DO DAILY THOUGHTS ABOUT SOCIAL EXPERIENCES PROMOTE HEALTH AND WELL-BEING?

Brett C. Major

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Approved by:
Sara B. Algoe
Don H. Baucom
Barbara L. Fredrickson
B. Keith Payne
Paschal Sheeran
ABSTRACT

Brett C. Major: Do Daily Thoughts About Social Experiences Promote Health and Well-Being?
(Under the direction of Barbara L. Fredrickson)

In this seven-week experimental intervention, 121 adults participated in a randomized control trial testing whether daily reflection on social experiences has a beneficial impact on mental and physical health, and, if so, whether positivity resonance mediates this relationship. Participants were randomly assigned to one of three conditions, and received daily e-mails with questions designed to prime their attention to condition-specific topics. To prime attention to social aspects of eudaimonic well-being, participants randomly assigned to the social experience focus condition were asked to reflect on daily social interactions and rate how “close” and “in tune” they felt to the people with whom they interacted. Because socially-experienced positive emotions were speculated to drive health benefits, a second eudaimonic condition offered tighter control by focusing on equally-positive, but nonsocial, aspects of eudaimonic well-being. That is, participants assigned to the nonsocial experience focus condition were asked to reflect on daily enjoyable events they experienced alone that day and rate how “meaningful” and “rewarding” the events had been. In a neutrally-valenced control – the task focus condition – participants were asked to reflect on daily tasks and rate how “useful” and “important” those tasks had been. Resting respiratory sinus arrhythmia (RSA), illness symptoms, flourishing, and loneliness were measured at pre- and post-intervention to assess how each condition impacted health and well-being.
The overarching hypothesis that people in the social experience focus condition would report increases in positivity resonance, which would in turn promote their health and wellbeing was largely unsupported. No differences emerged between any of the conditions in positivity resonance, or in two of the four outcome variables: RSA and flourishing. In an unexpected finding, both eudaimonic interventions prompted people to engage in more discrete daily social interactions, which in turn reduced their feelings of loneliness relative to the control. In addition, the two eudaimonic wellbeing interventions prompted decreases in illness symptoms relative to the control, but only among older adults. These findings may shed light on how people can fine-tune their daily thoughts and behaviors in order to become more socially engaged in their daily lives and ultimately promote lasting changes to their wellbeing.
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INTRODUCTION

In the past two decades, research on wellbeing has become a topic of increased focus within the wider domain of mental and physical health. Though definitions vary, wellbeing is generally thought to be a combination of psychological resources, which include hedonic or subjective wellbeing (e.g., high frequencies of positive affect, low frequencies of negative affect, satisfaction with life; Diener, 2000), eudaimonic wellbeing (e.g., having purpose and meaning in life; Ryan & Deci, 2001), and social wellbeing (e.g., positive social functioning in society; Keyes, 2002). The inclusion of wellbeing as a core element of mental and physical health is well justified. Meta-analyses suggest that wellbeing is both the cause and the consequence of a variety of benefits, including relationship quality, workplace productivity, reduced depressive symptoms, reduced risk of metabolic, cardiovascular, and immune diseases, and reduced risk of mortality in people with physical illness (for meta-analytic reviews, see Chida & Steptoe, 2008 and Sin & Lyubomirsky, 2009). Further, research indicates that wellbeing is not a stable, trait-like attribute, but rather a psychological resource that can be altered in part through intentional activities (Lyubomirsky & Layous, 2013). Researchers have thus begun to explore not only how to reduce symptoms of mental and physical illness, but also how to increase wellbeing in order to promote better overall health. Though there are likely a variety of methods through which to improve health and wellbeing, such as mindfulness-based interventions (Gu, Strauss, Bond, & Cavanagh, 2015), Acceptance and Commitment Therapy (Veehof, Oskam, Schreurs, & Bohlmeijer, 2011), and
behavioral activation interventions (Mazzucchelli, Kane, & Rees, 2010), the present study postulates that enhancing the positive emotions people share with others in their social interactions may be particularly beneficial for wellbeing and health. Two relatively separate lines of research on positive emotions and interpersonal relationships, respectively, provide evidence to support this general prediction.

Quality interpersonal relationships are vitally important for good mental and physical health. Feeling a sense of belonging and social connection is a fundamental human need, and people are motivated to seek frequent and meaningful interactions with others (Baumeister & Leary, 1995). Having and maintaining quality social relationships is linked to numerous health benefits such as better immune functioning (Cohen et al., 1997; Lutgendorf et al., 2005), reduced risk of depression (Rozanski, Blumenthal, & Kaplan, 1999), and lower risk of mortality (Holt-Lunstad & Smith, 2012) to a degree comparable in magnitude to health risk factors such as obesity, cigarette smoking, and alcoholism (House, Landis, Umberson, & others, 1988). Conversely, people with real or perceived deficits in establishing and maintaining quality interpersonal relationships, who thus fail to fulfil this fundamental need to belong, tend to experience detrimental mental and physical consequences. For instance, loneliness, which refers to the discrepancy between a person’s preferred and actual social relationships (Peplau, Perlman, Peplau, & Perlman, 1982), is associated with higher risk of cardiovascular disease (Cacioppo et al., 2002), less restorative sleep (Kurina et al., 2011), and cognitive decline (Wilson et al., 2007).

In a largely separate line of work, research indicates that experiencing more frequent positive emotions has also been associated with beneficial health outcomes. According to the broaden-and-build theory (Fredrickson, 1998, 2001, 2013), positive emotions induce in
people a momentarily broadened cognitive state that enables them to consider new possibilities or engage in novel behaviors, beyond their habitual thoughts and actions. This momentarily broadened state, in turn, enables individuals to build resources (e.g., social support, resilience, etc.), which promote health and wellbeing on a more long-term scale. In support of this theory, meta-analyses (Lyubomirsky, King, & Diener, 2005; Pressman & Cohen, 2005) indicate the propensity to experience positive emotions is associated with beneficial resources, skills, and behaviors in several domains (i.e., work, love, health), such as altruism, sociability, conflict resolution skills, coping, likeability, better immune functioning, reduced risk of cardiovascular disease, and a lower risk of mortality.

Given the evident importance of both positive emotions and social interactions for health and wellbeing, it is somewhat surprising that relatively little research has considered questions about how these two constructs are intertwined (with some notable exceptions: Algoe and colleague’s research on the importance of gratitude expression, perceived responsiveness and shared laughter for relationship quality (Algoe, Fredrickson, & Gable, 2013; Algoe, Kurtz, & Hilaire, 2016; Kurtz & Algoe, 2015)). For one, are close relationships good for health, in part, because social interactions provide many opportunities for people to experience positive emotions on a momentary basis? Emotions (positive emotions in particular) are known to be more strongly felt when people are in the presence of others relative to when they are alone (McIntyre, Watson, Clark, & Cross, 1991; Pavot, Diener, & Fujita, 1990). And do positive emotions, which have primarily been studied as intra-individual experiences, have differential outcomes when they are shared between and among people within social situations? Further, if it is indeed the case that positive emotions and social interactions are best understood together, what interventions might be effective at
enhancing the positive emotions people share with others in order to promote flourishing mental health, reduce feelings of loneliness, strengthen their biological capacity for social connection and perhaps ultimately enable them to live healthier lives?

The present research seeks to address these questions using an intervention designed to boost the affective quality of one’s social experiences and subsequently drive improvements in well-being and an instrument-measured marker of health. More specifically, I propose that enhancing momentary experiences of social connection that are marked by a specific form of shared positive emotions, called positivity resonance, may be particularly influential in promoting health and well-being. Theory and empirical evidence substantiates this prediction.

**Positivity Resonance Promotes Health and Well-Being**

**Defining Positivity Resonance.** Positivity resonance theory (Fredrickson, 2016) suggests a particular form of positive emotions experienced within social interactions, called positivity resonance, may be especially powerful for promoting mental and physical health. Positivity resonance is a momentary experience that occurs when two or more people have an interpersonal connection characterized by three features: shared positive affect, mutual care and concern, and biobehavioral synchrony (Fredrickson, 2013b, 2013a, 2016). Though interpersonal connections have long been known to forecast health and wellbeing (Holt-Lunstad & Smith, 2012), Fredrickson (2016) postulates that the intertwined experiences of shared positive affect, mutual care and concern, and biobehavioral synchrony function to momentarily elevate the quality of interpersonal connections, which over time accumulates to have lasting impact on individuals’ health and wellbeing to an extent greater than positive emotions experienced alone or interpersonal connections lacking these key features. Given
the vast benefits of positive emotions and social interactions more generally, the prediction that positivity resonance may have even more powerful effects is a bold one. However, empirical research on shared positive affect, mutual care and concern, and biobehavioral synchrony provides evidence for how each of these features elevate the quality of positive social connections to a degree that merits this bold postulation.

**Shared positive affect.** Shared positive affect refers to any element of pleasant subjective experience that is jointly or co-experienced across two or more people. Positive affect has long been known to promote health and wellbeing (Fredrickson et al, 2008; Kok et al., 2013; Sin & Lyubomirsky, 2009), yet recent research has suggested that when positive affect is co-experienced with others, the effects may be even more powerful than positive affect experienced alone. In particular, shared positive emotions play an important role in promoting social bonding and social engagement in people. Shared smiles help people to better understand social situations and the emotions of others (Niedenthal, Mermillod, Maringer, & Hess, 2010) and shared laughter, more than solo laughter, is linked to higher relationship quality, closeness and social support in couples (Kurtz & Algoe, 2015). Research on capitalization indicates that disclosing news of a positive event with others can amplify positive affect, increase life satisfaction, and make the event more memorable. Further, when a shared positive event is met with active and constructive responses by the other (e.g., with enthusiasm and genuine concern), the discloser experiences increases in positive affect and life satisfaction above and beyond the effects of sharing the event itself (Gable & Reis, 2010).

**Mutual care and concern.** Mutual care and concern refers to the extent to which each person is momentarily invested in the well-being of the other(s). Mutual care and concern is
important in quality relationships because the feeling of being known or respected confirms one another’s worth and sense of competence (Dutton & Heaphy, 2003), making interaction partners less likely to feel judged or monitored and more willing to offer their viewpoints without fear of harming their image (Carmeli, Brueller, & Dutton, 2009; Edmundson, 2004). In a study assessing four different types of “love” relationships (i.e., romantic, parental, friendship, altruistic), being invested in the wellbeing of the other was reported to be the single characteristic most universally endorsed as essential to love relationships, across all four relationship types (Hegi & Bergner, 2010). Perceiving such genuine investment and responsiveness has been found to be a hallmark of closeness and intimacy (Reis, Clark & Holmes, 2004). Thus, in a moment of positivity resonance, feelings of mutual care and concern may be a key ingredient for enhancing the quality of one’s social connections and facilitating the growth of long-term social resources, like social bonds.

**Biobehavioral synchrony.** Biobehavioral synchrony refers to the extent to which peoples’ nonverbal behaviors, biochemistries and neural firings share the same tempo. Within interpersonal connections, biobehavioral synchrony facilitates a number of important psychosocial consequences by generating a particular emotional dynamic between those interacting. For instance, synchronized body movements have been found to facilitate embodied rapport (Vacharkulksemsuk & Fredrickson, 2012), compassion and altruistic behaviors (Valdesolo & DeSteno, 2011), emotional support satisfaction (Jones and Wirtz, 2007), and affiliation (Hove & Risen, 2009). Behavioral mimicry of postures, gestures, mannerisms and other motor movements is known to be associated with social consequences such as increased liking, empathy, interpersonal closeness, trust, and accuracy in perceiving and understanding the emotions of others (see Chartrand and Larkin, 2013 for review). In
addition, physiological synchrony has been linked to social bonding (see Feldman, 2015 for review) and relationship quality (Helm, Sbarra, & Ferrer, 2014), and neural synchrony has been implicated in interpersonal understanding (Stephens, Silbert, & Hasson, 2010). Thus, biobehavioral synchrony is a key ingredient for enhancing social affiliative behaviors conducive for high quality interpersonal connections.

**Theorized preconditions.** An important precondition for positivity resonance is theorized to be a mutual feeling of safety. Over evolutionary time, the human brain has been trained to respond to threats with narrow and specific thoughts and behaviors geared toward solving an evolutionary problem (Tooby & Cosmides, 1990). This type of narrowed, problem-solving mentality is not conducive to the broadened, affiliative state necessary for cultivating positivity resonance. Therefore, if an individual perceives a context to be unsafe or threatening, positivity resonance will not emerge.

A second precondition for positivity resonance is theorized to be real-time sensory connection (Fredrickson, 2016). Real-time temporal and sensory connection creates opportunities for positivity resonance to emerge through physical touches, eye contact, shared voice and/or mirrored facial expressions and body movements. Research supports this reasoning. For one, eye contact is important for facial mimicry to occur (Schrammell, Pannasch, Graupner, Mojzisch, & Velichkovsky, 2009), and for feelings to be shared (Niedenthal et al., 2010). Further, research and theory suggest that high quality interpersonal connections are characterized by shared behaviors that occur in real-time, like caring touch (Holt-Lundstad, Birmingham & Light, 2008), mirrored emotional expressions (Lakin, Jefferis, Cheng, & Chartrand, 2003), or shared laughter (Kurtz & Algoe, 2015). Without this sensory and temporal connection, attentive eye-contact cannot be made, smiles do not get
reflected back, and a caring pat on the shoulder cannot be offered or reciprocated, thus reducing opportunities to amplify a quality social connection.

**Theorized implications.** In keeping with the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001, 2013), positivity resonance is thought to have both momentary and long-term effects. At the momentary level, positive emotions evoked by positivity resonance are predicted to broaden the mindsets of interaction partners, momentarily enhancing feelings of empathy, interpersonal understanding, togetherness, and social closeness. Over time, these momentary experiences of positive emotions are posited to compound to enable people to build enduring personal resources – like mindfulness, environmental mastery, social bonds, and improved capacity for social engagement (as measured by cardiac vagal tone) – that may benefit long-term health and wellbeing (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Kok et al., 2013). These built resources then enable more frequent experiences of positive emotions in the future, thus creating an upward spiral of positive emotion (Fredrickson & Cohn, 2008). For instance, mindfulness enables people to be more mindful of positive circumstances, environmental mastery yields positive emotions as the result of feeling competent and empowered, and social bonds create opportunities to share good news or laugh with a friend.

Expanding on the broaden and build theory, a key proposition in the positivity resonance theory is that positivity resonance – more so than positive emotions experienced alone, or in the absence of mutual care and concern and biobehavioral synchrony – is predicted to be particularly influential in promoting health and wellbeing. I propose several reasons why this bold prediction is merited. First, whereas generalized positive emotions are known to promote interpersonal broadening with close others and acquaintances (i.e.,
increasing trust and feelings of oneness; Dunn & Schweitzer, 2003; Waugh & Fredrickson, 2006), positivity resonance may broaden in a more expansive way, by extending the boundaries of interpersonal broadening to include others beyond those within one’s immediate social network. Recent research indicates that inducing the emotion love – a closely related construct to positivity resonance defined as feelings of warmth and affection toward close platonic others – increases prosocial behaviors that help distant others (e.g., donations to refugees or international organizations), whereas other specific positive emotions (e.g., hope, pride, compassion) only increase prosocial behaviors that help close others (Cavanaugh, Bettman, & Luce, 2015). Second, unlike positive emotions experienced alone, a moment of positivity resonance can be prolonged and/or intensified through the contagious effects of positive emotions: voiced (i.e., fully vocalized) laughter, for instance, is known to elicit positive affect in others relative to un-voiced laughter (Bachorowski & Owren, 2001, 2003), and hearing Duchenne laughter is known to be an effective stimulus for evoking laughter in others (Provine, 1992). Third, when a moment of positivity resonance occurs, shared positive emotions, biobehavioral synchrony, and mutual care and concern are each thought to reciprocally enhance one another, further prolonging and intensifying the experience of positive affect in that moment. Consistent with this postulation, a recent study of married couples discussing an area of conflict indicated that physiological synchrony (i.e., averaged between-spouse correlations of physiology across moving 30-second windows) was significantly greater during 30-second windows centered around moments of shared positive affect (as coded by the Specific Affect Coding System) relative to moments of shared negative, shared neutral, or unmatched affect (Chen, Brown, Rothwell, Fredrickson & Levenson, in prep). Further, research indicates that felt understanding – a construct closely
related to mutual care and concern, defined as the feeling of being understood, appreciated and cared for – is known to elevate positive affect (Oishi, Koo, & Akimoto, 2008) and foster satisfying relationships (see Oishi, Krochik, & Akimoto, 2010 for review). Research also indicates that behavioral synchrony or mimicry is both the cause and effect of shared affect, affiliation, and increased liking (for review, see Chartrand & Lakin, 2013). Combined, these findings suggest that positivity resonance may create a self-sustaining upward dynamic between and among shared positive emotions, biobehavioral synchrony, and mutual care and concern.

A related theory that is compatible with positivity resonance is the polyvagal theory (Porges, 1995, 2001, 2007), which describes a biological pathway that might explain why positivity resonance is so powerful in promoting health and wellbeing. Porges has proposed that the myelinated vagus nerve – a primary component of the parasympathetic branch of the autonomic nervous system – as a central feature of the social engagement system. Cardiac vagal tone (CVT) represents an index of the vagus nerve, which functions to slow the heart and is thought to produce calm states that encourage social engagement and bonding with others. In particular, the social engagement system promotes affiliative functions such as head gestures, coordinating eye gaze, tuning the ear to the frequency of the human voice, and smiling (Porges, 2007). Notably, CVT cannot be directly measured and thus, it is commonly indexed by respiratory sinus arrhythmia (RSA), which is a non-invasive measure that quantifies the degree of vagal control over the heart, characterized by increases in heart rate during inspiration and decreases in heart rate during expiration (Berntson et al., 1997). Consistent with the polyvagal theory, research indicates that vagal activation (as measured by RSA) is greater among people who are in the presence of supportive, relative to ambivalent,
friendships (Holt-Lunstad, Uchino, Smith, & Hicks, 2007) and greater CVT is associated with social closeness (Kok & Fredrickson, 2010), and prosocial behavior (Kogan et al., 2014). But CVT is not just a marker of biological capacity for connection, it is also an objective maker of health. CVT (as measured by RSA) is an index of superior immune and heart functioning, better physiological regulation of glucose, and a predictor of increased likelihood of recovery following myocardial infarction (Thayer & Sternberg, 2006). In addition, recent research indicates that CVT is not just an stable trait-like resource, but also something that can be altered as a result of frequent positive social experiences (Kok et al., 2013). Over time, through the process of experience-dependent neural plasticity (Garland et al., 2010), repeated experiences of positive social connection might function to strengthen the vagus and thus strengthen a person’s physical health and biological capacity for social engagement. Further, as this capacity for social engagement increases, people may also experience more positive social connections, thus creating a self-sustaining upward spiral.

Existing Evidence Linking Positivity Resonance to Health and Wellbeing.

Consistent with theorizing about positivity resonance, several recent studies provide initial support for the claim that positivity resonance is indeed uniquely associated with health and wellbeing. The first line of evidence explores the effects of positivity resonance on health using the newly developed positivity resonance measure (PRM) by Major et. al (under review), designed to be used within episode-level data. Using the PRM embedded within the Day Reconstruction Method in a correlational study of 106 mid-life Amazon Mturkers, Major et. al., (under review) found initial construct and predictive validity for the new scale. Consistent with the claim that positivity resonance is in part the positive emotions experienced with others—positivity resonance was more closely associated with pleasant
emotions experienced in social contexts relative to those experienced in nonsocial contexts. Consistent with the proposition that real-time sensory connection is a precondition for positivity resonance, positivity resonance was greater when episodes involved more face-to-face time, whereas more time spent connecting remotely was unrelated to or negatively associated with positivity resonance. Also consistent with theory, positivity resonance was correlated with multiple measures of wellbeing, specifically, greater levels of flourishing, lower levels of loneliness, and fewer illness symptoms. To confirm the unique role of positivity resonance in predicting these wellbeing outcomes, analyses revealed that even when controlling for the overall proportion of time a person spent in social interactions, positivity resonance was still significantly associated with higher flourishing and lower loneliness. Further, even when controlling for a person’s overall pleasant emotions, positivity resonance was still significantly associated with flourishing and fewer illness symptoms.

Although these findings are correlational and cannot indicate causality, they suggest that even though social integration and positive emotions have independently been found to promote wellbeing, it is possible that the benefits of social integration on health and wellbeing may be particularly powerful when social connections are marked by positivity resonance. Likewise, the benefits of positive emotions on health and wellbeing may be particularly powerful when positive emotions are shared in the company of people who are “in synch” and who care about one another.

Another study assessed the relationship between positivity resonance and health and wellbeing using a proxy measure of positivity resonance (Kok & Fredrickson, 2010). In this study, 73 participants provided daily reports of their positive emotions and perceived positive social connections for nine weeks. Perceived positive social connections – a proxy measure
for positivity resonance – was captured by asking participants to think about three social interactions they had engaged in that day and rate how “in tune” and “close” they’d felt to the people with whom they had interacted. Cardiac vagal tone (CVT) – a trait-like physiological indicator of physical health, autonomic regulation, and capacity for social engagement (Porges, 2007; Thayer & Sternberg, 2006) – was assessed at an initial lab session, and again nine weeks later. Results indicated that asking participants to reflect on their positive social connections may have had consequential effects on health by providing daily opportunities for personal reflection. In particular, when people were given the opportunity to reflect on their social connections, higher levels of initial CVT were associated with greater gains in perceptions of social connections and positive emotions over the course of the study. Additionally, these same increases in perceptions of social connections and positive emotions were associated with increases in CVT, independent of initial levels of CVT. Although correlational, these findings suggest that opportunities to reflect on social connections can have consequential effects on health. These findings also suggest that positive emotions, perceptions of social connectedness (positivity resonance), and health may reciprocally influence each other.

**Methods for enhancing positivity resonance.** These studies provide initial evidence that positivity resonance has important associations with health and wellbeing. Therefore, it may be important to uncover methods through which people might enhance positivity resonance in their social connections in order to promote subsequent benefits to health and wellbeing.

Research suggests that one way people can enhance the quality of their social connections and subsequent wellbeing, is by increasing their intention to make brief positive
social connections with others. In a follow-up to their initial study of positivity resonance, Major, et al., (under review) manipulated positivity resonance among 98 university students via a two-week micro-intervention in which participants randomly assigned to the experimental condition were asked to cultivate moments of positive social connection with people (e.g., share a smile or high-five to celebrate a shared triumph with a friend). Participants randomly assigned to the control condition were asked to cultivate moments of mindful thought alone (e.g., take a moment to notice a personal accomplishment by being mindful of the present moment). At the end of the two-week intervention, participants in the experimental condition reported greater flourishing and lower degrees of loneliness compared to the mindful condition. Further, this effect was accounted for by higher levels of positivity resonance among those in the experimental condition. These findings suggest that positivity resonance in the form of subtle social connections, like a smile or a high-five, may have meaningful implications for health and well-being.

These initial findings regarding positivity resonance are an exciting first step in discovering how people might effectively enhance positivity resonance in ways that promote their wellbeing. The present study also tests an intervention through which to improve peoples’ experiences of positivity resonance. However, the present study seeks to enhance positivity resonance by asking people to engage in meaningful daily reflection on positive aspects of their social experiences. The way people think about their circumstances and experiences can have important implications for their day-to-day emotions, and more generally, their health and wellbeing. For example, reflective techniques such as gratitude writing, counting daily ‘blessings’, or reflecting on personal strengths have been linked to numerous health benefits (see Sin & Lyubomirsky, 2009 for meta-analytic review). In the
present study, I postulate that daily thoughts about positive aspects of social connection might promote health and wellbeing. The following section highlights empirical support for this prediction, and addresses why positivity resonance may be the mechanism through which these effects occur.

**Meaningful Daily Reflection on Social Experiences Promotes Health**

Loving kindness meditation (LKM), a contemplative practice in which individuals reflect on feelings of love and compassion toward the self and others, is one technique through which thoughts about social experiences are known to promote health. In a recent study, Kok and colleagues (2013) used LKM as a tool for enabling individuals to not only self-generate positive emotions, but positive emotions that were directed, at least in part, toward other people in their social world\(^1\). Participants who were randomly assigned to the experimental condition were asked practice LKM at home, whereas participants in the monitoring wait-list control condition provided all the same assessments as the LKM group, but would receive LKM instruction after the study concluded. Then, for nine weeks, all participants provided daily reports of their positive emotions and perceived positive social connections (i.e., think about three social interactions they had engaged in that day and rate how “in tune” and “close” they’d felt to the people with whom they had interacted). CVT was assessed before and after the nine-week intervention. Results indicated that participants who were randomly assigned to self-generate positive emotions using LKM reported

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\(^1\) Though the Kok et al. (2013) study and the Kok and Fredrickson (2010; described above) report different findings, the findings are conceptually related and both use the same dataset. The Kok et al. (2013) study tested the experimental effects of the LKM intervention, whereas the Kok and Fredrickson (2010) study looked at the effects of individual differences across all participants while controlling for experimental condition.
increases in positive emotions relative to individuals in a wait list control. This effect was moderated by CVT, such that individuals with higher CVT were able to self-generate more positive emotions. These self-generated positive emotions, in turn, produced increases in perceptions of positive social connections, which was associated with increased CVT. Thus, these findings demonstrate that peoples’ perceptions of social connections (positivity resonance) may account for the causal link between positive emotions and improvements in physical health (i.e., increases in CVT). These findings also suggest that CVT – a physiological indicator of health and capacity for social engagement – may promote health and wellbeing by enabling people to capitalize on daily social and emotional experiences.

In a follow-up study of 41 adults, Kok (2012) developed an experiment to test the causal effects of thoughts about social closeness (a proxy measure of positivity resonance) on health. That is, every day for eight weeks, participants randomly assigned to the social experience focus condition were asked the same questions about perceived social connections as in the earlier work by Kok and colleagues. Participants randomly assigned to the task focus condition, by contrast, were asked to think about three tasks they had engaged in that day and rate how “useful” and “important” those tasks had been for them. Participants also reported their daily positive and negative emotions. Results indicated that relative to the task focus condition, participants who thought about their daily social interactions experienced increases in daily positive affect over time, which in turn led to improvements in CVT; however, the relationship between experimental condition and increases in CVT over time was only marginally statistically significant. Though the effect of daily thoughts about social experiences on CVT was only marginal and should be interpreted cautiously, these
findings suggest that perhaps even an intervention as subtle as prompting people to reflect on their interpersonal experiences may influence physiological markers of health.

One common theme from these studies is that positive emotions that are at least partly derived from thoughts about the social world (i.e., LKM or daily reflection about social experiences) are associated with better health outcomes, as measured by CVT. However, these findings also raise numerous questions, many of which are questions the present research seeks to address. For one, in Kok’s (2012) study, the effect of daily thoughts on social experiences only marginally predicted changes in CVT. Given the small sample size (N = 41), it’s vital to attempt replication. To the extent that this effect replicates, and daily thoughts about social experiences improve CVT, what are the mechanisms through which this effect occurs? Do daily thoughts about social experiences subtly motivate individuals to change their social behaviors, inspiring them to develop more or higher-quality social interactions? Or does it prompt people to re-frame their perceptions, enabling them to experience their existing social interactions more positively? Or is it both? The present work seeks the answers to these questions to uncover new information about how people can fine-tune their perceptions and behaviors towards others to enrich their social interactions that, in turn, might promote their physical health.

The Present Research

The goal of this study is to test whether and how regular reflection on social experiences has a beneficial impact on mental and physical health. In particular, I test whether positivity resonance mediates the relationship between regular reflection on social experiences and improved mental and physical health. In this longitudinal experiment, 121 adults participated in a randomized control trial that compared changes in health and well-
being over a seven-week intervention (Figure 1). The present study replicates the social experience focus and task focus conditions from Kok’s (2012) recent work, but also expands on that initial study design in several ways.

First, a new, more rigorous control condition was added to test an alternative explanation to the findings. In the original study, participants in the task focus condition were asked to rate how useful and important the tasks were to them, a manipulation that primed attention to the outcomes of the tasks and did not increase positive emotions over time. Participants in the social experience focus condition were asked to rate how in tune and close they felt during their social interactions, which primed attention social aspects of eudaimonic wellbeing (i.e., experiences of connection) and resulted in relative increases in positive emotions. This leaves open the possibility that any type of eudaimonic intervention that evokes increases in positive emotions might also lead to the hypothesized outcomes. Because positive emotions experienced as the result of eudaimonic social experiences are speculated to drive health benefits, the present study included an additional control condition intended to evoke similar levels of eudaimonic positive emotions, but not as the result of social experiences. In this added nonsocial eudaimonic control condition, called the non-social experience focus condition, participants were asked to think about three enjoyable events they experienced alone and rate how “meaningful” and “rewarding” they were to them. By adding this additional condition, it will be possible to test the alternative explanation that positive emotions that result from daily thoughts about any eudaimonic experience will lead to the same health benefits as do daily thoughts about eudaimonic social experiences.

Second, a slight modification was made to the wording of the task focus condition. In its original form, the question left open the possibility that an individual could consider a task
that they completed with the help of others, thus making an unclear distinction as to whether outcomes might be attributable to social versus non-social thoughts. In the present study, the question in the task-condition was expanded so that participants were instructed to think of “three tasks they engaged in alone.”

Third, in addition to the attempt to replicate Kok’s (2012) findings, particularly the marginal effect of experimental condition on CVT, I also sought to measure additional mechanisms and outcome variables. In particular, I test additional theory-driven health and well-being outcomes (i.e., illness symptoms, flourishing, loneliness) that I expected, based on past evidence (Major, Lundberg, & Fredrickson, under review) might be beneficially influenced by daily thoughts about social experiences.

Fourth, this study also tests whether positivity resonance – as assessed across all discrete social interactions a person engages in on a typical day – is a mechanism through which thinking about social interactions promotes improvements in physical and psychological health. To this end, I used the Positivity Resonance Measure (PRM; Major et al., under review) to assess the extent to which a person’s social interactions were characterized by shared positive emotions, mutual care and concern, and biobehavioral synchrony. A number of the PRM’s features highlight the strengths of the present study in measuring positive social connections, relative to existing research. For instance, the PRM assesses not only a person’s internal affective experiences, but also their perception of the degree to which this affective experience was shared by the interaction partner(s). This is advantageous compared to many existing scales, which often focus only on intrapersonal affect. Further, the PRM has a number of additional advantages, relative to existing measures, because it is administered in episode-level assessments (in this case, across
numerous episodes spanning an entire day, as measured by the Day Reconstruction Method). First, by using episode level assessments, the PRM offers a temporal resolution appropriate for capturing the specific behaviors and emotions that describe specific interpersonal interactions, which are the building blocks of meaningful relationships (Algoe et al., 2016).

Second, because people’s experiences of positivity resonance are likely to vary from one interpersonal connection to the next, positivity resonance may be best represented when assessed across numerous episodes. Third, assessing positivity resonance at the episode level minimizes reporting biases: Cueing people to think about the particulars of a recent episode helps them to report more accurately on that episode, compared to relying on their own implicit generalizations about themselves across all situations (Robinson & Clore, 2002), as is the case with global self-reports (e.g., think about your social connections in general). A fourth advantage is that participants are cued to a set of episodes prior to administering the PRM, making it less likely that they would inadvertently focus only on interactions that are most memorable or prototypic, which itself would introduce bias.

Lastly, if positivity resonance is indeed found to be a mediator of the relationship between experimental condition and improvements in health and wellbeing, I also included several exploratory measures to better understand additional processes that might offer clues for how positivity resonance works. In line with the broaden and build theory, I included a social support variable to assess whether more supportive social bonds are a resource built by positivity resonance. I also explored whether positivity resonance functions via processes related to the social engagement system (Porges, 2007) as described above. Theory and empirical research link the social engagement system to a person’s ability to recognize and respond to social cues: people with higher CVT are more accurate in identifying the emotions
of others (Quintana, Guastella, Outhred, Hickie, & Kemp, 2012). Given that the ability to recognize and interpret subtle facial cues and emotional expressions is important for responding appropriately in social situations (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001; Bora, Eryavuz, Kayahan, Sungu, & Veznedaroglu, 2006) as well as sharing affective states, especially when eye contact is made (Niedenthal et al., 2010), I expect that this ability may also facilitate positivity resonance. To this end, I included the Reading the Mind in the Eyes Task (RMET) to assess whether individuals who think about daily social experiences demonstrate an enhanced ability to infer emotional states in others. Additionally, greater attention to social relative to non-social stimuli has been positively linked to vagal tone (Kok, 2012). Given that social interactions are generally perceived to be positive (Catalino, Algoe, & Fredrickson, 2014; McIntyre et al., 1991), this preference toward social stimuli could facilitate positivity resonance and social bonding by drawing people’s attention to potential opportunities for positive social connection. Therefore, I included a measure of implicit attention to social stimuli. Lastly, I was also interested in whether certain trait-level characteristics (i.e., extraversion) or resources (i.e., higher resting RSA, tendency to prioritize positive experiences) might moderate any observed effects.

**Primary hypotheses.** Because positive emotions that result from social experiences are theorized to be particularly important for promoting health and well-being, I predicted that even though the two eudaimonic interventions might evoke similar levels of positive emotions, only daily thoughts about social experiences would promote positivity resonance. I expected that increases in this particular type of positive emotions – positivity resonance – would in turn drive improvements in mental and physical health. I unpack this general prediction into the following three specific hypotheses:
Hypothesis 1: Participants in the social experience focus condition, relative to individuals in the nonsocial experience focus condition and task focus condition, would exhibit greater improvements in health and well-being from pre- to post-intervention as indexed by increases in RSA and flourishing, and decreases in loneliness and illness symptoms.

Hypothesis 2: Participants in the social experience focus condition, relative to individuals in the nonsocial experience focus condition and task focus condition, would exhibit greater positivity resonance in their social interactions.

Hypothesis 3: Condition-related improvements in health and well-being would be mediated by greater positivity resonance among individuals in the social experience focus condition, relative to the nonsocial experience focus condition and task focus condition.

Competing hypotheses. I also tested several competing hypotheses: that the hypothesized effects of experimental condition on health and well-being might also be mediated by: 1) pleasant emotions or 2) increased duration of time spent in social interactions and/or 3) increased frequency of social interactions.

In the case of the first competing hypothesis, Kok (2012) found that differences in pleasant emotions between the social experience focus condition and the task focus condition accounted for improvements in health and well-being for the social experience focus condition. If pleasant emotions are the driver of improvements in health and well-being, one hypothesis to explain this pattern is that condition-related improvements in health and well-being would be mediated by greater pleasant emotions.
Another competing hypothesis is that condition-specific improvements to health and wellbeing occur not because having daily thoughts about social interactions inspires people to improve the quality (i.e., positivity resonance) of their social connections but rather because it inspires them to develop new social connections or spend more time within their existing network of social connections. If this is the case, I might expect that condition-related improvements in health and wellbeing would be mediated by a) greater frequency of social interactions or b) longer duration of social interactions.

If it turns out that – in addition to positivity resonance – any of these competing variables (i.e., pleasant emotions, social interaction frequency, social interaction duration) are also significant mediators of the effect of experimental condition on health and wellbeing, I will enter both positivity resonance and the competing variable(s) into the model as simultaneous mediators to determine to unique contribution of each. Given the past research (Major et al., under review) highlighting the unique role of positivity resonance in predicting health and wellbeing, I expect that positivity resonance would emerge as the sole significant mediator of any condition-related improvements in health and wellbeing that emerge.

**Exploratory hypotheses: Processes associated with positivity resonance.** To provide a more complete understanding of positivity resonance, I also tested several exploratory hypotheses that might provide clues about how positivity resonance works. If my third hypothesis is supported and thoughts about daily social experiences boost positivity resonance, there are several possibilities that might explain the processes associated with increases in positivity resonance. One possibility is that thinking about social interactions on a daily basis boosts positivity resonance by reframing people’s
social perceptions, enabling them to be more socially engaged during their social
connections. More specifically, I tested whether daily thoughts about social interactions
might also be associated with a) greater implicit attention toward social stimuli or b)
greater skill in interpreting subtle social cues in the facial expressions of others or c)
greater perceptions of social support. Another possibility is that existing resources might
moderate the hypothesized effects. That is, thinking about daily social experiences boost
positivity resonance, but only for people who are extraverted, have higher resting levels
of RSA, or make it a priority to experience positivity in their daily life.
METHOD

Participants

Participants were recruited from an employee list-serve at the University of North Carolina at Chapel Hill. Recruitment materials referred to the benefits of daily reflection on increasing well-being and reducing stress, but did not specifically mention specific types of daily reflection. To qualify for the study, participants had to be at least 18 years of age, fluent in written and spoken English, able to access the internet on a daily basis, and not currently enrolled in school as an undergraduate. Each participant received monetary compensation. They received $30 for completing the pre-intervention surveys and the initial lab visit, $30 for completing the DRM survey and the post-intervention lab visit, and $20 for completing the post-intervention surveys. A $20 bonus was awarded to 157 participants with reasonably complete data sets (i.e., participants who completed all three surveys, both lab visits, and at least 80% of their daily reports). In addition, for each daily report submitted, participants received an entry to a drawing to win one of eight $50 gift cards. Total possible compensation for the study was $150.

One hundred and eighty-one adults consented for the study. However, a technical problem during the data collection resulted in a failure to randomize 49 participants over a two-week period. These 49 participants were excluded from primary analyses\(^2\) to avoid

\(^2\) I did, however, included these additional 49 participants in a series of analyses, reported below, that collapsed across conditions in an attempt to replicate correlational findings from prior research (Major et al., under review).
cohort/period effects which could have had an undue influence on one condition, thus making it impossible to separate effects attributable to the experimental intervention from situational events that occurred during those two weeks that were experienced by only one condition (e.g., snowstorms). Prior to data analysis, two participants were removed who informed researchers about significant life-changes midway through the study that may have substantially influenced their health and mood (i.e., hospitalization for depression and suicidal thinking). Because the intervention was delivered via daily reports, seven participants were removed ($n_{social} = 1$, $n_{nonsocial} = 3$, $n_{task} = 3$) who completed less than 66% of the daily reports and thus, in my judgement, did not receive adequate exposure to the intervention. Thus, a total of 123 participants ($43 = social$ experience focus condition, $39 = nonsocial$ experience focus condition, $41 = task$ focus condition) were included in the analysis sample (84 female, $M_{age} = 40.75$, $SD = 14.03$, Range: 22-82). Two participants dropped out of the study prior to their second lab visit. Thus, the sample size is 121 for any analyses that include variables measured during or after the second lab visit. Table 1 displays sample characteristics and demographics by broken down by condition. No significant differences in demographics (e.g., age, gender, ethnicity, employment status) emerged between condition.

**Daily Reports and Experimental Intervention**

**Daily reports.** To assess daily emotions, participants completed the modified Differential Emotions Scale (mDES; Fredrickson, 2013a; Fredrickson, Tugade, Waugh, & Larkin, 2003) each day. Immediately before their condition-specific questions, participants rated the greatest amount they had experienced 20 different emotions in the past 24 hours on

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3 The results in the current paper do not change when these participants are included.
a scale from 0 (not at all) to 4 (extremely). Composite positive emotion scores were composed of amusement, awe, gratitude, hope, inspiration, interest, joy, love, pride, and serenity. The mean positive emotion composite score was 1.83 ($SD = 0.60$; Range: 0.57 – 3.76) and the Cronbach’s alpha coefficient in this sample was .89. Composite negative emotion scores were composed of anger, boredom, contempt, disgust, embarrassment, fear, guilt, hate, sadness, and shame. The mean negative emotion composite score was 0.59 ($SD = 0.41$; Range: 0.02 – 2.75) and the Cronbach’s alpha coefficient in this sample was .87.

The daily reports deviated slightly from the Kok (2012) study by administering an illness symptom survey (Elliot & Sheldon, 1998) after the mDES, before the daily condition-specific value judgements. This survey assessed the frequency with which participants experienced 9 common symptoms of illness (e.g., headaches, coughing or sore throat, etc) each day. The illness symptom survey was included to address questions outside the scope of this study, therefore these data were not analyzed for the current paper.

**Daily condition-specific value judgements.** Participants assigned to the social experience focus condition received a daily email with items identical to those used by Kok and Fredrickson (2010; Kok, 2012). That is, participants were asked to list the three longest social interactions they had engaged in over the last 24 hours. They were then asked to consider these three social interactions in aggregate and rate them using two items adapted from Russell’s (1996) UCLA Loneliness scale (i.e., “I felt ‘in tune’ with the person/s around me” and “I felt close with the person/s around me”) on a scale from on a scale from 1 (not at all) to 7 (very much so). One strength of using questions such as these to prime participants with thoughts about positive social connection is that content of these reflections varied along with their daily experiences, thus making the manipulation less susceptible habituation
than other common social connection manipulations (e.g., listing the names of close relationship partners; Mikulincer, Shaver, & Rom, 2011). Because of the open-ended nature of these daily reflections it is certainly possible that some unpleasant social connections could occur, however, prior research indicates that in nonclinical samples, social interactions in daily life are largely pleasant (Catalino et al., 2014; McIntyre et al., 1991). Averaged across the two items, the mean “close and in-tune” score for people in this condition was 6.07 (SE = 0.33; Range: 3.02 – 6.88) on the 7-point scale.

The nonsocial experience focus condition was newly developed for this study to parse positive affect from social attention. The nonsocial experience focus condition was designed to match the social experience focus condition in valence (i.e., prompting participants to reflect on positive aspects of their day), eudaimonia (i.e., daily reflections were targeted on experiences likely to bring purpose and meaning to life), and structure (i.e., asking participants to make a value judgment about those aspects of their day) but to target nonsocial daily events instead of social interactions. Participants were asked to list the three longest enjoyable events they had engaged in alone over the last 24 hours. They were then asked to consider these three enjoyable events in aggregate and rate them using two items (i.e., “I felt the events were meaningful” and “I felt the events were rewarding”) on a scale from on a scale from 1 (not at all) to 7 (very much so). Averaged across the two items, the mean “meaningful and rewarding” score for people in this condition was 6.04 (SE = 0.48; Range: 1.16 – 6.95) on the 7-point scale.

The task focus was a slightly modified version of the instructions in the Kok (2012) study. Using the same structure as the other two conditions, the task focus matched the nonsocial experience focus condition by asking participants to reflect on events they
experienced alone, but deviated from the other two conditions in that it has no direct or implied focus on affective experience and therefore might be more affectively neutral.

Participants were asked to list the three longest tasks they had engaged in alone over the last 24 hours. They were then asked to consider the three tasks in aggregate and rate them using two items (i.e., “I felt the tasks were useful” and “I felt the tasks were important”) on a scale from 1 (not at all) to 7 (very much so). Averaged across the two items, the mean “useful and important” score for people in this condition was 5.05 ($SE = 0.15$; Range: 2.82 – 7.00) on the 7-point scale.

**Day Reconstruction Method**

The Day Reconstruction Method (DRM) was used to collect detailed episode-by-episode accounts of behavioral and emotional experiences across an entire day. Participants were told they would be completing an “online survey” on a scheduled date, but researchers were purposely vague about the specific content the online survey would contain. This detail is important because it eliminates the possibility that a participant might behave differently if they knew they would later be asked questions about their day. Using the DRM, participants were asked think about the previous day as if it were a continuous series of scenes or episodes starting from the time they woke up until the time they went to bed. For each episode they recorded, participants provided a name for the episode, its duration, and a brief description to remind themselves how they felt. After identifying each episode of their day, participants next reconsidered each episode in turn and provided information about their social interactions and emotions within each. For each episode, participants were asked “During this episode, were you interacting with anyone for more than a few minutes (including by phone, text messaging, e-mail, social media, etc.)?” For episodes containing an
interaction, participants were then asked to indicate the proportion of time within that episode (from 0 to 100 percent) they spent interacting: *face-to-face, phone/video-media, mediated communication* (e.g., *e-mail, texting, etc.*), or *not interacting*.

**Duration of social interaction.** Within each episode, the proportion of time spent interacting (either face-to-face, phone/video-media, or mediated communication) was multiplied by the duration of the episode to create an episode-level duration of social interaction score. Person-level duration of social interaction was computed by summing the episode-level duration of social interaction scores across all episodes and dividing by the total duration of the day\(^4\). Thus, the duration of social interaction score for each participant is more precisely interpreted as the proportion of their day spent interacting.

**Frequency of social interaction.** To measure the frequency of social interaction, I summed the number of episodes that were reported to contain an interaction (including by phone, text messaging, e-mail, social media, etc.).

**Self-Reported Pleasant and Unpleasant Emotions.** For each episode, participants separately rated their pleasant and unpleasant emotion for each episode ("indicate the greatest amount that you experienced [pleasant/unpleasant emotions] during this episode?") using a 5-point Likert scale ranging from 1 (*Not at all*) to 5 (*Extremely*). These 1-item responses were used to assess pleasant and unpleasant emotions at the episode level.

Pleasant and unpleasant emotions were assessed at the person level as well, given that dependent variables were also measured at the person-level. That is, pleasant/unpleasant emotions scores were aggregated across all episodes to create two person-level variables:

\(^4\) I chose to divided by the total duration of the day to account for differences between people in the duration of day. Additionally, by my judgement, the proportion of the day spent interacting is easier to interpret.
pleasant emotions – full day aggregate and unpleasant emotions – full day aggregate. These two variables captured the average pleasant and unpleasant emotional experience of an individual across all episodes of an entire day.

**Positivity resonance.** To measure positivity resonance, participants completed the positivity resonance measure (PRM) designed by Major, Lundberg & Fredrickson (under review). Within any episode containing an interaction, participants indicated the proportion of time during the episode (from 0 to 100 percent) they had experiences described within each of the seven items (Table 2). Episode level positivity resonance was computed as the mean of the seven items. However, I was mainly interested in positivity resonance at the person level, given that dependent variables (e.g., RSA) were also measured at the person-level. Person-level mean positivity resonance scores were computed by averaging positivity resonance scores across all social episodes (i.e., the PRM was only administered for social episodes). The Cronbach’s alpha coefficient for this scale in this sample was .78.

**Episode location.** Participants were also asked to report where each episode took place, from a list of four options: At work, at home, in public, or some other place. See Table 3 for descriptive statistics on affect ratings by location, and type of social interaction.

**Primary Outcome Variables: T1 and T2**

**RSA.** Resting respiratory sinus arrhythmia (RSA), a non-invasive proxy of cardiac vagal tone (Porges, 2007) was measured in the initial lab visit and eight-weeks later at the post-intervention lab visit. RSA is characterized by increases in heart rate with inspiration and decreases in heart rate with expiration (Berntson et al., 1997). The protocol used here acquired both continuous heart rate and respiration. Echocardiogram (ECG) was collected using disposable snap electrodes in a bipolar configuration on opposite sides of the chest.
Respiration was collected using pneumatic bellows placed around the participant’s torso at the bottom of the sternum. ECG and respiration were recorded continuously for five minutes, at rest\(^5\), at a sampling rate of 1000 Hz. Using an integrated system and software package (James Long Company, Caroga Lake, NY) the raw heart rate data were preprocessed and manually edited to correct for artifacts. Then, RSA was calculated based on changes in heart rate associated with respiration using a modified Grossman peak-to-valley method (Grossman, 1983) with re-sampling every 125 ms.

**Flourishing.** Participants completed the Mental Health Continuum – Short Form (Keyes, 2009) to assess flourishing mental health. Participants indicated the frequency with which they experienced 14 items over the past month using a scale from 0 (rarely or none of the time) to 3 (most or all of the time). Items included: “How often did you feel interested in life?” “How often did you feel that you had something to contribute to society?” and “How often did you feel confident to think or express your own ideas and opinions?” Flourishing was computed as the mean of the 14 items. The Cronbach’s alpha coefficient for this scale in this sample was .91.

**Loneliness.** Participants completed Russell’s (1996) UCLA Loneliness Scale. They rated the frequency with which they experienced 20-items on a 5-point scale ranging from 1 (never) to 5 (always). For instance, “How often do you feel close to people? (reverse

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\(^5\) Because respiration rate and depth can influence RSA, there is some debate in the field about whether to employ paced breathing techniques to reduce noise attributable to variability in respiration rates. In the present study, no such instructions were given to alter breathing because exerting effortful control over breathing may itself change RSA, and many empirical studies have found that paced-breathing does not yield any additional insights into RSA, over and above measures of RSA using spontaneous breathing at rest (Patwardhan, Evans, Bruce, & Knapp, 2001; Patwardhan, Evans, Bruce, Eckberg, & Knapp, 1995; Quintana & Heathers, 2014).
scored)” and “How often do you feel isolated from others?”. Loneliness was computed as the mean of the 20 items. The Cronbach’s alpha coefficient for this scale in this sample was .93.

Illness symptoms. Participants reported the frequency with which they experienced 13 common symptoms of illness or poor health over the past month (Elliot & Sheldon, 1998). Participants used a 7-point scale (1 = not at all, 7 = very frequently) to rate the frequency of each of the following symptoms: headaches, coughing or sore throat, shortness of breath, stiff or sore muscles, chest or heart pain, faintness or dizziness, acne or pimples, stomach ache or pain, feeling weak in parts of your body, numbness or tingling in parts of your body, nausea or upset stomach, runny or congested nose, and hot or cold spells. The composite score was computed as the mean of the 13 items. The reports of illness symptoms were positively skewed (skewness = 1.01), so I performed a logarithmic transformation on this variable (resulting skewness = 0.17). All subsequent analyses use this transformed variable. The Cronbach’s alpha coefficient for this scale in this sample was .76.

Exploratory Variables.

Social Support (T1 and T2). To measure the amount of support the participant provided and received from close others, two questions measuring support received were taken from the American Changing Lives study (House, 2010), and four additional questions were adapted from Brown and colleague's (2003) Giving/Receiving Emotional Support to a Spouse (GESS/RESS) scale. Participants rated questions on a scale from 0 (not at all) to 4 (an extreme amount). Questions included: “On the whole, how much do your friends and relatives make you feel loved and cared for?” (support received) and “On the whole, how much do you make your friends and relatives feel loved and cared for?” (support given).
Social support was computed as the mean of the six questions. The Cronbach’s alpha coefficient for this scale in this sample was .78.  

**Reading the Mind in the Eyes Task (RMET; T1 and T2).** To measure skill in detecting the emotions of others, participants completed the Reading the Mind in the Eyes Task (RMET; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). The RMET requires participants to decode mental states of people from photographs displaying only the eye area of the face. On each trial, participants selected from four options specific to each photo (e.g., contemplative, flustered, encouraging, amused). Correct responses were summed to create composite scores; higher scores are indicative of greater skill in detecting the emotions of others.

**Prioritizing positivity (T1).** To assess the extent to which people seek out positive emotional experiences when making decisions about how to organize day-to-day life, participants completed the prioritizing positivity scale (Catalino et al., 2014). Participants rated their agreement with seven items on a scale from 1 (*disagree strongly*) to 9 (*agree strongly*). Example items included, “A priority for me is experiencing happiness in everyday life” and “I look for and nurture my positive emotions.” Prioritizing positivity was computed as the mean of the seven items. The Cronbach’s alpha coefficient for this scale in this sample was .83.

**Extraversion (T1).** To measure extraversion, participants completed the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) – a short form personality inventory.

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6 I also measured implicit social affiliation to determine whether participants would have more positive automatic responses to social stimuli. However, due to an error in the programming of the task, the data were unusable. The task took approximately five minutes; during which participants completed a dot-probe consisting of social and nonsocial images.
inventory designed to measure the “big five” personality characteristics using two items each. Participants rated their agreement with 10 items on a scale from 1 (disagree strongly) to 7 (agree strongly). The pair of items corresponding to extraversion (e.g., I see myself as extraverted, enthusiastic) were averaged to form a single composite score. The Cronbach’s alpha coefficient for this scale in this sample was .76.

**Procedure**

Within one week prior to their initial lab visit, participants completed the pre-intervention (T1) survey set, which included the primary outcome variables and exploratory variables (Figure 1). At the initial lab visit, a resting assessment of RSA was collected, after which participants were randomly assigned to one of three experimental conditions (social experience focus, task focus, nonsocial experience focus). For seven weeks beginning the day after the initial lab visit, participants received a daily email that included a daily emotion report followed by questions specific to their experimental intervention condition. In the seventh week of the intervention, participants completed a Day Reconstruction Method (DRM) to provide a detailed episode-based report of their emotions and social interactions across the previous day from the time they woke up until the time they went to sleep. In the eighth week, participants returned for a post-intervention lab session during which a final assessment of resting RSA was collected. Within one week of their completion of the post-intervention lab session, participants completed a set of post-intervention (T2) questionnaires, identical to the pre-intervention (T1) questionnaires.
RESULTS

Experimental Manipulation Checks

**Compliance.** To test whether the intervention produced comparable levels of compliance between conditions, I conducted a one-way ANOVA with condition as the independent variable and percentage of daily reports completed as the dependent variable. On average, participants completed 93% of their daily reports, and results indicated that there were no differences in compliance across the three conditions, $F(2, 120) = 0.45, p = .638$.

Descriptive Statistics and Preliminary Analyses

Table 3 shows the means of pleasant emotions, unpleasant emotions, and positivity resonance by interaction type. Type of social interaction refers to the predominant type of social interaction in the DRM episode. That is, if an episode involved more than one activity, the episode was categorized as the type of interaction in which the individual spent the highest percentage of time within that episode. Only 27% of the sample reported having at least one episode that was predominantly a computer-mediated interaction, and only 51% of the sample reported having at least one episode that was predominantly a tele/video interaction. Thus, significance tests of emotion or positivity resonance ratings by type of interaction is too low-powered to be meaningful. However, the rank order of positivity resonance by context is consistent with theory and past evidence (Major et al., under review): mean levels of positivity resonance are highest in face-to-face interaction, lowest in computer-mediated interactions, with tele/video interactions falling in between. Table 3 also
shows the means of pleasant emotions, unpleasant emotions, and positivity resonance by place (i.e., at work, at home, in public, etc.). Though I had no specific predictions about differences in emotions or positivity resonance between these places, I included them for reference.

**Hypothesis 1: Participants in the social experience focus condition would exhibit increases in health and well-being relative to those in the other two conditions**

To test Hypothesis 1, I conducted a series of linear regressions. For each primary outcome variable (flourishing, loneliness, illness symptoms and resting RSA), increases in health and wellbeing were assessed using a regression model with the Time 2 primary outcome variable used as the dependent variable and the corresponding Time 1 variable and intervention condition as simultaneous predictors.

Consistent with expectations, results indicated that there were marginally significant differences between conditions on one primary outcome variable: loneliness (Table 4). Planned contrasts revealed that individuals in the social experience focus condition reported feeling significantly less lonely at the end of the study relative to those in the task focus condition, $t (116) = 2.14, p = .035$, but did not differ from those in the nonsocial experience focus condition, $t (116) = 1.32, p = .190$. The nonsocial experience focus condition and task focus condition also did not differ from each other, $t (116) = 0.77, p = .444$. This partially supports the hypothesis that reflecting on positive social experiences would reduce loneliness relative to a control condition. However, I did not find support for my prediction that reflecting on positive social experiences would prompt lower loneliness relative to reflecting on positive nonsocial experiences.

Contrary to hypotheses, no differences emerged between experimental conditions on any of the other three primary outcome variables (Table 4). Thus, individuals in each
condition reported similar levels of flourishing, illness symptoms and RSA at the end of study, after controlling for T1 scores of each of these variables.

**Post-hoc sensitivity analyses: Are some people more responsive to the intervention?** Although significant effects of experimental condition did not emerge for flourishing, illness symptoms or RSA, I assessed whether certain people may have been more responsive to experiencing gains in health and wellbeing than others in a series of post-hoc sensitivity analyses. Given the relatively small sample size for testing interaction effects and the post-hoc nature of these analyses, I make the following predictions for exploratory purposes and they should be interpreted cautiously. First, I tested demographic variables (i.e., age and gender). Second, I tested extraversion. Prior research suggests that wellbeing interventions may be less beneficial for people high in extraversion because these individuals already have an abundance of positive social and emotional opportunities; by contrast, individuals low in extraversion may not encounter this type of ceiling effect for positive emotions or social experiences, and thus may perhaps experience a greater boost in positive outcomes from an intervention designed to boost positive social experiences (Froh, Kashdan et al., 2009). Third, research also suggests that cardiac vagal tone – which is also used to index autonomic flexibility and the propensity for social engagement – facilitates an ability to garner more positive emotions out of social and emotional experiences (Kok et al., 2013; Kok & Fredrickson, 2010; Oveis et al., 2009). Thus, individuals with high resting RSA at T1 (an index of CVT) perhaps reap more benefits from the intervention than those with low resting RSA. Fourth, I tested whether the effects of the intervention might work better for people who make it a priority to experience positivity in their daily life. To this end, I tested
whether age, gender, extraversion, T1 resting RSA, or tendency to prioritize positivity interacted with condition in predicting any of the primary outcome variables.

These sensitivity analyses revealed that, no interaction effects emerged between condition and age, gender, extraversion, RSA, or prioritizing positivity in predicting flourishing, loneliness, or RSA (all $F'$s < 0.97, all $p$'s > .385). However, I did find a significant interaction between age and experimental condition in predicting illness symptoms. More specifically, for older adults, being in the task focus condition was associated with significantly greater increases in illness symptoms than both the social experience focus condition, $t(113) = 2.75, p = .007$, and the nonsocial experience focus condition, $t(113) = 2.35, p = .021$, who did not differ from one each other, $t(113) = 0.07, p = .942$. To further determine the nature of this interaction, I used the Johnson-Neyman technique, as recommended by Preacher, Curran, and Bauer, (2006), to determine exactly where along a continuous interaction variable (i.e., age) a difference emerges. Using this technique, I used the task focus condition as the reference group, and plotted the predictive marginal effects of illness symptoms (with 95% confidence intervals) across all ages for the social experience focus condition (Figure 2a) and for the nonsocial experience focus condition (Figure 2b). The resulting plots depict the age at which the 95% confidence interval does not include zero, thus demonstrating the age at which condition (i.e., social experience vs. task; nonsocial experience vs. task) predicts differences in illness symptoms. Results indicated that relative to the task focus condition, being in the social experience focus condition was associated with significantly greater decreases in illness symptoms, but only for people older than 52 years of age (22% of the adults in this sample were older than this age). Similarly, relative to the task focus condition, being in the nonsocial experience focus
Condition was associated with significantly greater decreases in illness symptoms, but only for people older than 43 years of age (40% of the adults in this sample were older than this age).

**Hypothesis 2**: Participants in the social experience focus condition, relative to the other two conditions, will exhibit greater positivity resonance in their social interactions

To test the effects of the intervention on positivity resonance or any of the proposed alternative mediators, I conducted a series of one-way ANOVAs with experimental condition as the between-persons variable and each mediator as separate dependent variables (i.e., pleasant emotions, duration of social interactions, frequency of social interactions). Contrary to my hypothesis, these analyses revealed no significant differences in positivity resonance across experimental conditions (Table 5). Though the means were in the hypothesized directions, the effect did not reach significance. Hence, the intervention was unsuccessful in manipulating positivity resonance and Hypothesis 2 is rejected. One-way ANOVAs also revealed no significant effect of condition for pleasant emotions, unpleasant emotions, as measured by the DRM.

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7 To replicate the analyses used in the original Kok (2012) study, I also tested the effect of condition on daily positive and negative emotions over time, as measured by the MDES in the daily reports. I tested whether condition predicted change in positive emotions over time using a latent growth curve identical to that used in Kok (2012): “Participants’ daily emotion reports were aggregated into week-by-week averages. Week-by-week positive emotions scores were constrained to one on the latent intercept term, while loadings for the slope term were as follows: 0 for the first week, 1 for week 1, etc. Condition was allowed to predict both the latent positive emotions intercept and the latent positive emotions slope. Both the positive emotions intercept and slope were used to predict end-of-study vagal tone, controlling for starting vagal tone.” Inconsistent with previous findings, results indicated that the path representing the direct effect of experimental condition on change in positive emotions was not significant ($b = .01, p = .785$).
One-way ANOVAs revealed no significant effect of condition for duration of social interactions, ruling out the possibility that the intervention may have prompted individuals in the social experience condition to spend a greater duration of time interacting with others. However, a significant main effect of condition emerged for the number of daily social interactions. Planned contrasts revealed that, relative to people in the task focus condition, participants in the social experience focus condition reported engaging in more social interactions, $t(118) = 2.13, p = .035$, as did those in the nonsocial experience focus condition, $t(118) = 2.91, p = .004$, but the social and nonsocial experience focus conditions did not significantly differ from each other $t(118) = 0.86, p = .392$. Surprisingly, these findings indicate that both of the eudaimonic interventions were similarly effective in increasing the frequency of social interaction relative to the task-focus control.

Second, I tested the exploratory hypothesis that thinking about social interactions on a daily basis may have prompted people to re-frame their perceptions, enabling them to experience their existing social interactions in a different light. I expected that relative to the nonsocial experience focus and task focus conditions, the social experience focus condition to demonstrate greater skill in detecting emotions in others (RMET), and greater perceptions of social support from pre-to post-intervention. However, contrary to expectations, linear regressions revealed that condition did not significantly predict T2 RMET scores, or T2 social support, when controlling for T1 scores (Table 6).

**Post-hoc sensitivity analyses: Are some people more susceptible to the effects of the intervention?** To mirror the analyses conducted for Hypothesis 1, I tested whether certain people may have been more responsive to the intervention than others, and thus experience differential gains in the social and emotional mediators (i.e., positivity resonance,
pleasant emotions, unpleasant emotions, time spent interacting, number of social interactions).

First, I tested demographic variables (i.e., age and gender). Gender did not interact with experimental condition in predicting any of the social and emotional mediators (all $F$’s < 1.74, all $p$’s > .180). I also tested whether age would interact with condition in predicting social and emotional mediators. That is, perhaps the reason only older adults in the social and nonsocial experience conditions experienced decreases in illness symptoms was because they gleaned more positive emotions out of their experiences (i.e., greater pleasant emotions, positivity resonance) or engaged in more social interactions (i.e., greater time spent in social interactions, greater number of social interactions). If so, age could interact with condition in the hypothesized mediation effects described in Hypothesis 3. However, contrary to expectations, age did not significantly interact with condition in predicting any of the social or emotional mediators (all $F$’s < 1.38, all $p$’s > .256).

I also tested trait extraversion, resting RSA, and prioritizing positivity, but none of these variables significantly interacted with condition in predicting any of the social or emotional mediators (all $F$’s < 0.70, all $p$’s > .497).

**Hypothesis 3: Improvements in health and well-being will be mediated by greater positivity resonance among individuals in the social experience focus condition, relative to the nonsocial experience focus condition and task focus condition**

As reported above, I found that no significant differences emerged between conditions on three of the four primary outcome variables: RSA, flourishing, and illness symptoms. Still, the lack of a significant total effect of X (condition) on Y (i.e., change in RSA, flourishing, or illness symptoms) alone does not rule out Hypothesis 3. That is, it is still possible to find a significant indirect effect of X, through M (e.g., positivity
resonance), on Y if the direct and indirect effects are significantly influencing Y in opposite directions (suppression effect; MacKinnon, Krull, & Lockwood, 2000; Preacher & Hayes, 2004). However, as previously reported, no significant differences merged between conditions on the hypothesized mediator (i.e., positivity resonance) or on three of the four alternative mediators (i.e., pleasant emotions, unpleasant emotions, duration of social interaction). Combined with the lack of condition-specific differences in primary outcome variables, the lack of condition-specific differences in these mediators rules out the possibility of a significant mediation (via a suppression effect, or otherwise). Thus, for three of the four primary outcome variables, Hypothesis 3 was not substantiated. That is, positivity resonance did not significantly mediate condition-specific differences in RSA, flourishing, or illness symptoms. Further, pleasant emotions, unpleasant emotions, and duration of social interaction did not significantly mediate condition-specific differences in RSA, flourishing, or illness symptoms.

As reported above, I found that relative to the task focus condition, individuals in the both eudaimonic intervention conditions reported having a better outcome on one hypothesized primary outcome variables: loneliness. But given that no differences between conditions emerged on positivity resonance, pleasant emotions, unpleasant emotions, or duration of social interactions, these mediators cannot explain condition-specific differences in loneliness. Thus, Hypothesis 3 was also not substantiated for loneliness as the primary outcome variable. However, I did find that individuals in the

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8 Rather than repetitively presenting null findings, I elected to only conduct tests of the indirect effect when differences between conditions emerged in the mediator. However, the full set of mediational analyses (with each iteration of the five mediators, and the four primary outcome variables) are available upon request.
social and nonsocial experience focus conditions reported a greater frequency of social interactions relative to the task focus condition. Thus, I tested whether number of social interactions mediated the significant relationship between condition and loneliness.

I used the PROCESS macro for SPSS with 5,000 bootstrapped samples (Hayes, 2013) to test for mediation with condition as a dummy-coded multicategorical predictor. Following Hayes’ (2013) guidelines for a three-group independent variable, I used the social experience focus condition as the reference group and thus constructed two dummy variables, representing the nonsocial experience focus condition and the task focus condition. In the model, I entered end-of study loneliness as the dependent variable, frequency of social interaction as the mediator, and T1 loneliness as a covariate (Table 7). Because there were three groups, there are two indirect effects: (D1) the indirect effect of the social experience focus vs. the task focus condition on loneliness through frequency of social interaction and (D2) the indirect effect of the social experience focus vs. the nonsocial experience focus condition on loneliness through frequency of social interaction. A bootstrap analysis of the significance of the indirect effects of condition predicting loneliness through number of social episodes yielded 95% confidence intervals (CIs) that did not include 0, thus indicating a significant indirect effect (Table 7). In particular, people in the social experience focus condition, relative to the task focus condition, reported decreases in loneliness as a result of their greater frequency of daily social interactions, 95% CI = [.0027, .0788]. The contrast between the social and nonsocial experience focus conditions did not yield a significant indirect effect, 99% CI = [-.0211, .0511].
Because the nonsocial experience focus condition reported greater frequency of social interaction relative to the task focus condition, I conducted a post-hoc test to see whether these condition-specific differences in frequency of social interaction accounted for differences in loneliness. To do so, I repeated the model above, but instead used the nonsocial experience focus condition as the reference group and used a 99% CI as a multiple test correction (i.e., Bonferroni approach), as suggested by Hayes (2013). Results indicated that the indirect effect of being in the nonsocial experience focus condition, relative to the task focus condition, yielded significant decreases in loneliness as a result of their greater frequency of daily social interactions, \( b = .04, 99\% \text{ CI} = [.0001, .1108] \). Thus, the number of social interactions in a typical day is a significant mechanism through which both the eudaimonic interventions reduced loneliness, relative to the task-focus control.

**Replication of Previous Positivity Resonance Findings**

Because the intervention to experimentally manipulate positivity resonance did not work, I cannot make causal conclusions about the effects of positivity resonance on health and wellbeing. The current dataset is still useful, however, for assessing correlational associations between positivity resonance and the hypothesized outcomes. To this end, I replicated several analyses from Major, Lundberg and Fredrickson’s (under review) initial study. In particular, I tested whether data from this new sample might also support the hypothesis that positivity resonance would be associated with better health and wellbeing as measured by flourishing, loneliness, and illness symptoms. To expand on the findings, I also tested whether RSA would follow the same pattern. I also tested whether data from this new sample might also support the hypothesis that the relationship
between positivity resonance and each of the primary outcome variables would remain significant, even when controlling for overall positive emotions or duration of social interaction. I also expanded upon these findings by testing whether positivity resonance would remain significant when controlling for frequency of social interaction.

For this set of analyses, I collapsed the data across conditions and included the full set of participants (n = 170), which included the 49 participants that were previously excluded because of a failure to randomize. I conducted hierarchical linear regressions, each with one of the four T2 primary outcome variables (i.e., T2 illness symptoms, loneliness, flourishing, RSA) as the dependent variable. In Step 1, I entered positivity resonance and the T1 primary outcome variable as predictors. In Step 2, I added a) pleasant emotions b) duration of time spent interacting, or c) frequency of social interaction to the model in order to observe the unique effect of positivity resonance on the primary outcome variable when controlling for pleasant emotions or duration/frequency of social interaction aggregated across the day.

Consistent with prior findings, higher mean-levels of positivity resonance were significantly correlated with higher levels of flourishing and lower levels of loneliness, even when controlling for pleasant emotions and duration of social interaction (Table 8). Positivity resonance also remained a significant predictor of loneliness and flourishing, even when controlling for frequency of social interaction. Inconsistent with prior findings, positivity resonance was not significantly associated with illness symptoms, and this relationship remained non-significant even when controlling for pleasant emotions, duration of social interaction, or frequency of social interaction. Additionally, no significant relationships emerged between positivity resonance and RSA in any of the models.
DISCUSSION

In this study, I did not find support for my overarching hypothesis that prompting people to think about how close and in tune they felt within their social interactions would evoke increases in positivity resonance, which would in turn promote their health and wellbeing. The intervention designed to manipulate positivity resonance was unsuccessful, and no differences in positivity resonance emerged between any of the conditions. Thus, I cannot offer causal claims about the influence of positivity resonance on health and wellbeing. Further, contrary to previous empirical work (Kok, 2012), relative to thinking about daily tasks, thinking about daily social experiences did not evoke increases in positive emotions as measured by the DRM or daily reports. The fact that the intervention did not induce differences in positivity resonance or positive emotions more generally may in part explain why, contrary to hypotheses, no differences emerged between conditions in RSA, flourishing, or illness symptoms (among younger adults). Somewhat consistent with hypotheses, people who reflected on how close and in tune they felt within their daily social interactions did report lower loneliness and fewer illness symptoms (albeit only among adults older than 52) relative to people who reflected on the extent to which their daily tasks were useful and important. However, people who reflected on the extent to which solitary interesting daily events were meaningful and rewarding also reported similar decreases in loneliness and illness symptoms (albeit the latter effect only emerged among adults older than 43) relative to
the task focus condition, which indicates that, inconsistent with hypotheses, these improvements in health and wellbeing were not specific to people who thought about positive social experiences, but rather eudaimonic experiences more broadly. Further, these condition-specific improvements in loneliness and illness symptoms were not mediated by positivity resonance, as hypothesized. Further, the condition-specific differences in illness symptoms that emerged only among middle-aged and older adults were not accounted for by any of the potential mediator variables measured here.

The intervention did, however, prompt an increase in the frequency of social interactions on a typical day for individuals in both the eudaimonic conditions relative to the task control condition. Further, I found a significant indirect effect of condition on loneliness, through frequency of social interactions; an effect that emerged for both the eudaimonic conditions, relative to the task control condition. In other words, daily thoughts about close and in-tune social interactions or meaningful and rewarding interesting solitary events, which were comparably positively valued, may prompt people to engage in more discrete daily social interactions, which in turn reduces their feelings of loneliness relative to people who thought about useful and important daily tasks. An alternate explanation is that these results may have been due to a suppression of social interactions for people in the task focus condition. More specifically, if people become primed to efficiency and importance of work tasks, they may curtail on social,

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9 As noted in the method section, the mean “close and in-tune” score for people in the social experience focus condition, was nearly identical to the mean “meaningful and rewarding” score for people in the nonsocial experience focus condition (i.e., 6.07 and 6.04, respectively).
non-task activities. This could be tested by using a no-intervention control group in future research.

This study also offered correlational support for the predictive validity of positivity resonance, as measured by the PRM. Consistent with theory and prior findings (Fredrickson, 2016; Major et al., under review), positivity resonance, as assessed by the PRM, was correlated with multiple measures of wellbeing. More specifically, greater positivity resonance was significantly associated with greater levels of flourishing and lower levels of loneliness. To confirm the unique role of positivity resonance in predicting these wellbeing outcomes, analyses revealed that even when controlling for a person’s overall pleasant emotions, duration of social interaction, or frequency of social interaction, positivity resonance was still significantly associated with higher flourishing and lower loneliness. Although these findings are correlational and cannot indicate causality, they suggest that even though social integration and positive emotions have independently been found to promote wellbeing, it is possible that the benefits of social integration on wellbeing may be particularly powerful when social connections are marked by positivity resonance. Likewise, the benefits of positive emotions on wellbeing may be particularly powerful when positive emotions are shared in the company of people who are “in synch” and who care about one another.

Failure of the Experimental Manipulation

Contrary to hypotheses, the intervention did not induce positivity resonance in people who engaged in daily thoughts about close and in-tune social interactions. Further, and contrary to a prior (albeit unpublished) study (Kok, 2012), the intervention did not
induce any differences in positive emotions between any conditions. There are several possibilities that might explain these null effects.

One possibility is that the manipulation is too subtle to work. Given the small sample size and marginal findings in the Kok (2012) study, the inability to replicate the finding may suggest the original finding was simply a false positive. I used a subtle experimental intervention and tightly controlled comparison conditions that matched the social experience focus condition on many features, such as the practice of making daily value judgements and engaging in thoughtful daily reflection. Ultimately, the manipulation may not have been strong enough to evoke meaningful changes in positivity resonance or positive emotions more generally. Another possibility could be related to the addition of a series of questions about illness symptoms that were added to the daily survey in the present study to test a research question outside the scope of this study. Though the question was intended to track changes in illness symptoms over time, it may have had unintended consequences. For instance, this question may have primed participants with thoughts about their illness symptoms, which may have negated any increases in positive emotions that might have occurred as a result of thinking about social experiences. This explanation could also account for why no differences in positivity resonance or positive emotions emerged between conditions. Future studies may wish to manipulate whether or not illness symptom questions are included in the daily surveys, to test whether an adversity-primed context is necessary to prompt changes in the frequency of social interaction and loneliness or whether the absence of an adversity primed context would yield results as originally hypothesized.
Why Might Thoughts About Social and Nonsocial Experiences Elicit Similar Effects?

I expected that positive emotions experienced as the result of thoughts about social experiences would be associated with even better health and wellbeing benefits than equally positive thoughts about nonsocial experiences. Inconsistent with this prediction, one pattern that emerged in the data is that daily thoughts about both social and nonsocial experiences elicited similar outcomes: similar decreases in loneliness, similar decreases in illness symptoms (for middle-aged to older adults), and similar increases in frequency of social interaction. One possibility to explain this finding is that thinking about close and in-tune social interactions and meaningful and rewarding interesting events may have each elicited eudaimonic wellbeing. Unlike hedonic forms of wellbeing, which are achieved by maximizing pleasure and minimizing pain, eudaimonic well-being occurs when a person’s life experiences are most congruent with their deeply values (Keyes, 2002; Ryff & Singer, 2000). Though exact definitions of eudaimonic wellbeing vary, researchers generally agree that there are several distinct aspects of human actualization, which include: positive relations with others (or relatedness), autonomy, environmental mastery (or competence), purpose in life, self-acceptance, and personal growth. Drawing from this perspective, thinking about close and in-tune social interactions may have instilled eudaimonic wellbeing by enabling people to reflect on their positive relations with others. Similarly, thinking about meaningful and rewarding interesting events may have enhanced eudaimonic wellbeing by enabling people to consider how daily events may have contributed to their sense of purpose in life. Though this is purely speculative and I don’t have the data to directly test this hypothesis, the content of the daily thought instructions for each of these conditions is consistent with conceptualizations of eudaimonic wellbeing.
Implications for Reducing Loneliness

Loneliness, is a prevalent mental health issue in today’s society and is implicated with a multitude of risk factors for health, ranging from less restorative sleep, to higher risk of cardiovascular disease, to cognitive decline (Masi, Chen, Hawkley, & Cacioppo, 2010). The current study offers a minimal, but potentially effective intervention through which to reduce loneliness. I found that the act of simply thinking about close and in-tune social interactions or meaningful and rewarding interesting events may have led to increased frequency of social engagement, which in turn reduced loneliness.

This finding is noteworthy for several reasons. For one, it offers evidence that repetitive thought patterns about eudaimonic experiences may influence self-reported behaviors associated with social wellbeing. Prior research suggests that meaningful reflection on positive experiences in the form of LKM yields improvements in RSA, which is thought to be a biological indicator of physical health, the social engagement system, and capacity for social connection (Porges, 2007; Thayer & Sternberg, 2006). Though I did not find significant differences in RSA, increases in frequency of social interactions and reductions in loneliness are consistent with a profile of someone who is socially engaged. Indeed, in this sample, higher frequency of social interactions and lower levels of loneliness were significantly associated with higher levels of extraversion and agreeableness – two trait level characteristics of socially engaged people.10 Thus, it’s possible the intervention did enhance some aspect of the biological capacity to connect, just not RSA. For example, oxytocin – a biological mechanism associated with an

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10 These analyses were conducted post-hoc, to provide support for this claim in the discussion. For these analyses, I used T1 extraversion, agreeableness, and loneliness.
individual’s capacity for positive social connection – could be beneficially influenced by the current intervention. Recent research indicates that genetic variability in oxytocin signaling were differentially associated with gains in positive emotions as the result of a socially-focused loving-kindness training (Isgett, Algoe, Boulton, Way & Fredrickson, 2016). This is purely speculation, and future research would be needed to empirically test this possibility. Second, it’s meaningful that such a subtle manipulation (i.e., prompting people to think about eudaimonic experiences) can lead to significant changes in social behavior and in loneliness. This subtle intervention is may have considerable reach because it is simple, brief, and potentially easily self-administered. Though there are number of interventions that are effective in cultivating wellbeing – like positive psychotherapy, life coaching, or mindfulness-based trainings – many of these interventions must be administered in face-to-face sessions, these can be costly and time-consuming (for meta-analytic review, see Sin & Lyubomirsky, 2009; Boilier et al., 2013). So even though the present intervention may yield modest effects, the impact on wellbeing from a public health perspective could still be substantial to the extent that it is cost effective, and can be scalable to large populations, potentially reaching demographics that might not otherwise receive health interventions (Boilier et al., 2013).

Recent models of social cognition as a function of loneliness may provide an explanation for why thoughts about eudaimonic experiences prompted decreases in loneliness. According to these models, feelings of being isolated can be considered a social threat that activates self-preservation motives among lonely people. In particular, perceptions of social isolation heighten implicit hyper-vigilance to social threats (Cacioppo et al., 2002), which can ultimately lead to attentional, confirmatory and
memory biases that sustain negative affect and feelings of loneliness. This model may explain the effects of the current intervention. That is, reflecting on eudaimonic experiences may directly counter-act perceptions of social threat by creating consistent repetitive thoughts about positive experiences, which may disrupt maladaptive thought patterns. More specifically, the current intervention may target memory and attentional biases by creating in people a new set of memories and attentional primes to draw from during social interactions. Of course, further work will need to test whether this intervention is equally suited for people with more severe loneliness, who might have more trouble identifying positive aspects of social experiences.

Though these findings are encouraging, they should be interpreted cautiously, as demand characteristics could partly explain the effects. For participants in the social experience condition, their daily questions were items derived from the loneliness scale itself. Thus, it’s possible that any decreases in loneliness for participants in this group could be explained by demand characteristics. However, demand characteristics do not explain the parallel result for the nonsocial experience focus condition, which used daily questions unrelated to loneliness.

**Future Directions**

The present study offers a several noteworthy findings and raises a series of important questions, which pave the way for several avenues for future research. One particularly intriguing question is: if the two eudaimonic interventions prompt people to engage in more social interactions, who is it that they are interacting with? It could be that people are engaging with their existing network of social connections more frequently and/or engaging with new social partners, thus expanding their network of
social connections. Though the present study cannot answer questions about the targets of these social interactions, the results do seem to suggest that regardless of the interaction partner, the intervention does not seem to be changing the affective experience of those additional interactions, as measured by positivity resonance, positive emotions, or negative emotions averaged across episodes.

Because the current sample had relatively low levels of loneliness, another interesting question is whether these findings are applicable to people with more extreme levels of loneliness. Regardless, these findings are encouraging that the effect exists, even for non-lonely persons, and that a ceiling effect did not emerge. The present findings will need to be replicated to determine whether the effects of this intervention on loneliness are widely generalizable to people across the entire spectrum of loneliness or whether they exist only for non-lonely people. Additionally, future work is still needed to test whether this reduction in loneliness is clinically significant and whether it changes biomarkers (e.g., cortisol, inflammation) or other serious consequences of loneliness (e.g., cognitive decline or diminished capacity for self-regulation).

Another future direction is to consider the negatively valenced equivalent of positivity resonance: perhaps best described as “negativity resonance.” One question that remains is whether the beneficial effects of shared emotion, mutual care and concern, and biobehavioral synchrony are exclusive to positive emotions, or whether shared negative emotions, in the right contexts, might also be adaptive. Of course, negative emotions more generally are adaptive in that they provide important information to alert people of adaptive problems that need to be solved. However, one place where positivity resonance diverges from other forms of “emotion resonance” is with cognitive broadening. That is,
to the extent that negativity resonance doesn’t include any elements of positive affect, it’s unlikely that these experiences would have the same meaningful outcomes as positivity resonance because they lack the cognitive broadening that serves as the basis for building resources. This is not to say that shared negative experiences can’t be adaptive in some ways. This possibility may be best understood by considering how resilient people react to negative life experiences. The ability of resilient individuals to overcome and bounce back from stressful events is at least partly due to their ability to recognize the negative aspects of stressful situations, but still experience positive emotions even amidst the negative emotions (Ong, Bergeman, Bisconti, & Wallace, 2006; Waugh, Thompson, & Gotlib, 2011). Thus, adaptive versions of negativity resonance may function in the same way. For instance, some forms of group therapy that involve disclosing and sharing of negative experiences (Pennebaker, Zech, Rimé, & others, 2001), may achieve beneficial results to the extent that positive emotions are also present, preventing a potential downward spiral of rumination. Of course, these are just speculations, and research will be needed to empirically test these postulations.

Though the DRM – used in the present study – is a useful tool for collecting unbiased self-reports of behavior, a diverse set of methods and measures – including objectively assessed behavior – may also be key to providing the most complete picture of positivity resonance. One measure that may be particularly useful is the Electronically Activated Recorder (EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001), a device that randomly takes audio samples in daily life in order to naturalistically sample daily activities and conversations. Behavioral coding schemes may be another practical way to more objectively explore behaviors related to positivity resonance. One behavioral
coding measure that may be particularly useful is a behavioral synchrony coding scheme used in a recent study by (Vacharkulksemsuk & Fredrickson, 2012). In this study, trained coders viewed muted split-screen recordings of a partner interaction task and coded them on three key aspects of behavioral synchrony: simultaneous movement, tempo similarity, and coordination and smoothness. Lastly, assessing time-varying RSA linkage between dyads in social interaction paradigms enables measurement of physiological synchrony with a second-by-second temporal resolution (Gates, Gatzke-Kopp, Sandsten, & Blandon, 2015). This type of temporal precision is ideal for answering questions about the momentary effects of positivity resonance on shared physiological states.

**Positivity Resonance as a Tool for Measuring Positive Social Experiences**

Given the newness of the positivity resonance measure, part of the goal of this study was illustrate its potential uses as a tool for measuring positive social experiences. As noted in the introduction, the PRM is best suited for episode-level data. In the present study, I chose to embed the PRM in the DRM because the DRM is a well-validated tool known to provide accurate and unbiased self-reports of episode-level data across an entire day (Kahneman & Krueger, 2006). Although the DRM is a well-validated tool, some researchers may also find it useful to embed the PRM within other episode-level methods, depending on their research needs. For example, the Event Reconstruction Method (ERM; Schwarz et al., 2009) might be most suitable for the PRM when researchers are interested in targeting particular types of episodes (e.g., think of your most recent classroom experience) instead of an entire day. The PRM might also be administered immediately following a specific interaction episode, such as customer service exchanges or laboratory-based interactions between and among strangers.
The new Positivity Resonance Measure (PRM) may be a beneficial instrument for both positive emotion researchers and social integration researchers alike. Prior research on positive emotions has tended to examine these pleasant states as an intra-individual experience (Fredrickson, 2016), and often overlooks opportunities to explore how positive emotions can be shared between and among people in social situations. The present evidence replicated previous correlational findings (Major et al., under review) and provides some support for recent theories that suggest that shared experiences of positivity may be particularly beneficial for wellbeing (Fredrickson, 2016; Dutton & Heaphy, 2003). The PRM will aid future research in affective science that aims to distinguish where and how positive emotions are derived, and whether such differences yield differential outcomes. The PRM may also be helpful to social integration researchers. Prior research has largely considered social relationships as a more global construct (e.g., social networks, social integration, perceived social support; Berkman & Glass, 2000; Heaney & Israel, 2008), a perspective that makes it difficult to assess the degree to which the (positive) emotions that unfold on a momentary basis within social interactions might explain the association of social relationships with superior health and wellbeing.

**Limitations**

Because the Positivity Resonance Measure is new, one limitation is the question of whether or not it is fully capturing the construct of positivity resonance. Though initial findings are promising and consistent with theorizing about positivity resonance (Major, Lundberg, & Fredrickson, under review; Fredrickson, 2016), more work is needed. One priority for future research is to obtain PRM reports from multiple interaction partners in order to know whether and when the experience is truly shared, and the extent to which the
degree of shared experience plays a differential role in promoting wellbeing. Additionally, because some features of positivity resonance may occur outside of awareness and be more difficult for participants to perceive (i.e., synchrony), it may be helpful to consider whether additional non-self-report assessments – like shared smiles, or synchrony across behavioral and biological markers – might provide a more complete picture of positivity resonance. Regardless of these limitations, the present scale may still be valuable, particularly considering that it is drastically less expensive than alternative measures of similar constructs like physiological synchrony.

**Conclusion**

In conclusion, these findings shed light on how meaningful daily reflection on social interactions or interesting solitary events can promote wellbeing. I found that both eudaimonic interventions (i.e., daily thoughts about close and in-tune social interactions or meaningful and rewarding interesting events) prompted people to engage in more social interactions, which in turn led to reduced feelings of loneliness relative to people who thought about useful and important tasks. I also found that both eudaimonic wellbeing interventions prompted a decrease in illness symptoms, but only among middle-aged and older adults. To the extent that this result can be replicated, these findings may shed light on how people can fine-tune their daily thoughts and behaviors in order to become more socially engaged and ultimately promote lasting changes to their wellbeing.
Table 1

Sample demographics by condition.

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<tr>
<th>Characteristic</th>
<th>Social Experience (n = 43)</th>
<th>Nonsocial Experience (n = 39)</th>
<th>Task (n = 41)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>45.26 (15.20)</td>
<td>37.51 (12.50)</td>
<td>39.10 (13.20)</td>
</tr>
<tr>
<td>% Female</td>
<td>62.79%</td>
<td>64.10%</td>
<td>78.05%</td>
</tr>
<tr>
<td>% Employed</td>
<td>93.02%</td>
<td>89.74%</td>
<td>85.27%</td>
</tr>
<tr>
<td>% Caucasian</td>
<td>83.72%</td>
<td>66.67%</td>
<td>78.05%</td>
</tr>
</tbody>
</table>
Table 2

*Positivity Resonance Measure (PRM)*

**Instructions:** Considering only the time during this episode that you were interacting with others (face-to-face, or otherwise), for what proportion of the time from (0 to 100 percent)…

…did you experience a mutual sense of warmth and concern toward one another?
…were you able to attune to and connect with the other(s)?
…did thoughts and feelings flow with ease between you and the other(s)?
…did you feel a mutual sense of being energized and uplifted in each other's company?
…were you and the other(s) mutually responsive to one another's needs?
…did you feel a sense of mutual trust in, and respect for one another?
…did you feel "in synch" with the other(s)?
Figure 1

**Experimental Design**

<table>
<thead>
<tr>
<th>Pre-intervention (T1)</th>
<th>Experimental intervention</th>
<th>DRM</th>
<th>Post-intervention (T2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab visit &amp; surveys</td>
<td>Daily emails (7-weeks)</td>
<td></td>
<td>Lab visit &amp; surveys</td>
</tr>
<tr>
<td><strong>Primary Outcome Vars.:</strong></td>
<td>Daily condition questions:</td>
<td>Episode-level</td>
<td>Primary Outcome Vars.:</td>
</tr>
<tr>
<td>RSA</td>
<td><strong>Task Focus:</strong> Think about tasks, rate how “useful” and “important”</td>
<td>Length of episode</td>
<td>• RSA</td>
</tr>
<tr>
<td>Loneliness</td>
<td><strong>Nonsocial Experience Focus:</strong> Think about solitary interesting events, rate how “meaningful” &amp; “rewarding”</td>
<td>Type of interact.</td>
<td>• Loneliness</td>
</tr>
<tr>
<td>Flourishing</td>
<td><strong>Social Experience Focus:</strong> Think about social interactions, rate how “in tune” and “close”</td>
<td>Positivity Res.</td>
<td>• Flourishing</td>
</tr>
<tr>
<td>Illness symptoms</td>
<td>Daily emotion reports:</td>
<td>Person level</td>
<td>• Illness symptoms</td>
</tr>
<tr>
<td><strong>Exploratory Vars.:</strong></td>
<td>• PA/NA</td>
<td>• Duration of social interactions</td>
<td>Exploratory Vars.:</td>
</tr>
<tr>
<td>Social support</td>
<td></td>
<td>• Frequency of social interactions</td>
<td>• Social support</td>
</tr>
<tr>
<td>PA-IAT</td>
<td></td>
<td>• Positivity Resonance</td>
<td>• PA-IAT</td>
</tr>
<tr>
<td>RMET</td>
<td></td>
<td>• Trait PA</td>
<td>• RMET</td>
</tr>
<tr>
<td>Prioritizing positivity</td>
<td></td>
<td></td>
<td>• Prioritizing positivity</td>
</tr>
</tbody>
</table>
Table 3

**Descriptive Statistics of Person-Level Mean Affect Ratings by Episode Category**

<table>
<thead>
<tr>
<th>Category of episode</th>
<th>Person-Level Mean Affect Rating</th>
<th>Mean hours/day</th>
<th>Proportion of sample reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positivity resonance</td>
<td>Pleasant emotion</td>
<td>Unpleasant emotion</td>
</tr>
<tr>
<td>Predominant type of social interaction:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face-to-face interaction</td>
<td>75.81</td>
<td>2.70</td>
<td>0.82</td>
</tr>
<tr>
<td>Tele/video interaction</td>
<td>68.23</td>
<td>2.28</td>
<td>1.07</td>
</tr>
<tr>
<td>Computer-mediated interaction</td>
<td>56.65</td>
<td>2.13</td>
<td>1.14</td>
</tr>
<tr>
<td>Not interacting</td>
<td>55.32</td>
<td>2.07</td>
<td>0.88</td>
</tr>
<tr>
<td>Place:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At home</td>
<td>77.76</td>
<td>2.40</td>
<td>0.79</td>
</tr>
<tr>
<td>Some other place</td>
<td>76.92</td>
<td>2.31</td>
<td>0.93</td>
</tr>
<tr>
<td>In a public place</td>
<td>71.63</td>
<td>2.42</td>
<td>0.83</td>
</tr>
<tr>
<td>At work</td>
<td>63.39</td>
<td>2.24</td>
<td>0.98</td>
</tr>
</tbody>
</table>

*Note.* Mean affect ratings by type and location of interaction. Person-level mean affect ratings were computed for each category (type of social interaction or place) by averaging each person’s emotion scores across all episodes of that type. Proportion of sample reporting is the percentage of individuals who reported at least one episode of that category.

1Because an episode could have included more than one type of social interaction, episodes were categorized by the predominant type of social interaction in that episode (i.e., the type of social interaction in which the individual reported spending the highest percentage of time within that particular episode).
### TABLE 4

*Primary Outcome Variables: Descriptive Statistics for Each Condition and Results of the Omnibus Comparing Differences in Change in the Primary Outcome Variable by Condition.*

<table>
<thead>
<tr>
<th>Primary outcome variable:</th>
<th>Mean (SD)</th>
<th>Social Experience</th>
<th>Nonsocial Experience</th>
<th>Task</th>
<th>F(2,118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Pre</td>
<td>Post</td>
<td></td>
</tr>
<tr>
<td>Flourishing</td>
<td></td>
<td>4.41 (0.79)</td>
<td>4.45 (0.79)</td>
<td>4.45 (0.73)</td>
<td>4.57 (0.66)</td>
<td>4.54 (0.88)</td>
</tr>
<tr>
<td>Loneliness</td>
<td></td>
<td>2.00 (0.51)</td>
<td>1.94 (0.50)</td>
<td>2.10 (0.47)</td>
<td>2.09 (0.39)</td>
<td>2.12 (0.57)</td>
</tr>
<tr>
<td>Illness symptoms</td>
<td></td>
<td>0.65 (0.36)</td>
<td>0.68 (0.41)</td>
<td>0.66 (0.30)</td>
<td>0.61 (0.32)</td>
<td>0.74 (0.31)</td>
</tr>
<tr>
<td>RSA</td>
<td></td>
<td>0.08 (0.05)</td>
<td>0.07 (0.06)</td>
<td>0.10 (0.09)</td>
<td>0.08 (0.05)</td>
<td>0.09 (0.09)</td>
</tr>
</tbody>
</table>
Table 5

Mediators: Means and standard deviations for each of the three conditions as well as the results of the omnibus and planned contrasts (as indicated by subscripts) for determining where conditions differ on mediator variables.

<table>
<thead>
<tr>
<th>Mediator:</th>
<th>Mean (SD)</th>
<th></th>
<th></th>
<th>F(2,118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social</td>
<td>Nonsocial</td>
<td>Task</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Experience</td>
<td>Experience</td>
<td></td>
<td>F(2,118)</td>
<td>p</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positivity Resonance</td>
<td>73.24 (16.35)</td>
<td>70.33 (16.89)</td>
<td>69.27 (15.40)</td>
<td>0.70</td>
<td>.487</td>
</tr>
<tr>
<td>Pleasant Emotions</td>
<td>2.37 (0.69)</td>
<td>2.33 (0.55)</td>
<td>2.32 (0.53)</td>
<td>0.09</td>
<td>.917</td>
</tr>
<tr>
<td>Unpleasant Emotions</td>
<td>0.82 (0.59)</td>
<td>0.86 (0.60)</td>
<td>0.92 (0.60)</td>
<td>0.29</td>
<td>.746</td>
</tr>
<tr>
<td>Duration of social interaction</td>
<td>0.58 (0.21)</td>
<td>0.56 (0.22)</td>
<td>0.52 (0.23)</td>
<td>1.02</td>
<td>.363</td>
</tr>
<tr>
<td>Frequency of social interaction</td>
<td>8.95 (4.08)\textsubscript{a}</td>
<td>9.71 (4.38)\textsubscript{b}</td>
<td>7.10 (3.17)\textsubscript{a,b}</td>
<td>4.53</td>
<td>.027</td>
</tr>
</tbody>
</table>

*Note.* Results for the planned contrasts are indicated by subscripts: Means that share a subscript within a row are significantly different at \( p < .05 \) or greater.
Table 6

Exploratory Variables: Descriptive Statistics for Each Condition and Results of the Omnibus Comparing Differences in Change in the Exploratory Process Variable by Condition.

| Exploratory processes: | Mean (SD)         |          |          |          |          |           |           |           |
|-----------------------|-------------------|----------|----------|----------|----------|-----------|-----------|
|                       | Social Experience | Nonsocial Experience | Task |           |           |           |           |
|                       | Pre               | Post     | Pre      | Post     | Pre      | Post      |           |
| RMET                  | 27.41 (3.93)      | 27.67 (3.78) | 26.53 (4.12) | 25.89 (5.86) | 27.31 (4.68) | 27.37 (4.67) | 1.15 | .322 |
| Social Support        | 4.03 (0.58)      | 4.01 (0.61) | 3.95 (0.55) | 3.97 (0.53) | 3.99 (0.56) | 4.00 (0.56) | 0.03 | .976 |
Figure 2

A: Average Marginal Effect of Social Experience with 95% CIs

Note. This plot depicts the age at which the 95% confidence interval does not include zero, thus demonstrating that at ages 52 and above, the social experience focus condition demonstrates significantly fewer illness symptoms relative to the task focus condition.

B: Average Marginal Effect of Non-Social Experience Condition with 95% CIs

Note. This plot depicts the age at which the 95% confidence interval does not include zero, thus demonstrating that at ages 43 and above, the nonsocial experience focus condition demonstrates significantly fewer illness symptoms relative to the task focus condition.
Table 7

Mediational Path Analysis: The Effect of Condition, Through Mediator, on Changes in Loneliness

<table>
<thead>
<tr>
<th>Contrast</th>
<th>Mediator: Positivity Resonance</th>
<th>Mediator: N of Social Episodes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta_a$</td>
<td>$\beta_b$</td>
</tr>
<tr>
<td>$D_1$: Social vs Task</td>
<td>-.23</td>
<td>-.04*</td>
</tr>
<tr>
<td>$D_2$: Social vs Nonsocial</td>
<td>-.21</td>
<td>-.04*</td>
</tr>
</tbody>
</table>

*p < .05
Table 8

**Standardized Coefficients for Regression of Primary Outcome Variables on Positivity Resonance, Positive Emotions, Duration of Social Interaction, and Frequency of Social Interaction**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>T2 Flourishing</th>
<th>T2 Loneliness</th>
<th>T2 Illness Symptoms</th>
<th>RSA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE&lt;sub&gt;B&lt;/sub&gt;</td>
<td>β</td>
<td>p</td>
</tr>
<tr>
<td>T1 Primary Outcome</td>
<td>0.61</td>
<td>.05</td>
<td>.66</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Positivity Resonance&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0.12</td>
<td>0.03</td>
<td>.25</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Model 2a</td>
<td>T1 Primary Outcome</td>
<td>0.59</td>
<td>.05</td>
<td>.63</td>
</tr>
<tr>
<td>Positivity Resonance</td>
<td>0.09</td>
<td>0.29</td>
<td>.19</td>
<td>.002</td>
</tr>
<tr>
<td>Pleasant Emotions</td>
<td>0.19</td>
<td>0.08</td>
<td>.15</td>
<td>.016</td>
</tr>
<tr>
<td>Model 2b</td>
<td>T1 Primary Outcome</td>
<td>0.60</td>
<td>.05</td>
<td>.65</td>
</tr>
<tr>
<td>Positivity Resonance</td>
<td>0.12</td>
<td>0.03</td>
<td>.34</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Dur. Social Interaction</td>
<td>0.13</td>
<td>0.19</td>
<td>.03</td>
<td>.504</td>
</tr>
<tr>
<td>Model 2c</td>
<td>T1 Primary Outcome</td>
<td>0.61</td>
<td>0.05</td>
<td>.66</td>
</tr>
<tr>
<td>Positivity Resonance</td>
<td>0.11</td>
<td>0.03</td>
<td>.24</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Freq. Social Interaction</td>
<td>0.02</td>
<td>0.01</td>
<td>.09</td>
<td>.102</td>
</tr>
</tbody>
</table>

*Note.* The dependent variable in each of these models is the T2 assessment of the primary outcome variable. For each model, the T1 assessment of the primary outcome variable was included as a predictor, thus these findings can be interpreted as the change in each primary outcome variable from T1 to T2.

<sup>1</sup> I divided composite scores by 10 to put positivity resonance on a 10-point scale instead of a 100-point scale. This transformation makes it easier to interpret the unstandardized betas. Otherwise, a one-unit change in the original 100-point positivity resonance yielded impractically small unstandardized betas.
REFERENCES


