Participants rated their openness, conscientiousness, extraversion, agreeableness and neuroticism using the Ten-Item Personality Inventory (TIPI; Gosling et al., 2003; see Table 8 for reliability).

Number of interactions. Participants reported the tallies from the clickers (i.e., the number of interactions with strong and weak ties)[10].

Subjective well-being. We measured subjective well-being broadly, assessing positive and negative affect, and subjective happiness on the same scales as in Study 3 (see Table 4 for sample items and response options, and Table 8 for reliability). As in that study, in order to address our broad hypothesis about the relationship between interactions and subjective well-being, we standardized the PA, NA (reverse-scored), and subjective happiness measures and averaged them to create a composite measure (average $r = .74$; $\alpha = .95$).

Belonging. In order to assess participants' sense of belonging, we measured sense of community, social connectedness, loneliness and social support, as in Study 3 (see Table 4 for sample items and response options, and Table 8 for reliability). In order to address our broad hypothesis about the relationship between interactions and belonging, we standardized the social connectedness, loneliness (reverse-scored) and social support measures and averaged them to create a composite measure (average $r = .82$; $\alpha = .94$). We omitted the sense of community measure from the composite due to its low correlations with the other measures of belonging.

[10] Unfortunately the fields used to gather the number of daily interactions in the online survey were not required – people could leave these fields blank. On some occasions, participants reported the number of strong tie interactions, but left blank the number of weak tie interactions (e.g., four people did this on the first day that they used the clickers). We assumed that they interacted with zero weak ties on those days. On other occasions, a participant reported the number of weak tie interactions, but left blank the number of strong tie interactions (e.g., six people did this on the first day that they used the clickers). We assumed that they interacted with zero strong ties on those days. If both the number of weak tie interactions and the number of strong tie interactions were blank, they were both assumed to be missing (i.e., they were not assumed to be zero).

Results

Descriptives

Data were mostly complete; only 3.25% of the reports were missing. Two individuals completed only four reports, four individuals completed only five reports; the remaining 35 participants completed all six reports.

Averaging across their six reports, participants interacted with a mean of 6.70 strong ties (*SD* = 5.81) and 11.40 weak ties (*SD* = 12.96) each day (see Table 9 for descriptives).

Analytical Method

In order to model the hierarchical nature of our data, in which there are six measurements (daily clicker reports) nested within each participant, we again analyzed the data using hierarchical linear modeling (HLM), using the same equations as in Study 3.

Between-Person Differences in Social Interactions

We tested whether between-person differences in the number of average daily interactions affected subjective well-being. People who had, on average, a higher number of daily weak tie interactions than other individuals reported significantly greater average feelings of belonging, b = .02, $t(38) = 2.89$, $p = .01$ (see Table 11), but no difference in average subjective well-being, $p = .16$ (see Table 10). In contrast, people who had, on average, a higher number of daily strong tie interactions than other individuals did not report greater subjective well-being, $p = .26$, or greater belonging, $p = .98$.

With extraversion included in the model at the person-level, the results were very similar. People who had, on average, a higher number of daily weak tie interactions than other

individuals reported greater average feelings of belonging, b = .01, $t(38) = 2.34$, $p = .03$, but no difference in subjective well-being. In contrast, people who had, on average, a higher number of daily strong tie interactions than other individuals did not report greater subjective well-being, $p = .25$, or greater belonging, $p = .86$.

Within-Person Differences in Social Interactions

A more stringent test of our hypothesis pertains to within-person effects: do people experience greater subjective well-being on days when they have more interactions than they usually do? Indeed, people reported greater subjective well-being on days when they interacted with more strong ties than usual, b = .01, $t(40) = 2.77$, $p = .01$, but not on days when they interacted with more weak ties than usual, $p = .77$ (see Table 10). Further, people reported a greater sense of belonging on days when they interacted with more weak ties than usual, b = .002, $t(40) = 2.84$, $p = .01$, and on days when they interacted with more strong ties than usual, b = .01, $t(40) = 2.14$, $p = .04$ (see Table 11). Given that both weak tie interactions and strong tie interactions were entered simultaneously into the model, this suggests that weak tie interactions have an independent effect, above and beyond the effect of strong tie interactions. This within-person analysis effectively controls for differences in personality and other between-person factors.

Moderation by Age

In order to test whether the effects of weak tie interactions on subjective well-being were moderated by age, we included age in all of the person-level (equation 4) equations[11]. Age did not moderate the effects of either weak tie interactions or strong tie interactions; neither of the

[11] Although age was collected as a categorical measure, we included it as a continuous variable, with the youngest group coded as 0.

interaction terms was significant for any of the outcome measures (though there were some marginal effects; see Table 12 and Table 13). There was, however, a between-person effect of age. Older participants reported greater feelings of belonging, b = .22, $t(37) = 2.70$, $p = .01$, though no more or less subjective well-being than younger participants, $p = .24$. With extraversion added to the model, this between-person effect of age on belonging disappears, b = -.03, $t(36) = -.29$, $p = .78$, suggesting that this effect is explained by an increase in extraversion that accompanies increased age in our sample.

Discussion

On days when people interacted with more weak ties, they reported a greater sense of belonging, but no difference in subjective well-being at the end of the day. Further, on days when people interacted with more strong ties, they reported a marginally greater sense of belonging and marginally greater subjective well-being at the end of the day.

Although the results of the current study are broadly consistent with the results in Chapter 3, there are some discrepancies between them. For the student sample in Chapter 3, the effects of weak ties were predominantly on subjective well-being rather than belonging, whereas for the community sample in the current study, the effects of weak ties were predominantly on belonging rather than subjective well-being. Thus, although weak tie interactions are related to these broad, highly correlated constructs, the effects do not always manifest on the same measures.

The difference in the constructs that are related to social interactions may be due, in part, to differences between the two study samples and their daily social lives. Supporting this idea, the community sample reported fewer daily weak tie interactions ($M = 11.40$, $SD = 12.96$) than the UBC sample ($M = 15.96$, $SD = 9.45$), but greater variation in the number of daily weak tie

interactions. In contrast, the community sample reported fewer daily strong tie interactions (M = 6.70, SD = 5.81) than the UBC sample (M = 9.65, SD = 9.18), but also less variation in the number of daily strong tie interactions. The higher average number of daily strong tie interactions in the university sample may be a result of students having many close friends who are also at UBC, and thus available for frequent interactions, because they are also on campus. In contrast, the strong ties of community members are likely more geographically dispersed. One factor that might affect the higher variability in the number of daily strong tie interactions among the university students is the fact that students attend different classes on different days, and thus have different opportunities for interactions. Future work should examine how much of the variability in students' interactions comes from this source. It could be that this structural aspect of university life leads to greater subjective well-being, by diversifying interaction opportunities. Further investigation is needed to uncover the differences in daily social interactions among these populations, and how they might affect different measures of well-being.

Age was not related to differences in the average number of daily weak tie or strong tie interactions. At first glance, the current results might seem to contradict research that has shown that people choose to trim their social networks as they age. However, most previous research has examined the number of social ties in the network, rather than the number of interactions with social ties. This leaves open the possibility, suggested by the current results, that the number of interactions may not diminish concurrently with the size of the social network. However, it is worth noting some limitations of the current sample. Though representing a wide age range, the current sample is small, and generally middle-aged, whereas many of the studies that show shrinking social networks have studied older samples. The goal of the current research was to investigate whether our original finding - that people are happier on days when they interact with

more weak ties - generalizes to a broader population; we were not specifically interested in studying the effects on older adults, though we did draw on the aging literature to inform our hypotheses. Therefore, focused testing of aging-related social network questions would require further work, with larger, older samples.

The results of the current study suggest that the association between weak tie interactions and social and emotional well-being are not limited to university students; in a community sample, on days when people interacted with more weak ties, they felt a greater sense of belonging. The university sample also reported greater subjective well-being on days when they interacted with more weak ties. Although this finding did not replicate in the community sample, with further research to understand the complexities of weak tie interactions, a positive association between weak ties and subjective well-being may yet be found. On a spectrum of controlled environments, the psychology lab offers the most control, and the community offers the least, with the university environment falling somewhere in the middle. The results from Study 3 suggest that weak ties are associated with well-being outside of the lab, in the daily lives of university students, and the current results suggest that the associations between weak ties and well-being are not restricted to the university environment. Future research, testing moderators and mechanisms in order to gain more specific understanding of the effects and the measures of well-being that might be affected could be done within the more situationally consistent university context, and then tested in the community.

Table 8. Reliability for the measures in Study 4

Measure	Reliability (alpha)
Personality	O: .23
	C: .78
	E: .81
	A: .62
	N: .44
Subj. well-being composite	.95
Positive affect	.93
Negative affect	.90
Subjective happiness	.93
Belonging composite	.94
Community	.57
Connectedness	.84
Loneliness	.92
Social Support	.89

NOTE: For the personality measure, reliability was assessed across the two items constituting each of the big-Five factors: openness (O), conscientiousness (C), extraversion (E), agreeableness (A), neuroticism (N). For the remaining measures, the alpha was averaged across the different times the measure was collected.

Table 9. Descriptives of happiness and belonging measures, for Study 4

	Min	Max	Mean	SD
Strong tie interactions	.33	22.50	6.70	5.81
Weak tie interactions	0	74.67	11.40	12.96
Subjective well-being composite	-2.1	1.16	0	.82
Positive affect	1.56	5.00	3.69	.77
Negative affect	1.00	3.29	1.67	.61
Subjective happiness	1.50	6.94	5.23	1.28
Belonging composite	-2.52	1.28	0	.91
Community	1.58	3.00	2.30	.40
Connectedness	1.65	5.92	4.46	1.13
Social Support	1.20	4.00	3.27	.68
Loneliness	1.02	3.42	2.03	.61

NOTE: Numbers represent averages of the average of all measurements for a person.

Table 10. Hierarchical linear modeling analysis, predicting the subjective well-being composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness
Person-level (between)				
Intercept	.002 (.12)	3.69 (.12)***	1.67 (.09)***	5.23 (.19)***
Strong ties (mean)	-.02 (.02)	-.01 (.02)	.01 (.02)	-.05 (.03)+
Weak ties (mean)	.01 (.01)	.01 (.01)	-.01 (.005)	.02 (.01)+
Day-level (within)				
Strong tie slope	.01 (.005)**	.03 (.01)***	-.0003 (.01)	.01 (.01)
Weak tie slope	-.0004 (.001)	.003 (.002)	.003 (.001)*	-.0001 (.002)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 40 for the day-level effects, and 38 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 11. Hierarchical linear modeling analysis, predicting the belonging composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4

Effect	Belonging composite	Social connectedness	Social support	Loneliness	Sense of community
Person-level (between)					
Intercept	-.01 (.13)	4.47 (.17)***	3.27 (.10)***	2.03 (.09)***	2.30 (.06)***
Strong ties (mean)	.001 (.02)	-.01 (.03)	.01 (.02)	.003 (.01)	.004 (.009)
Weak ties (mean)	.02 (.01)**	.02 (.01)*	.01 (.005)**	-.01 (.004)*	.005 (.002)*
Day-level (within)					
Strong tie	.01 (.003)*	.01 (.004)**	.003 (.002)	-.004 (.005)	.00003 (.003)
Weak tie	.002 (.001)**	.003 (.002)+	.001 (.001)	-.002 (.001)*	.002 (.001)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 40 for the day-level effects, and 38 for the person-level effects. Sense of community is not included in the belonging composite, due to low correlations with the other measures.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 12. Hierarchical linear modeling analysis, predicting the subjective well-being composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4, testing moderation by age

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness
Person-level (between)				
Intercept	-.15 (.18)	3.65 (.18)***	1.85 (.14)***	5.04 (.29)***
Age	.09 (.08)	.02 (.08)	-.11 (.05)*	.12 (.11)
Strong ties (mean)	-.02 (.02)	-.01 (.02)	.01 (.02)	-.05 (.03)
Weak ties (mean)	.01 (.01)	.01 (.01)	-.01 (.01)	.02 (.01)+
Day-level (within)				
Strong tie slope				
Intercept	.02 (.01)**	.04 (.01)**	-.004 (.01)	.01 (.01)
Age	-.01 (.005)	-.01 (.01)	.003 (.01)	-.005 (.01)
Weak tie slope				
Intercept	-.003 (.003)	-.002 (.003)	.004 (.003)	.001 (.003)
Age	.003 (.002)	.01 (.003)+	-.001 (.002)	-.001 (.002)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 39 for the day-level effects, and 37 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 13. Hierarchical linear modeling analysis, predicting the belonging composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4, testing moderation by age

Effect	Belonging composite	Social connectedness	Social support	Loneliness	Sense of community
Person-level (between)					
Intercept	-.36 (.19)+	4.02 (.23)***	3.10 (.15)***	2.30 (.13)***	2.30 (.09)***
Age	.22 (.08)*	.28 (.10)**	.10 (.06)	-.17 (.05)**	.002 (.04)
Strong ties (mean)	.01 (.02)	.002 (.03)	.01 (.02)	-.01 (.01)	.004 (.01)
Weak ties (mean)	.02 (.01)**	.03 (.01)**	.01 (.005)**	-.01 (.004)**	.01 (.002)*
Day-level (within)					
Strong tie slope					
Intercept	.004 (.01)	.01 (.01)	.001 (.004)	-.003 (.01)	.01 (.01)
Age	.002 (.003)	.003 (.004)	.002 (.003)	-.002 (.005)	-.01 (.003)
Weak tie slope					
Intercept	.001 (.001)	-.0005 (.002)	.001 (.001)	.000004 (.002)	.002 (.001)
Age	.001 (.001)	.003 (.002)	-.001 (.001)	-.003 (.002)+	-.0005 (.001)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 39 for the day-level effects, and 37 for the person-level effects. Sense of community is not included in the belonging composite, due to low correlations with the other measures.
+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

CHAPTER 5 - DO INTERACTIONS WITH WEAK SOCIAL TIES CAUSE SHORT-TERM INCREASES IN HAPPINESS?[12]

In Chapter 3 and Chapter 4, results showed that people experience greater social and emotional well-being on days when they interact with more weak ties. Although the relationship between weak ties and happiness was relatively consistent across studies and samples, the direction of causality cannot be determined. We hypothesize that having more weak tie interactions leads to greater happiness, but it is also possible that being happier leads to having more weak tie interactions. The goal of Chapter 5 is to test the direction of causality, specifically whether having an extra weak tie interaction can lead to greater happiness.

STUDY 5: MINIMAL SOCIAL INTERACTION

Sometimes we stagger blearily into a coffee shop in search of a pick-me-up, wanting only to get our coffee and go. Other times, we exchange a few words with the barista, enjoying a bit of social interaction as we get our coffee. Indeed, every day we encounter many situations like these, which allow us to transform an instrumental exchange into a genuine social interaction with a stranger, but often we choose to forego these opportunities. Might we be missing out on a hidden source of belonging and happiness? Would we be happier if we embraced opportunities to treat strangers as if they were, or might become, acquaintances?

Studies using a wide variety of methodological approaches, from experience sampling and daily diaries to the day reconstruction method, all converge on the same finding: people enjoy socializing (Berry & Hansen, 1996; Clark & Watson, 1988; Kahneman et al., 2004; Krueger et al., 2009; Pavot et al., 1990; Reis et al., 2000; Vittengl & Holt, 1998a; Watson et al.,

[12] A version of this chapter has been submitted for publication. Sandstrom, G.M., & Dunn, E.W. Is efficiency overrated?: Minimal social interactions lead to belonging and positive affect.

1992). However, due to the methods used, these studies have primarily focused on interactions with close friends and family, largely overlooking minimal interactions such as the one with the Starbucks barista. For instance, many of these studies asked people to recall their interactions after hours had passed (e.g., Clark & Watson, 1988; Kahneman et al., 2004; Vittengl & Holt, 1998a), and evidence suggests that after a delay, people are more likely to remember interactions with close others (Eagle et al., 2009; Fu, 2005). In addition, a number of these studies targeted interactions of a substantial duration (e.g., Berry & Hansen, 1996; Reis, Sheldon et al., 2000; Watson et al., 1992), which are more likely to be interactions with close others. Yet, a typical day potentially provides a number of opportunities for interactions with people outside our close social circle, including strangers as well as weak ties - relationships involving less frequent contact, low emotional intensity and limited intimacy, such as the ones with acquaintances (Granovetter, 1973). It remains an empirical question whether these easily overlooked opportunities for social interaction can provide an untapped source of happiness in daily life.

Although past research has focused on interactions with close friends and family, recent work suggests that even interactions with strangers can boost positive affect. In one study, people were assigned to interact with either their own romantic partner or with an opposite sex stranger. Surprisingly, although they expected to feel better after interacting with their romantic partner versus a stranger, people felt just as good after interacting with the stranger (Dunn et al., 2007). The present research examines a situation in which a conversation with a stranger is required – placing an order at Starbucks – and varies whether or not the interaction is treated as strictly instrumental (i.e., solely in service of filling one's order) or treated as genuinely social, as if it were with a weak tie.

Minimal social interactions, in addition to providing a hidden source of enjoyment, might also provide minimal cues of belonging. Humans have a need to belong, and experience lower physical and emotional well-being when they struggle to fill this need (Baumeister & Leary, 1995). Even minimal cues of belonging or exclusion have consequences. For example, being visually acknowledged by a stranger increases feelings of social connectedness (Wesselmann et al., 2012). In contrast, being forgotten by a research assistant lowers feelings of meaning in life (King & Geise, 2011). Given that people experience more positive affect on days when the need to belong is satisfied (i.e., on days when they feel related to others; Reis et al., 2000), a minimal cue of belonging, such as a genuine social interaction with a stranger, should also carry implications for happiness.

In the current study, we investigated the effects of a customer initiating a conversation with a service provider. All customers buying a coffee at Starbucks must exchange information with the barista, but we instructed some of the participants to expand upon this minimal exchange and have a genuine social interaction, as they would with an acquaintance (i.e., weak tie). We hypothesized that customers who treated the service provider like a weak tie, rather than a stranger, would experience more positive affect, and be more satisfied with their overall experience. Further, we hypothesized that this social interaction would trigger feelings of belonging, which would mediate the effects of socializing on positive affect and satisfaction.

Method

Participants

In total, 60 participants (29 male, 28 female, 3 unreported) were recruited in person, from in front of a Starbucks in a busy, urban shopping district.[13] Participants spanned a wide range of ages: 22 were 25 years of age or younger, 13 were between 26 and 34 years of age, and 17 were 35 years of age or older (8 did not indicate their age).

Procedure

We approached people who were nearing Starbucks and asked if they would be willing to participate in a study in exchange for a $5 Starbucks gift card. If they agreed to participate, they filled out a consent form. Participants were then randomly assigned to make their interaction with the barista either efficient or social. In both conditions, the instructions encouraged participants to see the barista as an individual and take their perspective – our intention was for participants to perceive both sets of instructions as respectful toward the barista.

In the "social" condition, participants were instructed to: "have a genuine interaction with the cashier – smile, make eye contact to establish a connection, and have a brief conversation." We asked them about their usual interaction style, and then asked them to either enhance their usual behavior, or change their behavior, in order to follow the instructions (see Figure 1). In contrast, participants in the "efficient" condition were instructed to: "make your interaction with the cashier as efficient as possible – have your money ready, and avoid unnecessary

[13] Three additional participants – two in the efficient condition, and one in the social condition - did not return to complete the Time 2 measurements. One additional participant was removed from all analyses because he reported an injury during his Starbucks visit.

conversation." As in the social condition, we asked them about their usual interaction style, and then asked them to either enhance their usual behavior, or change it.

After receiving the instructions, participants in both conditions were provided with a gift card. They were asked to approach another research assistant, who was blind to their condition assignment, as they exited the store, in order to fill out a questionnaire.

Measures

After providing consent, but before being assigned to condition, participants completed two baseline questions. In order to assess their state happiness, we asked "What kind of day are you having so far?", which they answered on a scale of 1 = *bad* to 4 = *great*. In order to assess the person's trait happiness, we used a single item from the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999), which had the highest item-total correlation in a past study in our lab (Aknin et al., 2013); participants answered the question "Compared to most of my peers, I consider myself", on a scale of 1 = *less happy than my peers* to 7 = *more happy than my peers*.

After making their purchase, participants completed the Scale of Positive and Negative Emotions (Diener et al., 2010) as a measure of their current mood (PA: α =.87, NA: α =.84). This scale was developed to measure affect at the trait-level, asking people to report the frequency of various feelings over the past four weeks. We adapted it to measure state-level affect, asking participants to: "tell us how intensely you are experiencing each of the following feelings right now" (1 = *very slightly or not at all* to 5 = *extremely*). They also reported how satisfied they were with their Starbucks experience (1 = *not very satisfied* to 5 = *very satisfied*).

Participants answered several questions that were designed to allow us to test whether belonging mediated the hypothesized effects of condition on happiness and satisfaction. First, participants answered the item from the Sense of Community Scale (Davidson & Cotter, 1986)

with the highest item-total correlation in a past study in our lab ("I feel like I belong here"). Further, they answered two face-valid questions from the Social Connectedness Scale (Lee, Draper, & Lee, 2001), with high item-total correlations in the same past study in our lab ("I feel distant from people", "I feel like an outsider", both reverse-scored). All three belonging questions were answered on a scale of 1 = *strongly disagree* to 6 = *strongly agree*.

Finally, as a manipulation check, participants rated the degree of their interaction with the barista (1 = *interacted a lot less than usual* to 5 = *interacted a lot more than usual*).

Results

See Table 14 for descriptives.

Manipulation Check

An independent-samples *t*-test showed that people in the efficient condition (M = 2.58, SD = .96) interacted less than people in the social condition (M = 3.31, SD = .89), $t(58) = 3.05$, $p = .003$, $d = .79$, thus confirming the efficacy of our manipulation. One-sample *t*-tests confirmed that people in the efficient condition interacted significantly less than usual (the midpoint on the scale), $t(30) = -2.44$, $p = .02$, and people in the social condition interacted marginally more than usual, $t(28) = 1.88$, $p = .07$.

Data Preparation

There were pre-study differences between conditions in state happiness (M_{social} = 3.59, SD_{social} = .50; $M_{efficient}$ = 3.26, $SD_{efficient}$ =.68), $t(58) = 2.11$, $p = .04$, $d = .55$, and slight differences in trait happiness ($p = .11$). Given that participants were randomly assigned to condition, and that the differences at Time 1 should, therefore, be due to chance, we controlled for these differences

by using the Time 1 state and trait measures as covariates (following recommendation by Miller & Chapman, 2001).

In order to assess the broader construct of belonging, we averaged the single item from the Sense of Community scale with the two items from the Social Connectedness scale, which were all measured on the same scale, to create a belonging composite ($\alpha = .63$).[14]

The effect of efficient vs. social interactions

We ran analyses of covariance to predict outcomes from condition (social vs. efficient), using the Time 1 state and trait happiness measures as covariates. Compared to those in the efficient condition, participants in the social condition reported significantly higher positive affect, $F(1, 56) = 9.28$, $p = .004$, $\eta_p^2 = .14$, significantly lower negative affect, $F(1, 56) = 4.45$, $p = .04$, $\eta_p^2 = .07$, and marginally more satisfaction with their Starbucks experience, $F(1, 55) = 2.82$, $p = .10$, $\eta_p^2 = .05$ (see Figure 2).

Mediation

Next, we tested whether the effect of condition on the outcome variables was mediated by feelings of belonging. We did so by running a bias-corrected and accelerated bootstrap analysis using the INDIRECT macro developed by Preacher and Hayes (2008). Compared to those in the efficient condition, participants in the social condition reported a significantly

[14] In the interest of transparency, we also report the results with the sense of community item separate from the social connectedness items. Compared to those in the efficient condition, participants in the social condition reported significantly greater sense of community, $F(1, 56) = 10.78$, $p = .002$, $\eta_p^2 = .16$, though no difference in social connectedness, $F(1, 56) = .30$, $p = .59$. Controlling for Time 1 state and trait happiness, sense of community mediated the effect of condition assignment on positive affect, $CI_{95} = [.02, .27]$, and satisfaction, $CI_{95} = [.19, .74]$, though not negative affect, $CI_{95} = [-.16, .02]$. Given that social connectedness alone was not predicted by condition, it does not make sense to test it as a mediator in isolation.

greater sense of belonging, $F(1, 56) = 6.89$, $p = .01$, $\eta_p^2 = .11$. Controlling for Time 1 state and trait happiness, belonging mediated the effect of condition assignment on positive affect, CI_{95} = [.03, .32], negative affect, CI_{95} = [-.26, -.01], and satisfaction with the Starbucks experience, CI_{95} = [.04, .56].

Discussion

The present study demonstrates that transforming an instrumental exchange with a barista into a genuine social interaction leads to better mood and somewhat higher satisfaction than simply accomplishing the same exchange efficiently. Consistent with the theoretical notion that people feel happier when their need to belong is satisfied, we found evidence that our observed effects were mediated by belonging; people who were assigned to have a social interaction with the barista felt a greater sense of belonging, which explained their more positive feelings afterward.

The present study is the first to highlight the happiness benefits that result from turning everyday exchanges into social interactions. Our findings suggest that treating service providers like weak ties rather than strangers can provide a source of happiness that may often be overlooked in the drive for efficiency. Future work should continue to move beyond interactions with close friends and family, to further investigate the happiness potential of interactions with weak ties and strangers. Although the greatest happiness benefits will undoubtedly stem from meaningful, positive interactions with close others, the current results suggest additional means of boosting happiness, through the hidden potential of transforming everyday interactions.

The current study has implications for the belonging literature as well as the happiness literature. In their model of belonging regulation, Gardner, Pickett and Knowles (2005) suggested that when people are dissatisfied with their current state of belonging, a social

monitoring system will search for opportunities for positive social interaction. Initiation of even a minimal, genuine social interaction with a stranger, like the barista at Starbucks, might be enough to temporarily satisfy the need to belong. Further, pro-actively engaging in these types of interactions could pre-emptively bolster feelings of belonging, thus avoiding the need for restorative measures. In other words, future work should test whether minimal social interactions with strangers can a) restore a sense of belonging after a belonging threat occurs, and b) boost belonging before a belonging threat occurs, thus buffering against the negative consequences that result from the threat.

One limitation of the current work is the lack of control over the behavior of the barista. Past research has found that the behavior of service providers impacts customers. When employees greet customers, make eye contact and smile (i.e., display positive affect), customers also display more positive affect (Pugh, 2001; Tsai & Huang, 2002), perceive the service quality to be higher (Pugh, 2001), and report more positive behavioral intentions (e.g., intentions to return to the store or recommend it to others; Tsai & Huang, 2002). Although the behavior of the barista is undoubtedly important, this study's novel focus on the customer finds that customers can shape their happiness through their own behavior. Of course, these happiness benefits would likely disappear if the customer was thwarted in their desire to make a connection with the barista. However, this is unlikely to happen at Starbucks, which is an ideal context to study this effect, given that employees are trained to make a connection with customers, through eye contact and open-ended questions (Moon & Quelch, 2006). In contrast, attempting to turn an efficient exchange into a social interaction might lead to unpleasantness in other contexts, such as a busy Department of Motor Vehicles office or airport security line. Thus, the emotional

benefits observed in the present study may be limited to contexts in which service providers are able and willing to engage in friendly conversation.

As we go about our daily lives, we are surrounded by opportunities to talk to strangers. Although these interactions may be enjoyable (Epley & Schroeder, unpublished manuscript), the prospect of initiating a conversation with a stranger is often daunting. The current results highlight the benefits of transforming instrumental conversations that we are already having - such as placing a coffee order – into more sociable encounters. The next time you need a little pick-me-up, you might consider interacting with the Starbucks barista as if they were a weak tie, instead of a stranger, thereby mining this readily available source of happiness.

Table 14. Descriptives for Study 5

	Min	Max	Mean	SD
Pre-Purchase				
State happiness	2	4	3.42	.62
Trait happiness	2	7	5.42	1.12
Post-purchase				
Positive affect	2.33	5.00	3.90	.70
Negative affect	1.00	3.00	1.21	.38
Satisfaction	2.00	5.00	4.05	.94
Belonging composite	2.00	6.00	4.70	1.00
Belonging	1.00	6.00	4.32	1.44
Connectedness composite	2.00	6.00	5.08	1.04

Figure 1. Instructions flowchart in Study 5.

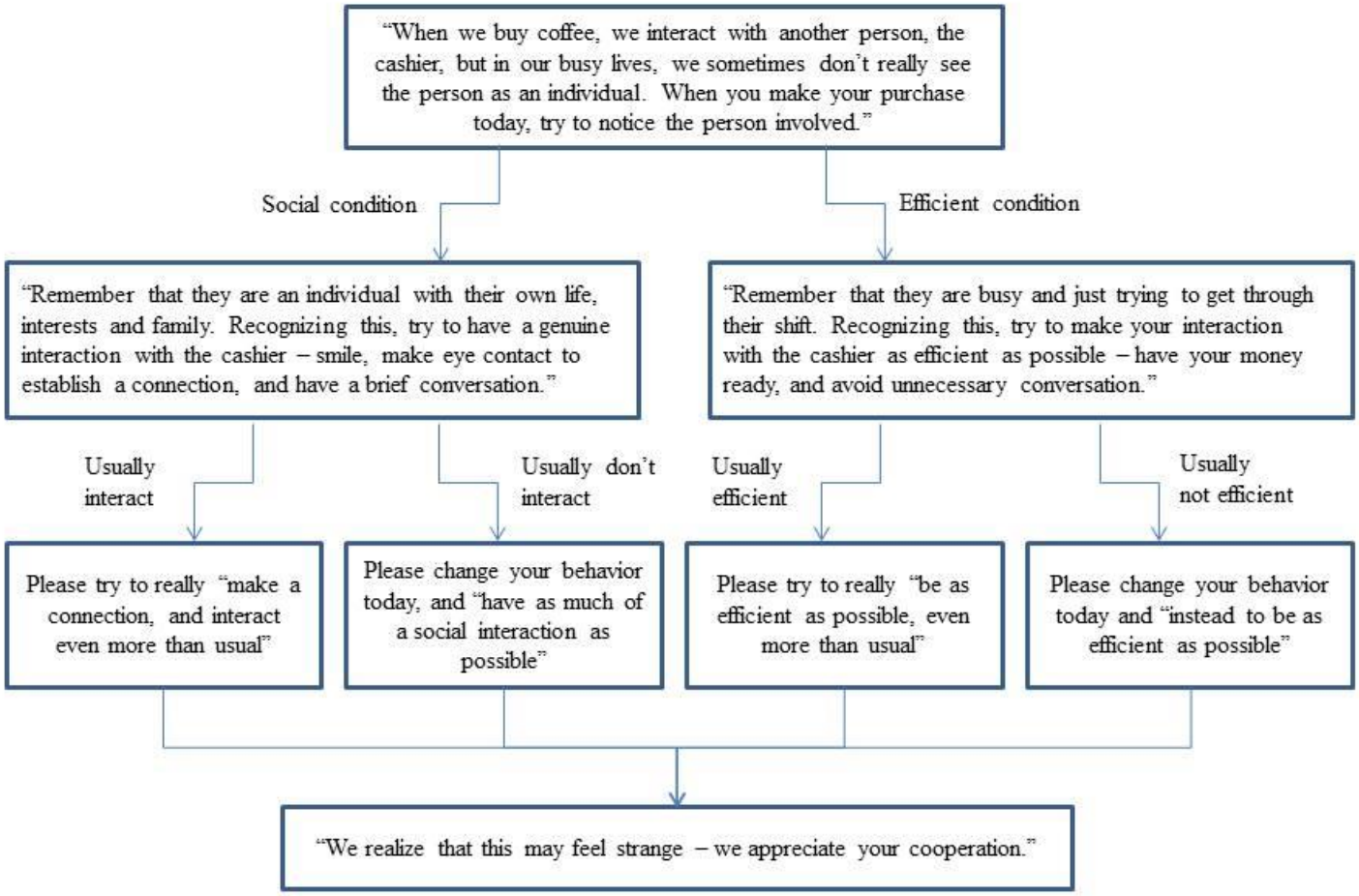
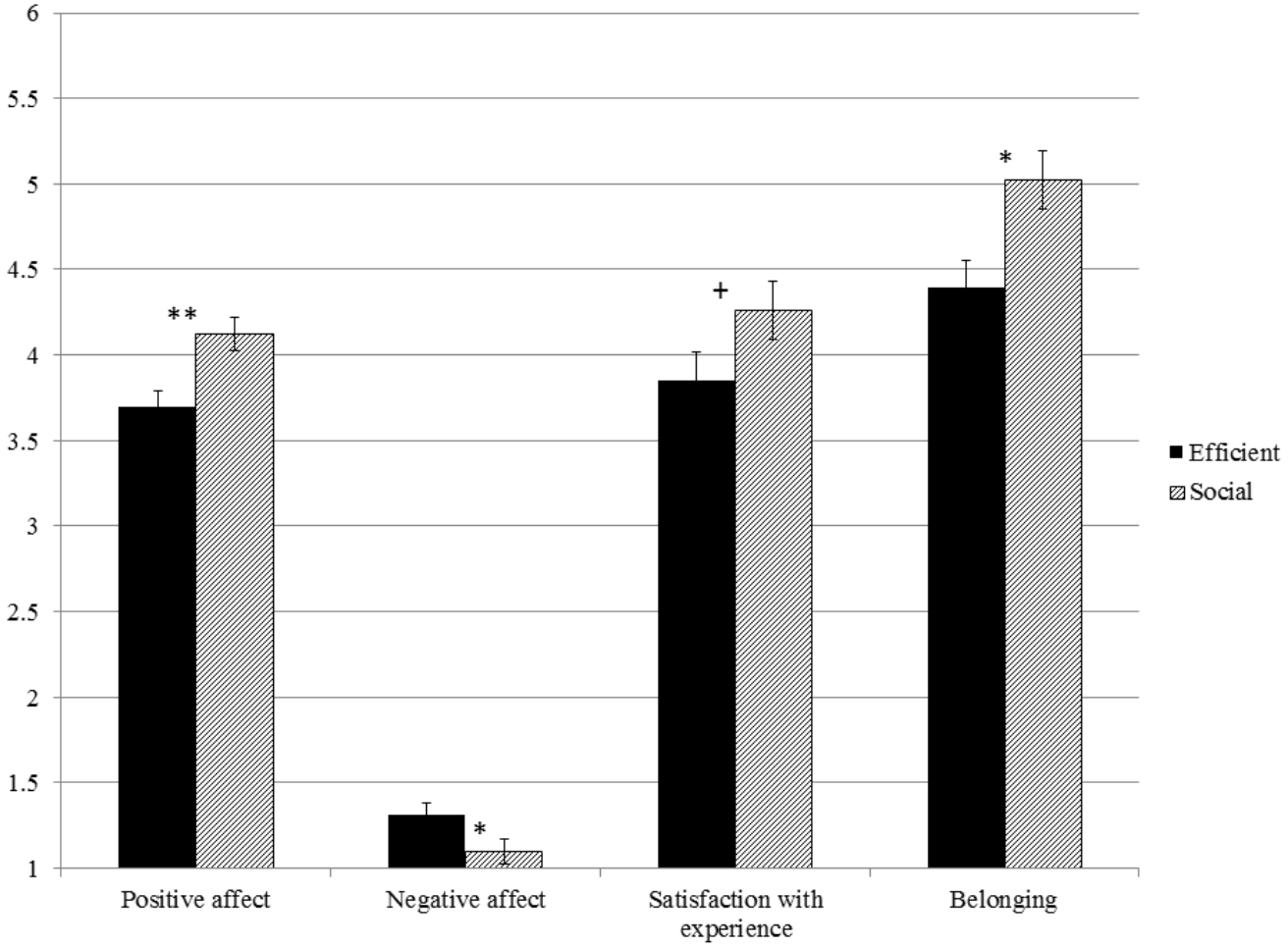


Figure 2. Positive affect, negative affect, satisfaction with Starbucks experience, and belonging as a result of condition assignment in Study 5



+ p < .10, * p < .05, ** p < .01, *** p < .001

CHAPTER 6 - DO INTERACTIONS WITH WEAK SOCIAL TIES CAUSE LONG-TERM INCREASES IN HAPPINESS?

In Chapter 5, results showed that people who were randomly assigned to have a social interaction with the barista at Starbucks (i.e., to treat the barista like a weak tie) experienced greater happiness than people who were randomly assigned to interact efficiently. In the current chapter, we look beyond immediate effects, and study whether weak tie interactions can have a longer-lasting impact.

STUDY 6: SOCIAL INTERACTION INTERVENTION

Can people become happier? Although a substantial part of a person's chronic happiness level is based in genetics, and a small part is related to life circumstances (e.g., country of residence, age), there remains a notable part that is related to intentional activity (Lyubomirsky et al., 2005). Positive psychology interventions have targeted this component of chronic happiness, attempting to increase people's happiness by altering their cognitions or behaviors. A recent meta-analysis suggests that interventions such as practicing gratitude, mindfulness or forgiveness, setting goals, and positive writing have all resulted in greater well-being (Sin & Lyubomirsky, 2009).

Social relationships contribute greatly to a person's happiness; the association between high-quality social relationships and happiness is extremely robust (Lyubomirsky et al., 2005). Relationships with members of one's social network play a role in an array of important life domains: the jobs that individuals get, the people that they marry, and their long-term health and happiness (e.g., Berkman & Syme, 1979; Berscheid & Reis, 1998; Cacioppo et al., 2009; Christakis & Fowler, 2007; Christakis & Fowler, 2008; Fowler & Christakis, 2008; Granovetter, 1973; Sprecher, Felmlee,

Orbuch, & Willetts, 2002; Uchino et al., 1996). Further, people enjoy the social interactions that form the basis of these relationships (Berry & Hansen, 1996; Clark & Watson, 1988; Kahneman et al., 2004; Krueger et al., 2009; Pavot et al., 1990; Reis, Sheldon et al., 2000; Vittengl & Holt, 1998a; Watson et al., 1992). Surprisingly, no positive psychology interventions have attempted to increase happiness specifically by increasing social interactions.

One past study did target social interactions, but not in such a way as to allow isolation of the effects. In a series of studies, Fordyce (1977, 1983) developed a program to increase happiness, which included 14 different strategies for increasing happiness, three of which related to social interactions: "spending more time socializing", "strengthen your closest relationships", and "develop an outgoing, social personality". Although participants who practiced this program experienced greater happiness than participants in control groups, the change cannot be attributed to any one of the strategies compared to the others. Thus, whether having more social interactions can lead to a lasting change in well-being remains an empirical question.

In the current study, participants were randomly assigned to have more social interactions, or were assigned to a non-social control group. Given that the results of Study 3 show that people are happier on days when they have one more weak tie interaction than usual, as well as on days when they have one more strong tie interaction than usual, we predicted that having either more strong tie interactions or more weak tie interactions each day would result in a sustained increase in subjective well-being.

Method

Participants

Overall, 118 participants (30 males, 88 females; M_{age} = 20.89, SD_{age} = 3.11) were recruited from the UBC community. Of these, 15 were recruited through a website that offers monetary compensation for study participation, and were paid $30 for completing the study. The remaining 103 participants were recruited from the human subject pool, and they completed the study for course credit. Two additional participants started the study, but completed fewer than five reports, and were consequently excluded from analyses (see Lyubomirsky et al., 2011).

Procedure

Participants reported their demographic details and well-being, and rated their personality. They were then randomly assigned to one of three conditions: strong tie, weak tie or control. Participants in the two experimental conditions were instructed to seek out either more strong tie interactions or more weak tie interactions than usual every day (see Appendix 3 for sample instructions). Strong ties and weak ties were differentiated from each other using the same criteria as in Studies 1-4; a strong tie was described as "someone you are very close to, someone who you know really well and knows you really well, **someone who you confide in** or talk to about yourself or your problems", whereas a weak tie was described as "someone you are not very close to, who you don't know very well and who doesn't know you very well, someone who you consider a friend, but would be **unlikely to confide in**" (see Appendix 2). Participants in the control condition were instructed to seek out more "traditional media interactions"

than usual every day. This could include reading a book or magazine, watching television, listening to the radio etc. The term "interactions" was employed to maintain consistency across instructions and survey questions. This control condition was designed to ensure that participants were changing their behavior and doing something new each day, but not changing their social interactions; online activities were explicitly excluded, in order to avoid increases in the use of social media.

To increase the likelihood that the participants would actually change their daily behavior, participants described at least three specific plans for having extra interactions (Gollwitzer, 1993; Gollwitzer & Brandstätter, 1997). The experimenter reviewed the plans to ensure their viability and to ensure that the participant had understood the instructions.

For ten days, participants received an e-mail each morning, reminding them to have extra interactions during the day. They also received an e-mail each evening, reminding them to complete an online survey. On this survey, participants described the extra interactions that they had had during the day, and how they were feeling, on various measures of happiness and belonging.

Measures

Personality. Participants rated their openness, conscientiousness, extraversion, agreeableness and neuroticism using the Ten-Item Personality Inventory (TIPI; Gosling et al., 2003; see Table 15 for reliability).

Given that extraversion has been linked to enjoyment of social interactions, and happiness (Lyubomirsky et al., 2005), in addition to measuring it on the TIPI, we also measured it with eight questions from the Big-Five Inventory (John & Srivastava, 1999;

see Table 15 for reliability). Participants rated the questions on a scale from 1 = *Disagree strongly* to 7 = *Agree strongly*.

Interactions. Participants were asked to describe any extra interactions that they had during the day that they would not normally have had. These were coded by two research assistants for reference to strong ties, weak ties, strangers, and traditional media. If the description was not detailed enough to allow the research assistant to determine the nature of the relationship, then the participant was contacted for further information or clarification.

Descriptions of interactions could be very brief, or quite in-depth. One participant in the weak tie condition responded: "When I got to Chemistry class (10am), I sat in my usual spot, beside the girl that sits beside me every class. I started off by saying hi and introducing myself to my seatmate in class. She was very nice and friendly, and we first talked about which faculty we're both in and the classes that we're both taking. The girl was enjoyable and fun to talk to, so I feel that we were able to connect and got closer than just a 'hi-hello' relationship." A participant in the strong tie condition responded: "Today my roommate and close friend from second year came over to my apartment. We had not seen each other in about a year because she was on exchange in Europe for a year and we had both been really busy during the summer so couldn't find time to meet up. We baked cookies and shared our summer stories and she told me all about her travels in Europe. It was really amazing catching up with a friend who I was so close to but haven't seen in a year. Things felt as if we had never been apart."

Subjective Evaluation. The pleasantness of the interactions was rated on a scale from 0 = *Not pleasant at all* to 10 = *Very pleasant*. Participants also reported their overall impression of the people they had interacted with, or the media they had consumed, on a

scale from -5 = *Very negative* to 5 = *Very positive*. Participants compared the number of social or media interactions they had that day to the number of interactions they have on a typical day, on a scale from 1 = *A lot fewer than usual* to 5 = *A lot more than usual*. They indicated whether or not they had had any negative interactions that day.

Subjective well-being. We measured subjective well-being broadly, assessing positive and negative affect, and subjective happiness using the same measures as in Study 3 (see Table 4 for sample items and response options, Table 15 for reliability, and Table 16 for descriptives). As before, we constructed a subjective well-being composite measure by standardizing the positive affect, negative affect (reverse-scored) and subjective happiness measures and averaging them together (average $r = .60$; $\alpha = .90$).

Belonging. In order to assess participants' sense of belonging, we used the same measures (sense of community, social connectedness, social support, and loneliness), and the same subset of items as we did in Study 3 (see Table 4 for sample items and response options, Table 15 for reliability, and Table 16 for descriptives). We constructed a belonging composite measure by standardizing the sense of community, social connectedness, social support, and loneliness (reverse-scored) measures and averaging them together (average $r = .75$; $\alpha = .95$).

Behavior Change. In order to assess whether participants followed instructions, the extent to which participants had followed the plan they had generated, and the extent to which they "[achieved] the broader goal of having more interactions (whether [they] followed [their] plan or not)" were measured on a 5-point scale from *Not at all* to *Completely*. Additionally, to assess whether their condition assignment led to other changes in behavior across the course of the study, we asked participants to "[reflect] back over the course of the study, please indicate how often each of the following

happened, compared to the two weeks before the study". Participants indicated whether they had performed the behaviors "less than usual", "about the same" as usual, or "more than usual". Of the 21 behaviors (see Table 17), three were explicitly manipulation check questions ("interacted with strong ties", "interacted with weak ties", "interacted with traditional media"). The remaining behaviors were thought to be potential confounds (e.g., "ate out", "felt stressed", "spent money").

Results

Descriptives

Data were mostly complete; only 2.88% of the reports were missing. Only 15 people completed fewer than 10 reports, whereas 103 participants completed all 10 reports.

The subjective evaluation of the interactions (e.g., pleasantness, overall impression) by participants in the different conditions differed greatly. A one-way ANOVA revealed a significant effect of condition on perceived pleasantness of the interactions (averaged across all 10 reports), $F(2, 115) = 5.93$, $p = .004$. Post-hoc comparisons using Tukey's test revealed that there was no difference in perceived pleasantness between those in the strong tie ($M = 7.93$, $SD = 1.24$) and weak tie conditions ($M = 7.59$, $SD = 1.16$), $p = .52$, but participants in the traditional media condition found their interactions less pleasant ($M = 6.90$, $SD = 1.60$) than participants in the strong tie condition, $p = .003$, and marginally less pleasant than participants in the weak tie condition, $p = .06$. Similarly, participants in the strong tie ($M = 3.73$, $SD = 1.01$) and weak tie conditions ($M = 3.50$, $SD = .79$) did not differ in their overall impression of their interactions, $p = .67$, but both had a significantly more positive impression than participants in the traditional media condition ($M = 2.04$, $SD = 1.56$), p's $< .001$.

In contrast, a one-way ANOVA revealed a significant effect of condition on the proportion of days that included negative interactions, $F(2, 115) = 10.42$, $p < .001$. Post-hoc comparisons using Tukey's test revealed that there was no difference in the proportion of days that included negative interactions between those in the weak tie (M = .09, SD = .12) and traditional media conditions (M = .07, SD = .09), p = .61, but participants in the strong tie condition reported a greater proportion of days that included negative interactions (M = .19, SD = .16) than participants in the weak tie condition, p = .003, and participants in the traditional media condition, $p < .001$.

Manipulation checks

The extent to which participants followed the instructions dictated by their condition assignment could be assessed through participants' self-reports, and also through their reported behavior. At the end of the study, participants answered some questions about their behavior over the course of the study, and how it differed from their behavior in the two weeks before the study (see Table 17). As expected, participants in the traditional media condition reported interacting with more traditional media than participants in either of the social interaction conditions, fewer strong tie interactions than participants in the strong tie condition, and fewer weak tie interactions than participants in the weak tie condition. However, the distinction between the strong tie and weak tie conditions was not as clear: there were no significant differences between these conditions in the number of strong or weak tie interactions, though the means were in the expected direction. This particular measure, assessed only at the end of the study, and asking participants for an estimate of their aggregate behavior over the course of two weeks, may not have been sensitive enough to detect changes in behavior.

In the daily online survey, participants answered some questions that pertain to compliance. One-way ANOVA's found no differences between conditions in self-reports about whether participants had achieved the goal of having more interactions, $p = .73$, and whether they had more interactions than usual, $p = .97$ (averaged across the daily measurements). In both cases, one-sample t-tests revealed that the overall mean, across conditions, was significantly higher than the scale midpoint, p's $< .001$, suggesting compliance.

Participants' reported behavior also testified to the efficacy of the condition assignment. Coders rated descriptions of the daily interactions for evidence of strong ties, weak ties, or traditional media. We tested for differences between conditions in the proportion of reports that had at least one interaction that indicated compliance (e.g., for a participant in the strong tie condition, the proportion of the 10 daily reports that had at least one interaction that was coded as a strong tie interaction). A one-way ANOVA predicting the proportion of compliant reports revealed a significant effect of condition, $F(2, 115) = 9.06$, $p < .001$, indicating that there were differences between conditions in compliancy. Post-hoc Tukey comparisons revealed that participants in the traditional media condition reported complying with condition assignment interactions more often ($M = 98\%$, $SD = 9.66$) than either the participants in the strong tie condition ($M = 77.85\%$, $SD = 27.19$), or the participants in the weak tie condition ($M = 82.15\%$, $SD = 25.62$), p's $< .01$, who did not differ from one another, $p = .67$. The means indicate that participants' behavior generally seemed to be compliant with their condition assignment instructions, though participants in the traditional media were more compliant than participants in the strong tie and weak tie conditions.

Change over time

In order to test for differences between conditions over time, we ran a series of repeated measures ANOVA's. The baseline measures taken in the lab before the intervention were used as the time 1 measure. The average of the online responses provided by each participant was used as the time 2 measure. For the subjective well-being composite and the belonging composite there were no main effects of time or condition, and there was no interaction between time and condition (see Table 18 and Table 19). The time by condition interaction was significant for subjective happiness, $F(2, 115) = 3.47$, $p = .03$; simple main effects revealed that participants in the traditional media condition showed a decrease over time, $p = .03$, whereas participants in the social interaction conditions showed no change, p's > .18. Additionally, the time by condition interaction was significant for loneliness, $F(2, 115) = 3.55$, $p = .03$; simple main effects revealed that participants in the strong tie condition showed a significant decrease over time, $p = .05$, and participants in the weak tie condition showed a marginal decrease over time, $p = .07$, whereas participants in the traditional media condition showed no change, $p = .18$.

In addition to testing for differences between conditions in the change over time, we also looked within conditions; we ran a series of paired-sample t-tests, comparing the baseline measures taken in the lab before the intervention to the average of the online responses. For the subjective well-being composite, the change over time was not significant in any condition, p's > .21 (see Table 20). However, there was a significant decrease in subjective happiness in the traditional media condition, $t(39) = -2.10$, $p = .04$. Further, there was a significant increase in flourishing in the weak tie condition, $t(38) =$

2.67, $p = .01$[15]. With respect to belonging, there was a marginal decrease in the belonging composite traditional media condition, $t(39) = -1.72$, $p = .09$, but the change over time was not significant in either the strong tie or weak tie condition, p's > .19. However, there was a significant decrease in loneliness in the strong tie condition, $t(38) = -2.39$, $p = .02$. These results are broadly consistent with the between-conditions repeated-measures analysis.

Given that extraversion is related to both social interactions (Watson et al., 1992) and happiness (Pavot et al., 1990), we tested whether the aforementioned differences between conditions remained after controlling for extraversion. We added extraversion as a covariate to the repeated measures ANOVA used in the primary analysis. With extraversion included in the model, the time by condition interaction remained significant for subjective happiness, $F(2, 114) = 3.50$, $p = .03$, and for loneliness, $F(2, 114) = 3.56$, $p = .03$. The simple main effects were also unchanged when extraversion was included in the model: a significant decrease in subjective happiness in the traditional media condition, $p = .02$, a significant decrease in loneliness in the strong tie condition, $p = .05$, and a marginal decrease in loneliness in the weak tie condition, $p = .07$.

Incidental differences between conditions

Participants were instructed to increase the number of specific types of interactions. Following these instructions could conceivably result in additional changes in behavior. In order to rule out the possibility that side-effect changes in behavior explain the differences between conditions, we ran a series of one-way ANOVA's, predicting potentially confounding behaviors from condition, following up with Tukey's

[15] Although the time by condition interaction in the between-conditions repeated-measures analysis was not significant for flourishing, $p = .14$, the simple main effects revealed that participants in the weak tie condition showed an increase in flourishing over time, p = .03, which is consistent with this *t*-test finding.

post-hoc comparisons. There were no differences between conditions for most of the behaviors that we assessed, such as drinking more alcohol, feeling energetic, or spending time outside, thus eliminating these behaviors as potential confounds (see Table 17). However, there was a main effect of number of interactions with social media, $F(2, 106) = 7.23$, $p = .001$, such that participants in the weak tie condition had more interactions with social media than participants in the traditional media condition ($p = .001$), though no more than participants in the strong tie condition, $p = .15$.

If people in the strong and weak tie conditions were having a different manner of interactions (e.g., social media interactions vs. face-to-face interactions), it might explain differences between conditions in outcomes. Given that face-to-face contact is better than online contact for building close relationships (Cummings, Butler, & Kraut, 2002), if participants in one of the social interaction conditions were having more face-to-face interactions than participants in the other social interaction condition, they might be expected to show greater positive consequences. Coders rated the descriptions of participants' daily interactions, classifying the interactions as in-person or not. Participants in the weak tie condition had a greater proportion of in-person interactions ($M = 77.41\%$, $SD = 23.13$) than participants in the strong tie condition ($M = 63.31\%$, $SD = 28.72$), $F(1, 73) = 5.50$, $p = .02$. This implies that any differences in outcomes due to the manner of interaction would favor more positive outcomes by participants in the weak tie condition. Both people in the strong tie condition and people in the weak tie condition showed a significantly greater decrease in loneliness than people in the traditional media condition, so differences in the manner of interaction did not seem to play a role. However, simple main effects follow-up to a non-significant time by condition interaction showed that people in the strong tie condition experienced no

change in flourishing, whereas people in the weak tie condition experienced a significant increase over time (i.e., a more positive outcome by participants in the weak tie condition). When the proportion of in-person interactions was added as a covariate to this analysis[16], both people in the strong tie condition and people in the weak tie condition showed a marginal increase in flourishing over time, suggesting that differences in the manner of interaction may have played a small role in this effect.

Discussion

People who had more interactions with weak ties showed a somewhat greater decrease in loneliness over the course of the study than people who consumed more traditional media, but no differences in any other measure of subjective well-being or belonging. Further, people who had more social interactions with weak ties reported greater flourishing at the end of the study than at the beginning. However, having more social interactions with strong ties was also fairly ineffective: people who had more interactions with strong ties showed a greater decrease in loneliness over the course of the study than people who consumed more traditional media, but no change in any other measure of subjective well-being or belonging.

Our earlier results showed that people are happier and feel a greater sense of belonging on days when they interact with one more weak tie than usual. Given this finding, why did the intervention not result in broad increases in subjective well-being and belonging for those in the weak tie condition? Based on the data, we must infer that interactions with weak ties can provide a short-term boost to one's well-being (as evidenced by Study 5), but do not have a long-term effect. However, this study also

[16] Given that "in-person" does not make sense with respect to traditional media "interactions", this analysis includes only the strong tie and weak tie conditions.

revealed few benefits to interacting with more strong ties, despite copious evidence linking social interactions to happiness, and results showing that people report greater happiness on days when they have more social interactions (Berry & Hansen, 1996). Thus, we must also infer that interactions with strong ties do not have a long-term effect.

It is possible that interactions with weak ties (and strong ties) have no long-term effects, but it is also possible that the effects do exist, but the study we ran was unable to detect them. Our intuition suggests that someone who is new to a particular environment, and thus has no network of weak ties, would benefit from increasing their daily weak tie interactions. Thus, perhaps the boost from one extra daily weak tie interaction is strong enough to cause a sustained increase in one's subjective well-being only when a person has not reached a threshold number of daily interactions.

Another reason that the social interaction interventions did not have long-lasting effects may be due to lack of compliance. Though several measures indicated general compliance, it is also clear that people in the traditional media condition were more compliant than people in the social interaction conditions. Instructions to have more traditional media interactions might have been easier to follow because people do not usually have many of these sorts of interactions. In contrast, instructions to have more social interactions might have been more difficult to follow because people already have many interactions each day. Indeed, although the online survey instructed participants to describe only the extra interactions that they had engaged in for the purposes of the study, many of the descriptions sounded instead like regular, daily interactions that would have taken place without the study (e.g., "I thanked everyone on Facebook who wished me a happy birthday." and "Today…I met a high school friend who I hadn't seen in over 4 years at the mall. The person approached me and initiated a conversation."). Thus, the

social interaction conditions may have been less effective because they did not result in changes in behavior and did not induce more interactions than usual.

In Study 5, treating a stranger like a weak tie provided an immediate boost in well-being. However, it seems more difficult to bring about sustained improvements to well-being; increasing one's daily level of weak tie interactions led to greater improvement over time than a control condition, and led to greater flourishing over time, but did not lead to broad increases in social or emotional well-being.

Table 15. Reliability and response frequency of the measures in Study 6

Measure	Reliability, time 1 (alpha)	Reliability, time 2 (alpha)	Response frequency
Personality			
Ten-Item Personality Inventory	O: .09	O: -.05	Twice
	C: .60	C: .69	
	E: .60	E: .62	
	A: .27	A: .23	
	N: .61	N: .71	
Extraversion (BFI)	.86	.87	Twice
Subj. well-being composite	.90	.93	
Positive affect	.89	.92	Daily
Negative affect	.81	.90	Daily
Subjective happiness	.88	.90	Daily
Belonging composite	.95	.96	
Community	.82	.88	Daily
Connectedness	.88	.90	Daily
Loneliness	.91	.91	Daily
Social Support	.78	.90	Daily

NOTE: For the Ten-Item Personality Inventory, reliability was assessed across the two items constituting each of the big-Five factors: openness (O), conscientiousness (C), extraversion (E), agreeableness (A), neuroticism (N). For the daily measures, the time 2 alpha was averaged across all measurements.

Table 16. Descriptives for measures of interest in Study 6, during the lab visit at the beginning of the study, and averaged across the daily measurements. One-way ANOVA's testing for differences between conditions on the baseline measures and on the averages of the daily measures.

	Lab (baseline)				Online (average across measurements)			
	Strong tie	Weak tie	Traditional media	*F*(2, 115)	Strong tie	Weak tie	Traditional media	*F*(2, 115)
Subj. well-being composite	-.13 (.84)	-.04 (.75)	.16 (.83)	1.29	-.005 (.89)	-.06 (.88)	.06 (.81)	.19
Positive affect	3.53 (.79)	3.73 (.71)	3.83 (.70)	1.75	3.63 (.11)	3.59 (.12)	3.64 (.11)	.05
Negative affect	2.14 (.76)	1.99 (.63)	2.01 (.62)	.54	2.02 (.11)	1.99 (.09)	1.96 (.08)	.12
Subjective happiness	4.90 (1.15)	4.62 (1.20)	5.21 (1.32)	2.25	4.92 (1.12)	4.74 (1.09)	5.00 (1.22)	.55
Flourishing	5.56 (.85)	5.38 (.91)	5.85 (.86)	2.97+	5.70 (.91)	5.59 (.94)	5.80 (.83)	.56
Belonging composite	-.06 (.85)	-.15 (.91)	.21 (.83)	1.91	.003 (.93)	-.11 (.92)	.11 (.86)	.59
Community	3.15 (.50)	3.15 (.91)	3.30 (.83)	1.33	3.17 (.56)	3.17 (.50)	3.26 (.48)	.43
Connectedness	4.56 (.93)	4.29 (1.09)	4.79 (1.00)	2.45+	4.62 (.95)	4.38 (1.10)	4.66 (.95)	.93
Social Support	3.38 (.52)	3.41 (.56)	3.50 (.49)	.56	3.43 (.54)	3.41 (.53)	3.52 (.49)	.56
Loneliness	2.09 (.56)	2.18 (.60)	1.90 (.55)	2.41+	1.98 (.53)	2.08 (.60)	1.97 (.53)	.44
Positive relations	4.68 (.76)	4.43 (.89)	4.74 (.89)	1.44	4.77 (.86)	4.36 (.90)	4.65 (.92)	2.09

NOTE: Cells represent means, with standard deviations in brackets.
+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 17. Means by condition for the manipulation check questions and possible confounded behaviors. One-way ANOVA's testing for differences between conditions in Study 6.

	Strong tie	Weak tie	Traditional media	$F(2, 106)$
Ate out	2.26	.234	2.13	1.09
Interacted with strong ties (people you are very close to, who you know really well and know you really well, people who you confide in)	2.79	2.57	2.33	8.01**
Drank alcohol	1.88	1.80	1.78	.27
Smoked	1.56	1.77	1.63	1.46
Interacted with weak ties (people you are not very close to, who you don't know very well and don't know you very well, people you would be unlikely to confide in)	2.44	2.74	2.28	4.68*
Drank coffee	1.97	2.11	2.08	.38
Felt energetic	2.26	2.34	2.03	2.14
Spent time working	2.09	2.11	2.40	2.41+
Interacted with strangers (people you don't know)	2.50	2.69	2.38	2.57+
Spent time at home	1.88	1.97	1.98	.22
Exercised	1.91	2.06	2.10	.74
Spent time on leisure activities	2.00	2.31	2.08	2.16
Interacted with people, generally speaking	2.74	2.77	2.40	6.41**
Suffered from headaches, pain, sickness…	1.82	1.97	1.88	.41
Spent time at work	2.03	1.94	2.05	.40
Felt stressed	2.21	2.14	2.28	.30
Interacted with traditional (NOT online) media (e.g., read newspapers,	1.79	1.97	2.83	40.16***

magazines…)				
Spent money	2.44	2.54	2.23	2.93+
Tried new things	2.18	2.43	2.28	1.50
Spent time outside	2.24	2.49	2.35	1.31
Interacted with social media (e.g., Facebook, Twitter…)	2.24	2.51	1.98	7.23**
Felt happy	2.29	2.40	2.20	.99

+ p < .10, * *p* < .05, ** *p* < .01, *** *p* < .001

Table 18. Repeated-measure ANOVA results, predicting time 2 on the subjective well-being composite measure, and all its component measures, from condition and the time 1 measurement in Study 6

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness	Flourishing
Within-subjects					
Time	.001	1.68	1.08	.12	3.27+
Time * Condition	1.59	2.25	.33	3.47*	2.03
Between-subjects					
Condition	.59	.60	.36	1.34	1.70
Estimated marginal means					
Time * Condition					
Media Time 1 vs. Time 2	-.10	-.20+	-.05	-.20*	-.05
Strong Time 1 vs. Time 2	.12	.10	-.11	.03	.14
Weak Time 1 vs. Time 2	-.02	-.14	-.004	.12	.21*

NOTE: The within-subjects and between-subjects results are F-values. Estimated marginal means data are the result of post-hoc comparisons, using a Bonferroni adjustment for multiple comparisons. These numbers represent mean differences; a negative number indicates a decrease over time. Flourishing was measured only during the lab visit at the beginning of the study, and at the end of the study, not daily; it was not included in the subjective well-being composite.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 19. Repeated-measure ANOVA results, predicting time 2 on the belonging composite measure, and all its component measures, from condition and the time 1 measurement in Study 6

Effect	Belonging composite	Sense of community	Social connectedness	Social support	Loneliness	Positive relations
Within-subjects						
Time	.001	.01	.01	.98	2.11	.22
Time * Condition	2.16	.46	1.96	.34	3.55*	1.05
Between-subjects						
Condition	1.17	.87	1.67	.57	1.25	1.87
Estimated marginal means						
Time * Condition						
Media Time 1 vs. Time 2	-.10+	-.03	-.14	.02	.07	-.09
Strong Time 1 vs. Time 2	.07	.02	.06	.05	-.11*	.08
Weak Time 1 vs. Time 2	.04	.02	.08	-.001	-.10+	-.07

NOTE: The within-subjects and between-subjects results are F-values. Estimated marginal means data are the result of post-hoc comparisons, using a Bonferroni adjustment for multiple comparisons. These numbers represent mean differences; a negative number indicates a decrease over time. Positive relations was measured only during the lab visit at the beginning of the study, and at the end of the study, not daily; it was not included in the belonging composite.
+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 20. T-test comparing raw score change over time compared to zero, in Study 6

	Strong tie	Weak tie	Traditional Media
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Happiness composite	.12 (.59)	-.02 (.51)	-.10 (.55)
Positive affect	.10 (.68)	-.14 (.64)	-.20 (.64)+
Negative affect	-.11 (.67)	-.004 (.50)	-.05 (.61)
Subjective happiness	.03 (.52)	.12 (.55)	-.20 (.61)*
Flourishing	.13 (.63)	.21 (.49)*	-.05 (.65)
Belonging composite	.07 (.32)	.04 (.46)	-.10 (.38)+
Sense of community	.02 (.29)	.02 (.27)	-.03 (.30)
Social connectedness	.06 (.38)	.08 (.66)	-.14 (.55)
Social support	.05 (.22)	-.001 (.28)	.02 (.27)
Loneliness	-.11 (.28)*	-.10 (.39)	.07 (.33)
Positive relations	.08 (.57)	-.07 (.47)	-.09 (.66)

+ p < .10, * *p* < .05, ** *p* < .01, *** *p* < .001

CHAPTER 7 - GENERAL DISCUSSION

The studies described in this dissertation are the first to ask whether and to what extent relationships with weak ties, and interactions with weak ties contribute to one's subjective well-being and feelings of belonging. Past research has repeatedly shown that social relationships are robustly associated with subjective well-being, but this research has focused primarily on strong tie relationships, especially those with spouses and people who provide support (e.g., emotional, instrumental). Similarly, past research has repeatedly shown that people experience greater subjective well-being when socializing with others, but, due to methodological reasons, this research has focused primarily on interactions with strong ties. Based on this research linking strong tie relationships and strong tie interactions to positive consequences, and past research investigating the positive consequences of interactions with strangers, we hypothesized that social relationships and social interactions with weak ties would be associated with subjective well-being and feelings of belonging.

Are weak tie relationships associated with happiness?

The focus in Chapter 2 was on social relationships with weak ties. Participants reported how many strong tie and weak tie relationships they had, and rated their own happiness. Both the number of strong tie relationships and the number of weak tie relationships were independently related to greater self-reported happiness. This study also examined the intuitions that people have about the association between strong and weak tie relationships and happiness. Participants viewed profiles that described people who had different numbers of strong tie and weak tie relationships, and they predicted how happy the people described in the profiles would be. Both the number of strong tie relationships and the number of weak tie relationships described in the

profile independently predicted inferences drawn about the target's happiness. Putting these two findings together, the results suggest that we expect that people with more strong ties and more weak ties are happier, and this expectation is accurate, in that people who have more strong ties and more weak ties actually are happier. The results of Study 1 provide the first evidence that the weak ties in one's social network are linked to one's happiness.

Are interactions with weak ties associated with happiness?

Moving beyond social relationships, Chapter 3 and Chapter 4 focused on social interactions with weak ties. In Study 2, students kept track of their interactions with classmates in a particular class. At the end of that class, they received a short questionnaire via text message. They reported the number of interactions, as well as their current mood and feelings of belonging. We retained only those participants who indicated that they had no strong ties in that particular class, in order to ensure that we were capturing weak tie interactions. The data reveal that people who, on average, had more weak tie interactions each day than others did were happier and felt a greater sense of belonging. Further, on days when students interacted with more weak tie classmates than usual, they were somewhat happier and felt a greater sense of belonging. Thus, not only is subjective well-being associated with having weak ties in one's social network, but also with interacting with weak ties.

In order to test whether interactions with weak ties have an effect independent of the effect of interactions with strong ties, in Study 3 people kept track of both their strong tie interactions and their weak tie interactions. Participants used two hand-held mechanical tally counters ("clickers") to keep track of their daily interactions: one to count strong tie interactions, and one to count weak tie interactions. At the end of each day, participants accessed an online

survey to report the numbers of each type of interaction, as well as their subjective well-being and feelings of belonging. Participants who, on average, interacted with more weak ties each day than others did were happier and felt a greater sense of belonging. Additionally, on days when participants interacted with more weak ties than usual, they reported greater subjective well-being, though no difference in feelings of belonging. These effects were independent of the effect of interactions with strong ties: on days when participants interacted with more strong ties than usual, they also reported greater subjective well-being and greater feelings of belonging. Also, people who, on average, interacted with more strong ties each day than others did were happier and felt a greater sense of belonging.

Replicating this study with a community sample in Study 4, we found somewhat similar results: people who, on average, interacted with more weak ties each day than others did were happier, though they did not feel a greater sense of belonging. On days when participants interacted with more weak ties than usual, they reported greater belonging, though not greater subjective well-being. As for strong ties, people who, on average, had more interactions each day showed no advantage over people who, on average had fewer interactions each day: they reported no difference in happiness or feelings of belonging. However, on days when participants interacted with more strong ties than usual, they reported greater subjective well-being and belonging. These findings build on and extend the results from Study 2, showing that the effect of interactions with weak ties is independent of the effect of interactions with strong ties, and that the associations between weak tie interactions and social and emotional well-being generalize to a broader population.

Do interactions with weak ties cause happiness?

Having established that interactions with weak ties are associated with subjective well-being and belonging, Chapter 5 and Chapter 6 investigated the direction of causality. Although it is also possible that greater subjective well-being leads people to have more interactions with weak ties, we hypothesized that having more interactions with weak ties would lead people to experience greater subjective well-being and feelings of belonging. In Study 5, participants were recruited outside of Starbucks. Although all customers must interact with the cashier to place their order, some participants were asked to establish a genuine social connection, thus treating the cashier like a weak tie rather than a stranger – smiling, making eye contact, and having a brief conversation. Other participants were instructed to make their interaction as efficient as possible, avoiding unnecessary conversation. Results showed that the people who transformed an instrumental exchange with the cashier into a genuine social interaction reported a better mood and somewhat higher satisfaction than those who accomplished the same exchange efficiently. These effects were mediated by belonging; people who were assigned to have a social interaction with the cashier felt a greater sense of belonging, which explained their more positive feelings afterward. Thus, minimal interactions, such as the ones we would have with a weak tie, lead to greater subjective well-being, through increased feelings of belonging.

Given that weak tie interactions have positive consequences in the short-term, Study 6 examined whether the effects can be sustained over time. Participants were instructed to have more strong tie interactions, have more weak tie interactions, or consume more traditional media (control condition) every day for 10 days. Neither people in the strong tie condition nor people in the weak tie condition showed broad, sustained changes in subjective well-being or belonging, though those in the weak tie condition did show increased flourishing over time. Further, those in

the strong tie and weak tie conditions showed a decrease in loneliness over time (marginal in the weak tie condition), whereas those in the traditional media condition did not. Thus, although weak tie interactions may lead to greater subjective well-being in the short-term, no broad impact on long-term changes in happiness could be detected.

Discrepancies

Looking across studies, we find that people who report a higher average number of daily weak tie interactions report higher average happiness and belonging (see Appendix 4). Further, on days when people interact with more weak ties, they experience greater happiness and belonging.

Despite the consistent associations between weak ties and happiness that appear across studies, there are two notable discrepancies. First, although people who reported a higher average number of daily weak tie interactions compared to others reported higher average happiness in Study 2 and Study 3, this was not the case in Study 4. Similarly, on days when people interacted with more weak ties than usual they reported greater happiness in Study 2 and Study 3, but not in Study 4. Given that Study 4 was a replication of Study 3, with a community sample instead of a university sample, one would expect these associations to replicate.

It is possible that the non-significant association between weak tie interactions and happiness for the community sample means that the effect is limited to university samples. This seems unlikely given the strong association between weak tie relationships and happiness in Study 1, which also drew upon a non-university sample. However, people in the university and community samples of the daily interaction study are likely interacting with different types of weak ties due to differences in their social contexts, which may have implications for the

strength of the association. For example, university students may be having more social, elective interactions, whereas the community sample may be having more instrumental, required interactions (e.g., with service providers and colleagues at work). There is some evidence of the types of interactions that university students are having in a data set we recently collected, with about 1600 social interactions from 55 students (Sandstrom & Dunn, 2013). Given the choice of classifying each interaction as either "Just for business / information", "Both business and fun" or "Just for fun", university students classified 57% as being just for fun. Though we have no comparable data for community samples, we suspect that the proportion of fun interactions would be lower. Another hint that interactions may be less voluntary in the community sample is the fact that extraversion does not predict the number of weak tie interactions in this sample, whereas it does for the university sample; if participants were having more interactions dictated by the situational context, and less interactions by choice, then we might expect the relationship between extraversion and the number of interactions to be reduced. Future work investigating the extent to which the association between weak tie interactions and happiness is driven by fun interactions more than by business interactions may shed light on the discrepancies found in the current set of studies.

One other discrepancy was revealed in the results: on days when people interacted with more weak ties than usual they reported greater feelings of belonging in Study 4, but not in Study 3. Interestingly, people who had a higher average number of daily weak tie interactions than others reported greater average feelings of belonging in both studies; the discrepancy was limited to the more stringent test of an association within a person's daily fluctuations. In both studies, we used a composite measure of belonging that included measures of community (only in Study 3), connectedness, loneliness and social support. Although the use of composite measures has

advantages, such as allowing us to see patterns across a range of measures, it can also obscure findings on individual measures. It is important to note that although there was no effect on the overall belonging composite with the university sample in Study 3, there was a marginal association between weak tie interactions and the sense of community measure. This is consistent with the findings from Study 2; on days when students interacted with more weak tie classmates, they reported a greater sense of belonging, on a question drawn from the sense of community scale. Thus, one explanation for the discrepancy is that students in the university sample felt a greater sense of belonging, but it was restricted to the university environment. This would explain the absence of an effect on the broader measure of social connectedness. However, in error, social connectedness was not measured at the first two time points for the university sample, resulting in only four measurements instead of six. This experimenter error may have diminished the likelihood of detecting an effect, providing an alternative explanation for the discrepancy. Future work is needed to evaluate these possible explanations.

Relationship between subjective well-being and belonging

The similarities and discrepancies of the findings across studies suggest that subjective well-being and belonging are closely related, but independent constructs that often move in tandem, but sometimes move separately. Consequently, these findings raise a question about the nature of the relationship between weak tie interactions, subjective well-being and belonging. Are weak tie interactions associated with subjective well-being indirectly through belonging, are weak tie interactions associated with belonging indirectly through subjective well-being, or are weak tie interactions simply associated with both subjective well-being and belonging? We ran additional analyses to test for indirect effects (see Appendix 6).

There is little evidence to support subjective well-being as a mediator between weak tie interactions and belonging. There is no evidence of mediation on belonging through subjective well-being in Studies 2-4 (see Table 31). In Study 6 there were no effects of condition on belonging, but there were effects of condition on loneliness, a measure that contributes to the belonging composite; there is no evidence of mediation on loneliness through subjective well-being (see Table 33). However, in Study 5 there are significant indirect effects of positive affect and negative affect (the only measures of subjective well-being included in the study) on belonging (a three-item composite; see Table 32).

Theory and past research suggest that the opposite causal direction is more plausible. Baumeister and Leary (1995) proposed that people have a need to belong, and thrive only when that need is fulfilled. Further, studies have shown that people experience greater happiness on days when they feel more connected to others (Reis et al., 2000). Looking across studies, there is mixed evidence supporting the hypothesis that belonging mediates the effects of weak tie interactions on subjective well-being. In Study 2 and Study 5, there is evidence suggestive of mediation. Both of these studies assess feelings of belonging and happiness a short time after the interactions have occurred, which might make these constructs more likely to move in tandem. Additionally, in Study 6 there is a significant indirect effect of loneliness (the average of the online measurements) on the average subjective well-being composite, controlling for loneliness during the lab visit. In contrast, there is no evidence of mediation through belonging in Study 3 or Study 4 (though, given the use of hierarchical linear modeling, it was not possible to test for an indirect effect via bootstrapping, as in Study 5 and Study 6; see Table 30).

The present results are consistent with past research on the relationship between belonging and subjective well-being. In Studies 2-5, belonging predicts subjective well-being

directly. Similarly, in Study 6, average loneliness predicts average happiness, both with and without controlling for time 1 loneliness and happiness. In addition to direct effects, belonging mediates the relationship between weak tie interactions and subjective well-being in Studies 2, 5 and 6. However, in Study 3, weak tie interactions did not predict belonging, though they did predict happiness directly. Taken together, this suggests that weak tie interactions might predict happiness directly, as well as indirectly by increasing belonging.

Effects of Personality

Although we found consistent evidence across studies that people who have more weak tie relationships are happier, it is important to ask whether this association is a spurious result of other individual differences. One individual difference with widespread implications is someone's personality. We ran supplementary analyses to determine whether the association between weak tie relationships and happiness could be partly explained by differences in the big-five personality traits (see Appendix 5).

Overall, the between-person associations with weak tie relationships show little change when the big-five personality traits are included in the analysis. In Study 1, the association between the number of weak tie relationships and self-reported happiness remains after controlling for personality (see Table 22); conscientiousness, extraversion, agreeableness and neuroticism are all significantly related to self-reported happiness (negatively for neuroticism, positively for the other traits), but they explain variance that is independent from the variance explained by the number of weak tie relationships.

We also examined whether the associations between subjective well-being and belonging and the average number of daily weak tie interactions held after controlling for personality.

When the big-five personality traits are included in the statistical models, the association between the average number of daily weak tie interactions and average subjective well-being drops to marginal in Study 2 (see Table 23), but remains significant in Study 3 (see Table 24) and remains non-significant in Study 4 (see Table 26). As for belonging, the association with the average number of daily weak tie interactions remains significant in Study 2 and Study 4 (see Table 27), but drops to marginal in Study 3 (see Table 25). The specific personality traits that are linked to happiness and belonging differ across studies 2, 3 and 4 (see Appendix 5), but each of the big-five traits significantly or marginally predicts happiness in at least one study, and each of the big-five traits, with the exception of openness, significantly or marginally predicts belonging in at least one study.

In Study 6, we tested whether the differences between conditions held after controlling for the big-five traits as covariates. The time by condition interaction remained significant for subjective happiness, $F(2, 110) = 4.40$, $p = .02$, and loneliness, $F(1, 110) = 3.54$, $p = .03$, and became significant for flourishing, $F(1, 110) = 3.49$, $p = .03$. Simple main effects continued to reveal a significant decrease in subjective happiness for participants in the traditional media condition ($p = .01$), a significant decrease in loneliness for participants in the strong tie condition ($p = .05$), and a marginal decrease for participants in the weak tie condition ($p = .07$). Participants in the weak tie condition showed a significant increase in flourishing ($p = .01$).

Personality is also related to a person's mean number of weak tie interactions. Using hierarchical linear modeling to predict the number of weak tie interactions (at the within-person level) from the big-five personality traits (at the between-person level), extraversion predicted more weak tie classmate interactions in Study 2, $t(127) = 4.37$, $p < .001$, more daily weak tie interactions in Study 3, $t(52) = 2.72$, $p = .01$, but no more daily weak tie interactions for the

community sample in Study 4, $p = .69$. None of the other big-five traits predicted the number of weak tie interactions.

In sum, the associations between weak tie relationships/interactions and happiness and belonging remain intact, though somewhat weaker, after controlling for the big-five personality traits. Though the big-five traits are related to both happiness and belonging, and extraversion is related to the number of weak tie interactions, these relationships do not fully explain the associations between weak tie relationships/interactions and happiness and belonging.

Generalizability

It is important to ask whether the current findings generalize: is the association between weak ties and happiness restricted to certain kinds of people? Although several of the studies described in this dissertation used North American university samples, which are limited in their representativeness (Henrich, Heine, & Norenzayan, 2010; i.e., studies 2, 3 and 6), others used broader samples (i.e., studies 1, 4 and 5). In the case of the studies using the clicker methodology, we ran the same study both with a university sample and with a community sample. The participants differed in their mean levels of daily weak tie interactions: the university sample had more daily strong tie interactions and more daily weak tie interactions than the community sample. However, despite these differences, both samples demonstrated greater subjective well-being and/or belonging on days when they interacted with more weak ties. This evidence provides preliminary support for the effects of weak ties holding across age groups and situational contexts (students, full-time employees, retirees).

Although the current work suggests that the association between weak ties and happiness holds across age groups, it is important to consider whether the association holds across the

myriad other ways in which people differ. Recent work suggests that the link between weak ties and subjective well-being may depend upon socioeconomic conditions; people living in economically unstable (i.e., relatively poor), but residentially stable areas (i.e., areas with few people moving away) were happier if they favored strong ties, whereas people living in other socioeconomic conditions were happier if they favored weak ties (Oishi & Kesebir, 2013). The authors suggested that when there is no worry of friends moving away, but economic resources are scarce, it would be prudent to minimize the number of friends to whom one would feel responsibility to help financially.

This finding suggests that in particular economic conditions, people with more weak tie relationships might report lower happiness, thus calling into question the generalizability of the results of Study 1. The Canadian Census provides measures of the percentage of low income people, and the percentage of people who lived at the same address five years ago, which can be used as indices of economic stability and residential stability, respectively. The current studies were run in Vancouver, which has relatively low economic stability (more than two standard deviations below the mean), and relatively low residential stability (approximately one standard deviation lower than the mean), compared to other metropolitan areas in Canada. As such, it does not fall into the category of economic conditions that would be expected to favour strong ties to the detriment of weak ties. It would be interesting to test whether relationships with weak ties would still be associated with greater subjective well-being for people who reside in an economically unstable, residentially stable area, such as Nanaimo (one standard deviation below the mean on economic stability, and one standard deviation above the mean on residential stability). On the one hand, we might expect relationships with weak ties to be associated with social and emotional well-being, despite economic conditions, but on the other hand, in

situational contexts where thoughts of financial responsibility are primed, then the associations with well-being might be erased.

Culture is another factor that might limit generalizability of these findings. Individuals in collectivist cultures have less frequent, but more intimate social interactions (Wheeler, Reis, & Bond, 1989), suggesting fewer weak tie interactions. Citing evidence that East Asians are less willing to extend trust toward weak ties than North Americans, Hamamura and Cheung (2013) found that although North Americans were more creative when they had more weak ties, the same was not true for East Asians. Consequently, for people in collectivist cultures, strong tie interactions might be associated with subjective well-being and belonging, but we might predict a less robust association with weak tie interactions.

Measurement Issues

Given that these are among the first studies in psychology to examine weak ties, in the absence of past research to drive more specific hypotheses, we elected to use a broad range of measures to assess subjective well-being and belonging. We relied upon the use of composite measures to show general patterns of associations with weak ties. However, for transparency, we also report the results for the individual measures. An examination of the measures that were associated with weak ties across studies, and those that were not, might be used to drive measure selection in future studies.

In order to measure subjective well-being, we examined positive affect, negative affect, and subjective happiness (a more global assessment of subjective well-being). In addition to theoretical arguments against distinguishing between different types of happiness (Kashdan et al., 2008), past empirical work has found that affective and cognitive measures are highly

correlated and often form a single factor (Lyubomirsky et al., 2005). Indeed, several past studies have combined measures similar to ours into composites for analysis (Aknin, Dunn, Sandstrom & Norton, 2013; Lyubomirsky et al., 2011; Oishi & Kesebir, 2013). Although daily variation in weak tie interactions was associated with variation in positive and negative affect in several studies, daily variation in weak tie interactions was not associated with variation in subjective happiness in either of the studies in which the measure was included. Thus, evidence from the current set of studies suggests that daily fluctuations in weak tie interactions may be associated with affective measures of happiness, but not more global assessments (e.g., subjective happiness).

We also used a wide variety of measures to assess belonging: sense of community, social connectedness, social support and loneliness. We expected that the sense of community and social connectedness measures, which refer to social connections in the abstract, might be more likely to be related to weak ties. In contrast, we expected the social support and loneliness measures, which seem to refer to a narrower group of social connections (those who provide support), to be more likely to be related to strong ties. Although the sense of community measure was reliable and highly correlated with other measures of belonging in university samples, it was not reliable and did not correlate with other measures of belonging in community samples; researchers doing future studies involving community samples would do well to be cautious about including this measure. Personal variation in weak tie interactions was not associated with variation in social support in either of the studies that included the measure. Thus, evidence from the current set of studies suggests that weak tie interactions are generally associated with measures of belonging that refer to a broad range of social relationships, but not with measures that refer to relationships with specific functions (e.g., providing social support).

Implications

Results from the present studies have implications for research on social interactions and on a broad array of research topics. The methods used in the current studies, which avoid the shortcomings associated with recall, may be of use in other studies of social interactions. Additionally, the literature on social capital, including research linking social capital and happiness, might be re-examined in light of the fact that weak tie relationships may constitute a large part of what is deemed social capital. Further, work on happiness interventions might benefit from considering how the properties of weak ties could make them especially powerful for promoting changes in happiness. Finally, given that weak ties may be easier to establish than strong ties, research on adaptation to new environments might benefit from specifically examining the potential of weak ties in fostering adjustment.

Methods for studying social interactions

The methods used in the current studies have implications for future study of social interactions. Much of the past work investigating the link between social interactions and subjective well-being has asked participants to recall all of their interactions at the end of the day, or after several hours have elapsed (Clark & Watson, 1988; Kahneman et al., 2004; Krueger et al., 2009; Reis, Sheldon et al., 2000; Vittengl & Holt, 1998a; Watson et al., 1992). In Study 3, participants used hand-held tally counters ("clickers") to keep track of their social interactions as they occurred. The number of daily strong tie interactions that participants counted with the clickers was similar to the number of interactions reported in past studies that used the Rochester Interaction Record (RIR; Reis & Wheeler, 1991), which asks participants to report only those interactions that are at least 10 minutes long. However, participants in the

current studies also reported weak tie interactions. Combining the number of strong tie interactions and the number of weak tie interactions, participants who used the clickers reported more than double the amount of interactions reported in studies that used the RIR. Although the clickers allowed us to get a more accurate estimate of the number of daily interactions, they did not allow us to capture any additional information about the interactions (e.g., the nature or emotional quality of the interactions). Cell phone technology may make it possible to enjoy the advantages of the clicker method – capturing a greater number of interactions – as well as the advantages of the diary method – more complete information about interactions. We are currently pilot testing a cell phone application that detects when conversations end, and pops up a list of questions to the participant. This will allow participants to classify the interaction partner as a strong or weak tie, and also answer questions about the nature and positivity of the interaction. Future studies would benefit from using methods such as this, that allow participants to report interactions as they occur (thus avoiding memory issues), as well as provide detailed information about the interactions.

Social capital

The prevalence of weak tie relationships in social networks may have implications for research on social capital. Research on social networks suggests that people's social networks are large (Burke, Marlow, & Lento, 2010; Dunbar, 1993; Pool & Kochen, 1979; Tong, Van Der Heide, Langwell, & Walther, 2008), but people consider only a small number of their connections to be close (Hammer, 1980; Roberts, Dunbar, Pollet, & Kuppens, 2009). Thus it is not surprising that the current findings suggest that people have more interactions with weak ties each day than with strong ties. Economists have argued that the social networks that enable these social interactions are resources that provide measurable value, and thus might be considered

"social capital" (analogous to the physical capital that enables production of goods and services; Helliwell & Putnam, 2004). In an analysis of several large data sets, social capital in the form of marriage and family, ties to friends and neighbours, ties at the workplace, and membership in community organizations were each independently related to happiness (Helliwell & Putnam, 2004). Many of these relationships are likely to be weak ties: relationships that are tied to a context (e.g., neighbours, colleagues, members of an organization) and do not exist outside of that particular context are often weak ties (Fingerman, 2004). Thus weak tie relationships may constitute a large part of what is deemed social capital, and may have implications for this work.

Feelings of belonging and connection to the community (i.e., social capital) are related to one's choice of residence. In one study, people who lived in cities reported lower connection to their community than people in any other area, including those who lived in remote and very remote areas (Cummins et al., 2005). This may explain why people in Australia and the United States who live in cities are less happy than those who live in rural towns (Berry & Okulicz-Kozaryn, 2011; Cummins et al., 2005). Although there are many opportunities for interactions in cities, it may be harder to make connections with people, and thus people may actually have fewer interactions, including weak tie interactions. In contrast, people who live in rural areas and are thus part of a smaller community may be likely to know more people; certainly stereotypes of small towns include the notion that everybody knows everybody else. Smaller, more walkable places may provide more opportunities for chance encounters which develop into relationships that build social capital (Rogers, Halstead, Gardner, & Carlson, 2011). Although some of these relationships will be with strong ties, many will be with weak ties. In sum, the type of relationships one builds may be related to where they live, and increased opportunities to build

weak tie relationships (as well as strong tie relationships) might help to explain why happiness is also related to where you live.

Hedonic adaptation

The Hedonic Adaptation Prevention model (Sheldon, Boehm & Lyubomirsky, 2012) suggests another way in which weak ties may be related to happiness: more than strong ties, they provide novelty and variety, which are key to staving off hedonic adaptation. Granovetter (1973) argued that people with stronger ties to one another are more similar to each other, suggesting that weak ties might provide a source of novelty in one's social interactions. Further, people in established relationships know each other well, and thus have less new information to disclose to one another (Reis, Collins et al., 2000). In comparison, weak ties bring the excitement of new revelations and new information. Thus, research with the goal of promoting sustained increases in happiness, which requires staving off hedonic adaptation, might benefit from examining weak ties, which might have adaptation-resistant properties.

Adjusting to life transitions

The current findings have useful implications for people in new environments, who lack a network of social ties: employees at a new job, students at a new school, immigrants in a new city/country. Establishing strong ties can help with adjustment for all of these groups. New employees report greater feelings of attachment and inclusion at work when their friendship network (as opposed to their informational network) is composed of stronger ties (Morrison, 2002). Students studying abroad experience less emotional distress when they have established strong tie relationships in the new environment (Furukawa et al., 1998), and less acculturative

stress when they report more social support (Yeh & Inose, 2003). Immigrants report less depression when they have more friends who they can talk to frankly (Kuo & Tsai, 1986).

While it is difficult and takes time to develop strong ties, it may be easier to establish weak ties, which might also promote adjustment to a new environment. Past studies hinted at this possibility, without examining weak ties directly. In addition to the strength of the network, the size of a new employee's friendship network also predicts feelings of attachment and inclusion at work (Morrison, 2002); to the extent that the social ties expanding the size of the network are, at least in part, weak ties, this suggests that weak ties may contribute towards feelings of social integration on the job. Students studying abroad report less acculturative stress when they feel a greater sense of social connectedness (Yeh & Inose, 2003). To the extent that social connectedness measures a broad, general sense of relatedness to the social world, this reduction in acculturative stress may reflect satisfaction with weak ties as well as strong ties. The current studies, which explicitly examined weak ties, suggest that well-being is related to having more weak ties in one's network and interacting with more weak ties. The sense of belonging and subjective well-being that are associated with establishing a social network of both strong and weak ties might, therefore, promote adjustment to a new environment.

Future Directions

This dissertation describes a set of studies that are among the first in psychology to specifically examine weak ties. The findings leave open many questions, and point the way to several avenues of future research. Further work is needed to establish causality, which may be bi-directional. Another important avenue for future research is a deeper understanding of the ways in which weak ties differ from strong ties. These distinctions have implications for the

development of relationships, social support, and classification of relationships. Finally, the qualities that differentiate weak ties from strong ties may suggest ways in which weak ties may provide advantages over strong ties.

Do weak ties cause happiness?

The current studies provide initial evidence that weak tie interactions may cause increased social and emotional well-being. Study 5 revealed that treating a stranger like a weak tie resulted in greater subjective well-being, and Study 6 revealed that increasing the number of one's daily weak tie interactions led directly to an increase in flourishing, and led indirectly to a greater increase in subjective well-being relative to people in the traditional media condition, through a greater decrease in loneliness (see mediation analysis in Appendix 6).

The current studies provide initial evidence that weak tie interactions may have positive consequences. Future work should further test the causal link. One way to do this might be to compare the emotional consequences of a day that includes both strong and weak tie interactions to a day that includes only strong tie interactions. Assuming a design with proper controls to ensure that the number of strong tie interactions remains constant, and that there is no negativity introduced by the method of reducing the number of weak tie interactions (e.g., guilt felt as a result of avoiding people), this would allow a valuable test of the ability of weak tie interactions to increase well-being.

Even if the evidence confirms that weak tie interactions cause increased social and emotional well-being, it is also possible that causality works in the opposite direction as well: a boost to subjective well-being might induce people to have more weak tie interactions. Indeed, research suggests that people in a happy mood are more inclined towards social activities rather

than non-social activities, whereas people in a sad mood are more inclined towards non-social activities rather than social activities (Whelan & Zelenski, 2011). This causal direction would be consistent with Fredrickson's (2001) Broaden and Build theory of positive emotions, which proposes that positive emotions prompt people to carry out behaviors that broaden and build their resources, in preparation for future threats. In this case, having more weak tie interactions might lay the groundwork for building the strong tie relationships that are so important for health and well-being. Assuming evidence for both causal directions, this might suggest a positive feedback loop, in which weak tie interactions lead to greater happiness, which in turn leads to more weak tie interactions.

One documented example of a positive feedback loop links happiness to prosocial spending. People who recalled spending money on another person were happier than people who recalled spending money on themselves (Aknin, Dunn, & Norton, 2012). Afterward, when they received a financial windfall, happier people were more likely to spend the windfall on someone else, rather than on themselves, thus perpetuating a positive cycle. People in a positive mood also judge others more positively (Baron, 1987), and make less severe moral judgments about others (Valdesolo & DeSteno, 2006). This research suggests possible downstream consequences of having more weak tie interactions. On days when people interact with more weak ties, they report greater happiness. To the extent that this relationship turns out to be causal, the happiness that results from the weak tie interactions could lead to more prosocial spending and more positive impressions about others. In sum, further investigation of the causal relationship between weak tie interactions and happiness is important, not just because of the implications for the happiness of individuals, but also given that individual happiness has downstream benefits for others.

Exploring the ways in which weak ties differ from strong ties

The present results show that people experience greater social and emotional well-being on days when they have more strong tie interactions and on days when they have more weak tie interactions. Do these results simply mean that all interactions, whether they be low or high in intimacy, are associated with social and emotional well-being? Is there any evidence to suggest that strong tie interactions and weak tie interactions are categorically different from one another? This is difficult to answer from the current results, due to the use of impoverished measurement of weak ties. In Studies 2-4, the sole information collected was the number of interactions; we have no information about the interaction partner, nor any information about the emotional quality of the interaction. For example, it is possible that required, business-related interactions might result in weaker effects on subjective well-being than volitional, social-related interactions. This issue was partially addressed in Study 6, in which we collected a description of the extra interactions participants had and asked them to report on the emotional quality of these interactions, as well as their impressions about their interaction partners. However, this information was also somewhat limited in that participants often reported several interactions, but reported on their interactions in aggregate, and did so retrospectively. Additional research questions could be investigated with a study design that allowed for reporting of the quality of each interaction as it occurs. For example, researchers could determine the relative strength of positive and negative interactions on one's subjective well-being at the end of the day, and weigh the quantity of interactions against the quality of the interactions.

Although the current results are not able to shed light on the qualities that distinguish weak ties from strong ties, in a review paper, Reis, Collins and Berscheid (2000) described several ways in which weak and strong ties might differ. First, people are more likely to express

their emotions in close relationships, sharing both their joys and sorrows, but people tend to suppress negative emotions in less close relationships. This is supported by research on self-presentation. People self-present less with close others, but surprisingly enjoy interactions more when they are instructed to self-present (Dunn et al., 2007). Reis, Collins and Berscheid (2000) also argued that conflict is normative in close relationships; the high degree of interdependence in close relationships is associated with more opportunities for disagreement. Finally, people have strong expectations about close partners' behavior, which leaves them vulnerable to negative feelings when those expectations are violated; breaches in expected relational behaviors can result in disappointment and betrayal (Simpson & Tran, 2006). When they are close to others, people may be more likely to feel embarrassment or envy, or feel like their privacy has been invaded (Rook, 1984). Consequently, although they provide companionship and support, strong ties may also be a source of negativity. Weak ties, on the other hand, are associated with lower expectations and lower emotional involvement, and therefore may provide some of the benefits of social interactions without some of the drawbacks that come exclusively with interactions with strong ties.

The results of Study 6 support the notion that, despite the general pleasantness of interactions with strong ties (the mean was about eight, on a zero to ten scale), they might also be a source of negativity. Participants in the strong tie, weak tie and traditional media conditions indicated if they had had any negative interactions during the day, and described any such interactions. People in the strong tie condition reported that they had had negative interactions more than twice as often as people in the other two conditions (19% of the days, compared to 9% in the weak tie condition and 6% in the traditional media condition). Although this suggests that strong tie interactions, despite being generally pleasant, can be negative, these results should be

viewed as preliminary; the question simply asked whether or not people had any negative interactions, and did not specify that those interactions needed to be congruent with the condition assignment. Coding of the descriptions of the negative interactions could provide more conclusive information about whether interactions with strong ties are more often the ones remembered as being negative.

Relationship development. The ways in which weak ties differ from strong ties are relevant to questions about the development of relationships. A person might talk to a stranger, over time turn that stranger into a weak tie, and eventually turn that weak tie into a strong tie. Past research has examined this process through the lens of close relationships, specifically romantic relationships, thus studying attraction and the development of intimacy through processes such as self-disclosure. However, when there is no romantic motivation, what induces someone to interact with a stranger? Ickes and colleagues have studied how personal characteristics, such as sex, ethnicity, and the big-five personality traits influence the initiation and enjoyment of interactions with strangers (Ickes, Bissonnette, Garcia, & Stinson, 1990). For instance, they found that people enjoy their interaction more when their level of extraversion is similar to their partner's, but this benefit of similarity does not hold for agreeableness: disagreeable people do not enjoy interacting with other disagreeable people. Little work has examined the influence of situational factors on interactions with strangers (Berscheid & Reis, 1998).

Having interacted with a stranger, what induces someone to interact with them again, thus establishing a weak tie? In one study, we found that students who formed a more accurate impression of the personality of a classmate with whom they were previously unacquainted not only liked the classmate more concurrently, but interacted with them more throughout the

semester and liked them more at the end of the semester (Human, Sandstrom, Dunn & Biesanz, in press). Past research, focused on romantic relationships, has proposed that relationships only progress when there is an expectation that future interactions will be rewarding (Berscheid & Reis, 1998). What kinds of rewards are relevant for weak ties, compared to strong ties? Hill (1987) proposed several motivations that drive people to interact with others: emotional support, attention, positive stimulation, social comparison. Are some of these motivations better, or more often satisfied by weak ties than by strong ties?

Finally, when do weak ties remain weak ties, and when do they grow into strong ties? There are many research questions pertaining to the development of relationships that are ripe for future research. Addressing these questions with respect to weak ties also has the potential to inform questions about the development of a broad array of relationships.

Social support. The specific motivations that drive interactions with weak ties might have implications for research on social support. In a seminal study, Cohen and colleagues (1997) found that the diversity of people's social networks was associated with susceptibility to the common cold. They asked participants to consider twelve types of social relationships and whether they spoke to someone with whom they had each type of relationship at least once every two weeks. Although some of these relationship types clearly indicate strong ties (e.g., spouse, parents, children), others are more likely to indicate weak ties (e.g., workmates, schoolmates, fellow volunteers, members of groups), though relationship type does not always predict the strength of the tie (Marsden & Campbell, 1984). People who regularly interacted with a more diverse array of people were less likely to catch a cold. Indeed, the diversity of one's social network has been linked to disease development and mortality, across a broad range of illnesses (Berkman, 1995; Cohen & Janicki-Deverts, 2009).

Why might having a diverse social network have protective qualities? One explanation may be that different types of ties provide different kinds of support. In one study, researchers asked participants to consider various sources of support: some typically strong tie sources (e.g., partner, immediate kin, close friends), and some typically weak tie sources (colleagues, acquaintances; Agneessens, Waege, & Lievens, 2006). Participants named a person who exemplified each source of support, and indicated whether they could rely on that person to provide specific kinds of support: instrumental (to help when they are sick or have financial problems), emotional (to talk to and provide comfort), companionship (to go on a trip with)[17]. The researchers found that each source provides specific kinds of support. For example, some friends provide companionship, some friends provide both companionship and emotional support, and other friends provide no support; friends are not likely to provide instrumental support.

Further information about the ways in which weak ties differ from strong ties may help to elucidate these questions about social support. Given that there may be less added value in having people in one's network that are able to provide redundant kinds of support, it is important to determine the extent to which the support provided by weak ties is unique, or broader than support provided from strong ties. For example, weak ties may primarily provide companionship, whereas instrumental and emotional support may generally be provided by strong ties (though a neighbor may provide instrumental support by picking up groceries and a hairdresser might provide emotional support by listening to one's troubles). However, there may be finer distinctions in the types of companionship that different weak ties are able to provide, or

[17] Companionship, when conceptualized as shared leisure activities, is sometimes thought to be different than social support, and has been shown to have unique associations with psychological well-being (Rook, 1987). However, belonging support, or feelings of social integration have been included in some taxonomies of social support (Cohen et al. 1985).

value in having a wide circle of weak ties that offer companionship in different contexts (e.g., friends to go to the movies with, different friends to exercise with).

Classification of relationships. If interactions with weak ties are driven by different motivations than interactions with strong ties, this may have implications for how people classify their social relationships. Relationships fall along a continuum of closeness and intimacy, and a relationship that one person might classify as a strong tie, another person might classify as a weak tie. Further work is needed to look at the individual differences or situational contexts that lead to specific classification strategies. The strategies that people use for classifying relationships may be related to the particular motivations for affiliation (Hill, 1987) that they endorse. For example, people who are primarily motivated by the desire for emotional support may classify others as weak ties unless they are able to provide emotional support, whereas people who are primarily motivated by the desire for positive stimulation may classify fewer people as weak ties, to the extent that more people provide stimulation than provide emotional support.

Other individual differences may also influence the way in which people classify their social relationships. For instance, might happy people be more inclusive about who they consider to be strong ties? This possibility is supported by exploratory data collected in Study 3. At the end of the study, participants were presented with a list of ambiguous relationships (e.g., "A co-worker that you gossip with at work, and talk about work problems with, but don't see outside of work"), and were asked to classify the relationships as either strong ties or weak ties. Happier participants rated more of these relationships as strong ties, even controlling for extraversion.

Unique advantages of weak ties. Understanding the distinctions between weak ties and strong ties lays the groundwork for another broad avenue for future research: examining the ways in which strong ties are more beneficial than weak ties, the ways in which weak ties are just as beneficial as strong ties, and the ways in which weak ties might be more beneficial than strong ties. As one example of the former, we tested whether the happiness benefits that result from giving money to others depend on the recipient of the money (Aknin, Sandstrom, Dunn, & Norton, 2011). When participants recalled a time they had spent money on someone else, they experienced greater positive affect when they recalled spending money on a strong tie rather than a weak tie. Though in this case strong ties conferred more advantages than weak ties, the ability of weak ties to connect people to diverse sources of information suggests certain ways in which weak ties may confer more advantages than strong ties. For instance, weak ties appear to have benefits for creativity; employees who have more weak ties at work are judged by their supervisors to be more creative (Perry-Smith, 2006). The fact that people are less emotionally close to weak ties might suggest that weak ties could provide a sense of impartiality, perspective and psychological distance that cannot be experienced with close others. Investigation into the complementary and distinctive effects of weak ties deserves future research attention.

Conclusion

Imagine that you were to move to a new city, where you didn't know anyone. The studies presented in this dissertation suggest that interactions with the receptionist at the tennis club and the pet store owner in the new city may provide opportunities for increasing your subjective well-being. Further, doing things like joining a tennis league team and reaching out to your neighbors will establish a network of weak ties, which is associated with greater happiness.

Finally, reach out to this network - you are likely to be happier on the days when you seek out extra interactions with the weak ties in your network.

This dissertation presents an initial investigation into weak ties and their relationship with subjective well-being. Much past research has focused on the strong ties in one's social network (especially romantic partners), and social interactions with strong ties. The current results suggest that studying the more peripheral members of one's social network might also be fruitful for learning about relationships and their consequences. In conclusion, social psychology would benefit from expanding its social circle, to include the study of weak ties.

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APPENDIX 1 – INSTRUCTIONS FOR THE TEXT MESSAGE RESPONSES IN STUDY 2

“Please answer with the number of people that you talked to **immediately** before, during or after class. This is almost always your classmates in that class, but could also include the professor or a teaching assistant. INCLUDE people you talk to right outside the lecture hall while waiting to get into class or right after class, and people you talk to in the lecture hall before class starts, during class, or after class. DON'T INCLUDE people you talked to for class purposes, like if your prof says "Turn to the person next to you and discuss...". An interaction does not have to be big - please count even if you just say hi or wave to someone you know. Count each person only once.”

APPENDIX 2 – INSTRUCTIONS FOR THE CLASSMATE QUESTIONNAIRE IN STUDY 2

"Please list all of the students that you know in this class. Each person might be either a strong tie or a weak tie: A **strong tie** is someone you are very close to, someone who you know really well and knows you really well, **someone who you confide in** or talk to about yourself or your problems (e.g., a good friend).

On the other hand, a **weak tie** is someone you are not very close to, who you don't know very well and who doesn't know you very well, someone who you consider a friend, but would be **unlikely to confide in** (e.g., a casual friend, an acquaintance).

Don't include someone who is an **absent tie**: Someone you don't recognize **or** who probably doesn't recognize you. It could be someone that you've met, but haven't really talked to."

APPENDIX 3 – CONDITION ASSIGNMENT INSTRUCTIONS IN STUDY 6

For the next two weeks, we would like you to seek out more interactions with weak ties than usual every day. I'll explain what I mean by all this. First, I said two weeks. We want you to fill out 10 reports as close together as possible – you don't have to do the study on the weekend, but you can if you like (it might be easy to do on the weekend). So, it should take approximately two weeks to do 10 reports, but it will depend on the schedule you choose. Next, I said interactions with weak ties. A weak tie is someone you are not very close to, someone who you don't know very well (and doesn't know you very well), someone who you consider a friend, but would be **unlikely to confide in** (e.g., a casual friend, an acquaintance, a neighbor, a friend of a friend…). These are not strangers – they are people that you already know, but not very well. Ideally, you would increase the number of weak tie interactions without increasing the number of interactions with close friends and family. As far as interactions go, this can include in-person conversations, phone calls, e-mails, text messages, or social media. We'll ask you to report general information about these extra interactions that you have at the end of the day in an online survey. I just want to point out that, ethically speaking, you shouldn't tell us the names of people that you talked to, or tell us anything about what was said – the people that you interact with are not participating in the study, and so ethically we can't have information about them. Instead, you can tell us their initials, or just say "a friend", but what's really important to us is that you provide information about the nature of your relationship with the person – how close are you? If you don't provide this information, we will follow up via e-mail to get more details. So, to summarize so far, we want you to take some **extra** time each day to have **more** weak tie interactions in whatever way is most enjoyable to you - this is all about changing your behavior, doing something different than usual. Any questions so far?

This is going to be hard, because we're basically asking you to change your habits for the next 10 days. So, we think it will be helpful to come up with a plan. I'm going to ask you to spend some time thinking about when, where and how you could add more weak tie interactions to your day. I'd like you to come up with at least 3 *specific* plans of the form "when-then". For example, "**When** I go to Social Psych class, **then** I will sit beside an acquaintance and get to know them better". Plans of this type are really helpful, because the "when" part identifies a situation, and you can automate your behavior, so that whenever that situation occurs, you automatically carry out your plan, no thinking required. Please return to the room and write up some plans for adding weak tie interactions to your day, and then bring them back so we can look them over together.

APPENDIX 4 – SUMMARY OF FINDINGS

Table 21. Summary of results from all studies.

	Interaction type	Subjective well-being					Belonging			
		Composite	Positive affect	Negative affect	Subjective happiness	Composite	Sense of community	Social connectedness	Social support	Loneliness
Study 1: inferences	Strong tie				**					
	Weak tie				***					
Study 2: classroom	Weak tie, between		**				**			
interactions	Weak tie, within		+				**			
Study 3: daily	Strong tie, between	**	*	n.s.	**	***	n.s.	***	*	***
interactions, UBC	Weak tie, between	**	*	***	n.s.	*	**	*	n.s.	+
	Strong tie, within	*	*	n.s.	n.s.	*	n.s.	n.s.	*	n.s.
	Weak tie, within	**	***	**	n.s.	n.s.	+	n.s.	n.s.	n.s.
Study 4: daily	Strong tie, between	n.s.	n.s.	n.s.	+	n.s.	n.s.	n.s.	n.s.	n.s.
interactions,	Weak tie, between	n.s.	n.s.	n.s.	+	**	*	*	**	*
community	Strong tie, within	**	***	n.s.	n.s.	*	n.s.	**	n.s.	n.s.
	Weak tie, within	n.s.	n.s.	*	n.s.	**	n.s.	+	n.s.	*
Study 5: minimal interaction (Starbucks)	Weak tie		**	*			**	n.s.		
Study 6: intervention	Strong tie	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	*
	Weak tie	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	+

NOTE: Interaction type of "between" refers to a between-subjects effect, focusing on a person's average number of interactions compared to other people. In contrast, "within" refers to a within-subjects effect, focusing on fluctuations in a person's own number of interactions (i.e., compared to their average daily report). A blank cell indicates that the measure was not assessed, and n.s. indicates

that the effect was not significant. For Study 1, only a single item from the subjective happiness scale was used. Study 2 used a single-item question to assess positive affect, which was not drawn from the same scale used to assess positive affect in Studies 3 through 6. For Study 2 and Study 5, only a single item from the sense of community scale was used. For Study 4, sense of community was measured, but exhibited low reliability and was excluded from the belonging composite. For Study 5, only two items from the social connectedness scale were used. For Study 6, the results are simple main effects on a time by condition interaction; people in the weak tie condition also reported greater flourishing at the end of the study compared to the beginning of the study.

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

APPENDIX 5 – SUPPLEMENTARY ANALYSES: PERSONALITY

In order to test whether the effects hold, controlling for personality, we re-ran the original analyses, with the big-five personality traits included in the models.

Table 22. Hierarchical linear modeling analysis on happiness, controlling for personality, in Study 1.

	Linear Effect	
	b	*p*
Self-reports		
Openness	.02	.61
Conscientiousness	.19	<.001
Extraversion	.20	<.001
Agreeableness	.10	.01
Neuroticism	-.40	<.001
Strong ties	.13	.16
Weak ties	.23	.001

Table 23. Hierarchical linear modeling analysis, predicting happiness, belonging and class enjoyment from the number of interactions in Study 2, controlling for personality

	Happiness	Belonging	Class enjoyment
Person-level (between)			
Intercept	73.85 (.94)***	3.94 (.05)***	3.83 (.05)***
Openness	.19 (1.44)	.08 (.07)	.19 (.07)**
Conscientiousness	.84 (1.17)	.02 (.07)	-.07 (.06)
Extraversion	.93 (1.11)	.04 (.06)	-.07 (.06)
Agreeableness	-.85 (1.51)	.17 (.09)+	.20 (.07)**
Neuroticism	-3.37 (.88)***	-.17 (.06)**	-.06 (.05)
Interactions (mean)	.92 (.48)+	.07 (.04)*	.09 (.04)*
Text message-level (within)			
Interaction slope	.87 (.48)+	.08 (.03)**	.06 (.04)+

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 132 for the text message-level effects, and 126 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 24. Hierarchical linear modeling analysis, predicting the subjective well-being composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 3, controlling for personality

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness
Person-level (between)				
Intercept	-.0002 (.06)	3.61 (.06)***	2.02 (.07)***	5.08 (.10)***
Openness	.07 (.06)	-.01 (.06)	-.01 (.09)	.24 (.12)+
Conscientiousness	.04 (.04)	.04 (.04)	-.09 (.05)+	-.03 (.08)
Extraversion	.07 (.08)	.01 (.06)	-.03 (.06)	.17 (.12)
Agreeableness	.21 (.07)**	.22 (.06)***	-.09 (.06)	.28 (.12)*
Neuroticism	-.18 (.04)***	-.14 (.04)**	.09 (.05)+	-.25 (.07)***
Strong ties (mean)	.01 (.01)	.01 (.01)	.002 (.005)	.03 (.01)**
Weak ties (mean)	.01 (.01)*	.01 (.01)*	-.02 (.01)**	-.002 (.01)
Day-level (within)				
Strong tie slope	.01 (.005)*	.01 (.01)*	-.004 (.005)	.005 (.004)
Weak tie slope	.02 (.005)**	.03 (.01)***	-.02 (.005)**	.004 (.004)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 57 for the day-level effects, and 50 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 25. Hierarchical linear modeling analysis, predicting the belonging composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 3, controlling for personality

Effect	Belonging composite	Sense of community	Social connectedness	Social support	Loneliness
Person-level (between)					
Intercept	.01 (.07)	3.23 (.04)***	4.53 (.07)***	3.35 (.05)***	2.08 (.05)***
Openness	.04 (.07)	.08 (.05)	.01 (.07)	-.01 (.06)	.01 (.05)
Conscientiousness	.07 (.06)	.03 (.04)	.06 (.05)	.04(.04)	-.04 (.04)
Extraversion	.22 (.09)*	.07 (.04)*	.32 (.08)***	.06 (.05)	-.13 (.07)+
Agreeableness	.18 (.08)*	.14 (.05)**	.21 (.07)**	.06 (.06)	-.05 (.06)
Neuroticism	-.07 (.05)	-.06 (.04)	-.08 (.06)	.01 (.04)	.04 (.04)
Strong ties (mean)	.02 (.01)**	.01 (.003)*	.02 (.01)**	.01 (.01)+	-.02 (.01)**
Weak ties (mean)	.01 (.01)+	.01 (.004)***	.01 (.01)+	.002 (.006)	-.004 (.005)
Day-level (within)					
Strong tie slope	.01 (.003)*	.002 (.002)	.0004 (.005)	.01 (.003)*	-.003 (.003)
Weak tie slope	.001 (.004)	.003 (.002)+	.003 (.004)	-.001 (.003)	.002 (.002)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 57 for the day-level effects, and 50 for the person-level effects.
+ p < .10, * p < .05, ** p < .01, *** p < .001

Table 26. Hierarchical linear modeling analysis, predicting the subjective well-being composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4, controlling for personality

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness
Person-level (between)				
Intercept	.002 (.09)	3.69 (.10)***	1.67 (.07)***	5.23 (.15)***
Openness	-.13 (.08)+	-.12 (.09)	.09 (.05)+	-.20 (.13)
Conscientiousness	.42 (.10)***	.37 (.08)***	-.25 (.06)***	.60 (.17)**
Extraversion	.13 (.07)+	.16 (.07)*	-.07 (.04)	.18 (.12)
Agreeableness	-.12 (.10)	-.17 (.09)+	.05 (.06)	-.19 (.16)
Neuroticism	-.16 (.12)	-.08 (.10)	.19 (.07)*	-.18 (.20)
Strong ties (mean)	-.01 (.02)	.002 (.01)	-.0003 (.01)	-.02 (.03)
Weak ties (mean)	-.0002 (.01)	.001 (.004)	-.0003 (.004)	.01 (.01)
Day-level (within)				
Strong tie slope	.01 (.006)*	.03 (.01)***	-.002 (.01)	.01 (.01)
Weak tie slope	.0003 (.002)	.003 (.002)	.003 (.001)+	.001 (.002)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 40 for the day-level effects, and 33 for the person-level effects.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 27. Hierarchical linear modeling analysis, predicting the belonging composite measure, and all its component measures, from the number of strong and weak tie interactions in Study 4, controlling for personality

Effect	Belonging composite	Social connectedness	Social support	Loneliness	Sense of community
Person-level (between)					
Intercept	-.01 (.09)	4.47 (.11)***	3.27 (.07)***	2.03 (.06)***	2.30 (.06)***
Openness	-.08 (.07)	-.10 (.12)	-.06 (.08)	.07 (.06)	.04 (.07)
Conscientiousness	.29 (.09)**	.38 (.10)**	.14 (.08)+	-.17 (.07)*	-.09 (.04)*
Extraversion	.27 (.06)***	.31 (.08)***	.20 (.05)***	-.17 (.05)**	-.03 (.03)
Agreeableness	.10 (.08)	.12 (.11)	.08 (.07)	-.06 (.06)	.03 (.05)
Neuroticism	-.05 (.08)	-.12 (.10)	.03 (.07)	.04 (.06)	.08 (.05)+
Strong ties (mean)	.01 (.02)	.001 (.02)	.01 (.02)	-.002 (.01)	-.001 (.01)
Weak ties (mean)	.01 (.004)*	.01 (.01)	.01 (.003)*	-.01 (.003)+	.01 (.003)*
Day-level (within)					
Strong tie	.005 (.003)+	.01 (.004)**	.002 (.002)	-.004 (.005)	-.00001 (.003)
Weak tie	.003 (.001)**	.002 (.001)	.001 (.001)	-.003 (.001)*	.002 (.001)+

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets. The approximate degrees of freedom is 40 for the day-level effects, and 33 for the person-level effects. Sense of community is not included in the belonging composite, due to low correlations with the other measures.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 28. Repeated-measure ANOVA results, predicting time 2 on the subjective well-being composite measure, and all its component measures, from condition and the time 1 measurement in Study 6, controlling for personality

Effect	Subjective well-being composite	Positive affect	Negative affect	Subjective happiness	Flourishing
Within-subjects					
Time	2.57	.12	2.54	1.42	2.90+
Time * Condition	1.86	1.97	.33	4.40*	3.49*
Time * Openness	.30	.77	.13	.07	.02
Time * Conscientiousness	.17	1.20	1.9	.51	2.03
Time * Extraversion	2.50	.10	2.01	.46	.20
Time * Agreeableness	.17	.11	.17	.19	4.13*
Time * Neuroticism	2.49	.56	1.59	12.88***	12.69**
Between-subjects					
Condition	.25	.54	.18	.70	1.14
Openness	.87	2.22	.01	.88	3.46+
Conscientiousness	1.15	.13	3.63+	.08	2.24
Extraversion	17.31***	17.97***	1.54	22.04***	28.48***
Agreeableness	4.76*	1.33	2.13	7.37**	4.07*
Neuroticism	29.54***	16.40***	10.88***	36.69***	20.48***
Estimated marginal means					
Time * Condition					
Media Time 1 vs. Time 2	-.12	-.20+	-.03	-.22*	-.08
Strong Time 1 vs. Time 2	.12	.09	-.12	.02	.12
Weak Time 1 vs. Time 2	.01	-.12	-.02	.14	.26**

NOTE: The within-subjects and between-subjects results are F-values. Estimated marginal means data are the result of post-hoc comparisons, using a Bonferroni adjustment for multiple comparisons. These numbers represent mean differences; a negative number indicates a decrease over time. Flourishing was measured only during the lab visit at the beginning of the study, and at the end of the study, not daily; it was not included in the subjective well-being composite.

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 29. Repeated-measure ANOVA results, predicting time 2 on the belonging composite measure, and all its component measures, from condition and the time 1 measurement in Study 6, controlling for personality

Effect	Belonging composite	Sense of community	Social connectedness	Social support	Loneliness	Positive relations
Within-subjects						
Time	.49	.11	.22	.09	.73	1.53
Time * Condition	2.04	.54	1.89	.72	3.54*	1.00
Time * Openness	1.66	.74	2.52	3.18+	2.51	.08
Time * Conscientiousness	.01	.10	1.38	1.05	.11	1.11
Time * Extraversion	.78	1.19	1.29	6.92*	.12	.31
Time * Agreeableness	.07	.002	.04	.04	.17	.70
Time * Neuroticism	3.51+	.51	5.89*	.04	4.34*	6.11*
Between-subjects						
Condition	.45	.27	1.35	.18	.70	1.65
Openness	.05	.88	.04	.02	.10	.01
Conscientiousness	.38	.25	.35	.05	.71	.92
Extraversion	29.04***	9.59**	39.18***	15.44***	31.89***	22.93***
Agreeableness	2.60	4.64*	.02	4.72*	.70	11.66**
Neuroticism	15.67***	3.52+	23.22***	8.24**	19.28***	12.67**
Estimated marginal means						
Time * Condition						
Media Time 1 vs. Time 2	-.10	-.04	-.13	.03	.07	-.11
Strong Time 1 vs. Time 2	.07	.02	.05	.06	-.11*	.07
Weak Time 1 vs. Time 2	.04	.02	.09	-.02	-.10+	-.04

NOTE: The within-subjects and between-subjects results are F-values. Estimated marginal means data are the result of post-hoc comparisons, using a Bonferroni adjustment for multiple comparisons. These numbers represent mean differences; a negative number indicates a decrease over time. Positive relations was measured only during the lab visit at the beginning of the study, and at the end of the study, not daily; it was not included in the belonging composite.

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

APPENDIX 6 – SUPPLEMENTARY ANALYSES: MEDIATION

In order to understand the pathways of the effects, we tested two mediation models: weak tie interactions indirectly predicting happiness through belonging, and indirectly predicting belonging through happiness.

Figure 3. Mediational model examining the indirect effect of weak tie interactions on happiness through belonging

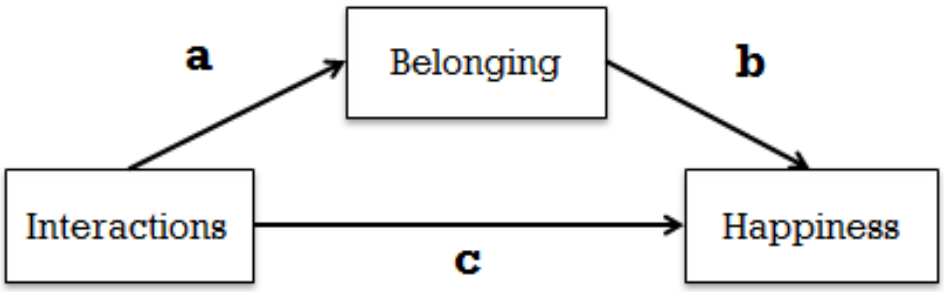

Table 30. Testing for patterns consistent with the hypothesis that belonging mediates the effect of interactions on happiness.

Study: interaction type	a: Interactions -> Belonging	b: Belonging -> Happiness	c: Interactions -> Happiness	c': Interactions, Belonging -> Happiness
2: Classroom, weak	.08 (.03)**	5.01 (.99)***	.88 (.47)+	.49 (.49)
3: Daily, weak	.002 (.003)	.49 (.11)***	.02 (.005)**	.01 (.004)**
3: Daily, strong	.01 (.003)*	.49 (.11)***	.01 (.005)*	.01 (.005)+
4: Daily, weak	.002 (.001)**	.30 (.12)*	-.0004 (.002)	-.002 (.002)
4: Daily, strong	.01 (.005)+	.30 (.12)*	.01 (.01)+	.01 (.01)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets.
+ p < .10, * *p* < .05, ** *p* < .01, *** *p* < .001

Figure 4. Mediational model examining the indirect effect of weak tie interactions on belonging through happiness

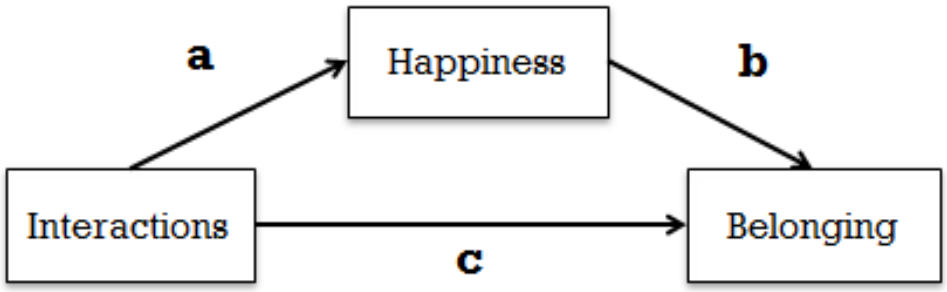

Table 31. Testing for patterns consistent with the hypothesis that happiness mediates the effect of interactions on belonging.

Study: interaction type	a: Interactions -> Happiness	b: Happiness -> Belonging	c: Interactions -> Belonging	c': Interactions, Happiness -> Belonging
2: Classroom weak	.88 (.47)+	.01 (.002)***	.08 (.03)**	.08 (.02)**
3: Daily weak	.02 (.005)**	.22 (.05)***	.002 (.003)	-.002 (.003)
3: Daily strong	.01 (.005)*	.22 (.05)***	.01 (.003)*	.01 (.003)+
4: Daily weak	-.0004 (.002)	.14 (.05)**	.002 (.001)**	.003 (.001)**
4: Daily, strong	.01 (.01)+	.14 (.05)**	.01 (.005)+	.01 (.005)

NOTE: Numbers represent unstandardized coefficients, with standard errors in brackets.
+ p < .10, * $p < .05$, ** $p < .01$, *** $p < .001$

Table 32. Indirect effects in Study 5: Bias-corrected and accelerated bootstrap analysis using the INDIRECT macro developed by Preacher and Hayes (2008), controlling for Time 1 state and trait happiness

Indirect effect	95% confidence interval
Condition -> Belonging -> Positive Affect	.03, .32
Condition -> Belonging -> Negative Affect	-.26, -.01
Condition -> Positive Affect -> Belonging	.12, .66
Condition -> Negative Affect -> Belonging	.01, .33

Table 33. Indirect effects in Study 6: Bias-corrected and accelerated bootstrap analysis using the INDIRECT macro developed by Preacher and Hayes (2008), controlling for loneliness and happiness during the lab visit

Indirect effect	95% confidence interval
Condition -> Loneliness -> Happiness composite	-.27, -.02
Condition -> Happiness Composite -> Loneliness	-.26, .002

NOTE: Condition refers to a dummy code comparing the effects of the weak tie condition to the effects of the traditional media condition. Both analyses use loneliness (reverse-scored and standardized) and happiness during the lab visit as covariates, and average loneliness over time (reverse-scored and standardized) – as the mediator in the first analysis, and as the dependent variable in the second analysis.