Everyone Else Is Having Fun Except Me:
Investigating the Effect of Emotional Pluralistic Ignorance on Loneliness

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Abstract of Dissertation

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Loneliness is a pervasive problem that has serious implications for psychological and physical health. According to the cognitive discrepancy model of loneliness, loneliness arises when individuals perceive a difference between their desired and actual social relationships. Using a sample of college-age adults, the current study examined emotional pluralistic ignorance as a contributor to the perceived discrepancy by influencing a person's desired relationships in three domains: with family, friends, and romantic partners. Results showed evidence of moderated mediation in friendships, with relationship dissatisfaction mediating the association between emotional pluralistic ignorance and loneliness. Further, the mediation was strongest among participants who had a high tendency to engage in social comparisons.

Table of Contents

Abstract of Dissertation..... iii

List of Figures.....v

List of Tables.....vi

Introduction..... 1

The Loneliest Generation..... 1

The Multidimensional Nature of Loneliness..... 1

The Clinical Significance of Loneliness..... 3

The Cognitive Discrepancy Model of Loneliness..... 6

Emotional Pluralistic Ignorance..... 8

Social Comparison Orientation..... 13

The Present Research..... 15

Method..... 18

Results..... 25

Discussion..... 35

References..... 46

List of Figures

Figure 1. A Conceptual Diagram of the Hypothesized Moderated Mediation Model…...63

Figure 2. A Statistical Diagram of the Hypothesized Moderated Mediation Model…....64

Figure 3. A Depiction of the Association Between Negative Emotional PI and Friendship Dissatisfaction as a Function of Social Comparison Orientation Level…….....65

Figure 4. A Depiction of the Conditional Indirect and the Direct Effect of Negative Emotional PI on Loneliness in Friendships……...66

Figure 5. A Depiction of the Association Between Positive Emotional PI and Friendship Dissatisfaction as a Function of Social Comparison Orientation Level…….....67

Figure 6. A Depiction of the Conditional Indirect and the Direct Effect of Positive Emotional PI on Loneliness in Friendships……...68

List of Tables

Table 1. Emotional PI Scores for Negative and Positive Experiences……..53

Table 2. Means, Standard Deviations, and Correlations for Primary Variables in Friendships and Family Relationships……...54

Table 3. Means and Standard Deviations for Primary Variables by Gender…….....55

Table 4. Means and Standard Deviations for Primary Variables by Race and Ethnicity…….....56

Table 5. Estimation Errors for Participants in Romantic Relationships……....57

Table 6. Means, Standard Deviations, and Correlations of Primary Variables for Participants in Romantic Relationships…….....58

Table 7. Constructing the Conditional Indirect Effects of Negative Emotional PI on Loneliness in Friendships Through Relationship Dissatisfaction for Various Values of Social Comparison Orientation…….59

Table 8. Bootstrap Confidence Intervals for Three Conditional Indirect Effects of Negative Emotional PI on Loneliness in Friendships……....60

Table 9. Constructing the Conditional Indirect Effects of Positive Emotional PI on Loneliness in Friendships Through Relationship Dissatisfaction for Various Values of Social Comparison Orientation…….....61

Table 10. Bootstrap Confidence Intervals for Three Conditional Indirect Effects of Positive Emotional PI on Loneliness in Friendships…….62

Introduction

Artist Gemma Correll created a drawing to raise awareness of mental health struggles for the nonprofit organization, Mental Health America. The image depicts a group of people standing under one large thought bubble with the text, "Everyone else has it together except me." While they all share the same thought, a separate, much smaller trail of bubbles rises from each person, indicating that they are unaware of this similarity. Each person believes they are alone in the experience of something hidden and private.

The Loneliest Generation

In 2018, the health insurer Cigna conducted a nationwide survey of more than 20,000 U.S. adults ages 18 years and older to study loneliness. The survey found that nearly half (46%) of Americans reported sometimes or always feeling alone. Even more alarming, the survey showed that those considered to be members of Generation Z (born 1997-2002) and Millennials (1981-1996) reported feeling the loneliest compared to older generations: those in Generation X (born 1965-1980), Baby Boomers (born 1946-1964), and Traditionalists (born before 1946). Generation Z surpassed the total average national loneliness score in the U.S. of 44, causing the researchers to give the nation's youngest adults the title of "the loneliest generation." The current research hopes to clarify an aspect of social cognition that explains how loneliness arises in young adults.

The Multidimensional Nature of Loneliness

Loneliness is a multidimensional construct (Killeen, 1998; Rubenstein & Shaver, 1982; Weiss, 1973). Weiss (1973) created a typology of loneliness with deficiencies in certain relationships eliciting different experiences of loneliness. According to Weiss's

typology, emotional loneliness "results from the lack of a close, intimate attachment to another person" while social loneliness "results from the lack of a network of social relationships in which the person is part of a group of friends who share common interests and activities" (Russell, Cutrona, Rose, & Yurko, 1984). DiTommaso and Spinner (1993) proposed a tripartite typology of loneliness that separated the construct of emotional loneliness into family-based and romantic-based types of loneliness. By separating the family and romantic domains, DiTommaso and Spinner's (1993) approach expanded Weiss's typology by creating two conceptually distinct domains that the single broad construct of "emotional loneliness" fails to capture. Using the tripartite model of loneliness, individuals can report experiencing one type of loneliness while being completely satisfied in other relationships (DiTommaso & Spinner, 1997). A multidimensional approach is especially fitting for examining loneliness in the young adult population, the group Cigna identified as being most at risk of loneliness, because of the major social transitions that young adults experience. For example, a student might have many friends at college but miss family members who live far away, and thus the student experiences loneliness in one relationship domain but not another. Another student might have the support of loving friends and family members but long for the romantic intimacy of a significant other and so still reports being lonely. Using a multidimensional approach to study loneliness allows the current research to explore its layered experience, while assessing loneliness using a single overall score does not accurately reflect differences in loneliness based on the type of relationship, failing to capture the complexity of the experience.

The multidimensional model of loneliness has been studied in previous research. Using a sample of undergraduate students, Bernardon, Babb, Hakim-Larson, and Gragg (2011) found that students with a secure attachment style reported lower levels of family, social, and romantic loneliness compared to those with insecure attachment styles. Individuals with insecure attachment reported greater loneliness in all three relationship domains. Furthermore, Bernardon et al. (2011) found that university students reported significantly higher levels of romantic loneliness compared to family and social loneliness, supporting a multidimensional approach by suggesting that people can report being lonely even if their needs are met in certain social contexts but not others. This finding might result from the common expectation that college students develop autonomy and independence from their parents (Arnett, 2000). This independence involves establishing a romantic relationship, which represents a primary task during the transition to adulthood (Seiffge-Krenke & Gelhaar, 2008). Indeed, when Cutrona (1982) asked college students what precipitated their loneliness, the three most frequent responses were leaving family and friends to begin college, breaking up with a romantic partner, and having problems with a friend or relative.

The Clinical Significance of Loneliness

Research has often conflated the constructs of loneliness and depression (Segrin, 1998) when the two are conceptually and empirically distinct. Using a sample of middle-aged and older adults, Cacioppo, Hughes, Waite, Hawkley, and Thisted (2006b) asked participants to complete both the revised UCLA Loneliness Scale and a measure of depression. The researchers conducted a factor analysis of all the items and found that those from the UCLA Loneliness Scale fell into clusters that were separate from the items

of the depression scale. The analyses showed that loneliness and depressed affect, while correlated, are two distinct dimensions of experience. Loneliness involves appraisals specifically in the *social* domain of one's life whereas depression is a global condition that encompasses multiple domains (Boivin, Hymel, & Bukowski, 1995). Hawkley, Burleson, Berntson, and Cacioppo (2003) found that loneliness was related to fewer positive and more negative emotions during social interactions. Specifically, loneliness was significantly correlated with less intimacy, comfort, and understanding and more caution, distrust, and conflict. Furthermore, Hawley et al. (2003) found that the effects of loneliness on the quality of social interactions were present after controlling for depression. Put simply, depression reflects how people feel generally, while loneliness reflects how they feel about their social relationships specifically.

The importance of examining loneliness in its own right comes into stark relief given its effects on cognition, mood, and self-regulation. Using a sample of college students, Cacioppo et al. (2006a) experimentally induced participants to feel lonely by using scripts designed to guide participants to re-experience moments in their lives that evoked profound feelings of either loneliness or social connection. Before and after using the scripts, the researchers administered the revised UCLA Loneliness Scale to ensure that the scripts induced the desired emotional state. Compared to those induced to feel low in loneliness, students who had been induced to feel high in loneliness reported lower levels of social support; higher levels of shyness; poorer social skills; lower self-esteem, optimism, and positive mood; and higher anger, anxiety, fear of negative evaluation, and negative mood. In addition to psychological consequences, researchers have found that loneliness is associated with physical health problems. Pressman et al. (2005)

investigated the antibody response to the influenza vaccination in a sample of college freshmen. The researchers found that high levels of loneliness throughout the semester were associated with poorer antibody response. Loneliness was also associated with greater psychological stress and negative affect, less positive affect, poorer sleep efficiency and quality, and elevations in levels of cortisol.

The effects of chronic loneliness further underscore the significance of studying it. Hawkley and Cacioppo (2007) found that, by middle age, the health habits of lonely people had become worse than their socially connected counterparts. While lonely young adults did not differ from their peers in their exercise habits, assessed either by frequency of activity or by total hours per week, socially connected older adults were 37% more likely than lonely older adults to have engaged in some type of vigorous physical activity in the past two weeks. The researchers saw the same pattern regarding diet (Hawkley & Cacioppo, 2007). Among young adults, eating habits did not differ substantially between the lonely and not lonely. However, among the older adults, loneliness was associated with a higher percentage of daily calories from fat. In a sample of 58- to 68-year-old participants, Hawkley, Thisted, Masi, and Cacioppo (2010) found that loneliness at the study's onset predicted increases in systolic blood pressure 2, 3, and 4 years later. The effect of loneliness on systolic blood pressure was independent of cardiovascular risk factors, medications, health conditions, and the effects of depressive symptoms, social support, perceived stress, and hostility. In addition to less physical activity, a fattier diet, and increased blood pressure, researchers have identified poorer sleep quality as another correlate of loneliness. Hawkley, Preacher, and Cacioppo (2010) examined the association between daily feelings of loneliness and subsequent feelings of daytime

dysfunction, operationalized as fatigue, low energy, and sleepiness, in a sample of middle-aged adults. The researchers found that the effect of loneliness on daytime dysfunction was independent of sleep duration, suggesting that the same amount of sleep is less restorative when individuals feel lonelier.

The Cognitive Discrepancy Model of Loneliness

The cognitive discrepancy model is the most common conceptualization of loneliness used in empirical social research (Stein & Tuval-Mashiach, 2015). Developed by Perlman and Peplau (1981), the cognitive discrepancy model posits that loneliness arises when people perceive a discrepancy between the relationships that they want and those that they have (Cacioppo & Patrick, 2008; Peplau & Perlman, 1982). This definition of loneliness underscores a cognitive element – that is, loneliness follows the perception that one's social relationships are inadequate in some way. In other words, the desired relationships form a standard against which people judge their current relationships. Loneliness develops when current relationships fall short of this standard.

Therefore, the cognitive discrepancy model hypothesizes that an increase in the number of relationships will not necessarily reduce a person's loneliness. Lonely individuals can have the same number of relationships as non-lonely people but still experience loneliness. Cognitive processes, such as the subjective appraisal of relationship quality (relative to expectations), predict loneliness more than quantitative or objective factors, such as frequency of social contact or number of friends (Asher & Paquette, 2003; Cutrona, 1982; Jones, 1982; Wheeler et al., 1983). For example, not all people with small social networks are lonely (Fischer & Phillips, 1982), and a person's total number of friends is not an accurate predictor of loneliness (Jones, 1982).

Researchers have explicitly examined cognitive discrepancies in the context of social relationships and loneliness. Archibald, Bartholomew, and Marx (1995) examined the cognitive discrepancy model of loneliness using a sample of high school sophomores. The researchers assessed the participants' actual levels of social activity; an actual-ideal discrepancy from participants' personally-defined, optimal level of social activity; and an actual-typical discrepancy from a socially-defined, normative standard of social activity. Normative standards were derived from using participants' perceptions of others' social lives as the measure against which they evaluated their own social life. Archibald et al. (1995) assessed loneliness using the revised UCLA Loneliness Scale. The researchers found that both actual-ideal and actual-typical discrepancies were associated with loneliness, but these associations were greatly reduced after controlling for actual levels of social activity. Given that actual-ideal and actual-typical discrepancies added only minimally to the prediction of loneliness after controlling for actual levels of social activity, Archibald et al. (1995) concluded that their results provided limited support for a cognitive discrepancy model of loneliness.

Russell, Cutrona, McRae, and Gomez (2012) also used data from a sample of high school sophomores to examine the relationship between desired and actual social contact and feelings of loneliness. The researchers found support for the cognitive discrepancy model for measures of close friendships. Specifically, Russell et al. (2012) found that the discrepancy between the students' ideal and actual number of close friends had a nonlinear relationship to feelings of satisfaction with close friendships and loneliness, after controlling for the number of close friends.

The limited range of social relationships that both Archibald et al. (1995) and Russell et al. (2012) studied presents a limitation. Russell et al. (2012) examined only close friendships, and while Archibald et al. (1995) collected data on participants' romantic relationships, only 15% of students were involved in romantic relationships. The current research addressed this limitation by investigating loneliness within a college-age population, where romantic relationships are more likely to be prevalent. Both studies also did not assess loneliness in family relationships, another limitation that the current study addresses. Additionally, both studies are limited by the use of a unidimensional measure of loneliness – namely, the UCLA Loneliness Scale. As described above, prior research has indicated that loneliness is a multidimensional construct with deficiencies in different types of relationships giving rise to different types of loneliness. The current study assesses distinct forms of loneliness by using a multidimensional measure of loneliness.

Emotional Pluralistic Ignorance

The current study examines pluralistic ignorance as an alternative cognitive discrepancy that explains loneliness. Pluralistic ignorance occurs when individuals believe that their private attitudes and judgments differ from those of others, even though their public behavior is identical (Miller & McFarland, 1991). Misperceptions of this nature could widen the gap between one's desired relationships and actual relationships, and give rise to greater loneliness. Like the picture described in the beginning, these misperceptions, caused and maintained by what is observable, can lead people to believe that they are alone in their thoughts and not recognize that others might feel the same. Research on pluralistic ignorance has shown that people's public behavior can be an

intentional misrepresentation of their true feelings, creating a social norm that does not truthfully reflect their private emotions or values. In a classic study of pluralistic ignorance, people reported believing that their fellow community members unanimously supported the local church's objection to card playing and smoking because opposition was so ubiquitous in public. However, the same people privately admitted that they were actually *against* the church's stance (Schanck, 1932). Schanck's (1932) study shows that there is a gap between what people truly feel and believe and how they choose to present themselves to others. This purposeful, public misrepresentation of private attitudes can create false social norms, as well as a belief that one's private attitudes and judgments differ from those of society, even though one's public behavior is the same.

Pluralistic ignorance is the cognitive process that occurs when people believe that they are the only ones who experience a discrepancy between what they truly feel and what their behavior shows. In contrast, they assume that other people's behaviors accurately reflect their true feelings. By propagating a mismatch between what people express publicly and what they experience privately, pluralistic ignorance can create an erroneous social norm.

Multiple studies have explored pluralistic ignorance within college populations. Prentice and Miller (1993) found that college students believed that they were more uncomfortable with campus alcohol practices than the average student, showing a divergence between private attitudes and the misperceived social norm. The students' perceived deviance, resulting from pluralistic ignorance, correlated with measures of campus alienation. Researchers have also examined whether the beliefs of individual cadets at the United States Air Force Academy about gender biases in fitness and

physical performance standards differed from their perception of their peers' beliefs (Do, Samuels, Adkins, Clinard, & Koveleskie, 2013). They found that cadets *wrongly* believed that their peers held more sexist beliefs than they actually did. Many cadets privately rejected biases against female cadets while incorrectly assuming that the cadet student body accepted them. The researchers hypothesize that a minority of openly sexist cadets publicly express their viewpoints, while egalitarian ones stay silent out of fear of standing out and challenging the perceived status quo. The vocal subset might have led all cadets to believe that sexist beliefs are the norm, creating an environment of pluralistic ignorance (Do et al., 2013). As the aforementioned studies illustrate, the two defining features of pluralistic ignorance that make it particularly powerful in defining social norms are: a divergence of subjective from actual norms and an illusion of universality (Prentice and Miller, 1993).

More recently, Jordan et al. (2011) investigated a specific type of pluralistic ignorance that focuses on emotions and relationships: emotional pluralistic ignorance (hereafter referred to as "emotional PI"). Emotional PI occurs when people perceive others in social contexts and believe that what they see (that is, the behavior they are able to observe) truthfully reflects how those people feel (their inner emotional experience), both in the moment and in private settings. Everyone really *is* having that much fun at the party, and you are the only one secretly feeling a little out-of-place and lonely. Jordan et al. (2011) hypothesized that emotional PI occurs for two reasons. First, people often appear happier in social settings because of impression-management concerns that dictate a preference for the expression of positive emotions over negative ones – for example, smiling and laughing at a party instead of pouting and sulking (Schlenker & Pontari,

2000). Relatedly, because people can observe others only in social contexts and not in solitary ones (watching others at a party versus seeing someone alone in a dormitory), they are more likely to observe others expressing positive emotions rather than negative ones (Diener, Larsen, & Emmons, 1984; Larson, Csikszentmihalyi, & Graef, 1982). The inability to observe others in solitary settings, where they are more likely to feel bad, might lead to what Jordan et al. (2011) describe as a biased sampling of others' lives, causing people to underestimate the prevalence of negative experiences among peers. Jordan et al. (2011) assessed emotional PI by asking a sample of university students to describe their own negative and positive experiences. Examples of negative experiences included "thought about distant friends/family" and "received low grade." Examples of positive experiences included "attended fun party" and "had great meal." Jordan et al. (2011) found that lower estimations of the prevalence of others' negative experiences relative to their actual experiences predicted greater loneliness and rumination and lower life satisfaction. In the current study, we refer to participants' underestimation of the prevalence of their peers' negative experiences with the term "negative emotional PI." Participants also reported feeling lonelier when they thought other people were happier than they actually were. We refer to participants' overestimation of the prevalence of their peers' positive experiences with the term "positive emotional PI." Jordan et al.'s (2011) findings support their hypothesis that loneliness increases when people engage in a comparison of experiences and mistakenly believe that others have more pleasant lives than they actually do.

From Jordan et al.'s (2011) finding that emotional PI is associated with loneliness, the current study seeks to identify a mechanism through which this occurs and a

dispositional tendency that impacts differences in individuals' responses to emotional PI. While Jordan et al. (2011) found an association between negative and positive emotional PI and loneliness, it is unclear precisely why these constructs are related. Exactly how do misperceptions of the social norm – thinking that negative experiences are rarer and positive experiences more frequent among peers – cause people to feel lonely? One mechanism that might mediate the association between emotional PI and loneliness is dissatisfaction with social relationships. The current study hypothesized that emotional PI creates misperceptions of others' relationships and social networks that cause people to feel dissatisfied with their own relationships by comparison. We hypothesized that this dissatisfaction, in turn, contributes to loneliness.

The present research conceptualizes emotional PI as a type of cognitive discrepancy that leads to loneliness. In other words, emotional PI distorts the social norms of observed experiences, widening the gulf between the relationships that people believe are the social norm versus their own relationships. As a result of negative and positive emotional PI, the perceived discrepancy that defines loneliness is no longer a comparison between the relationships that people want and those that they have on an individual level. Now, the scope has widened to include a person's peers. In other words, emotional PI, with its emphasis on social norms, casts the cognitive discrepancy of loneliness on a much larger scale. The discrepancy no longer occurs as a perception on the individual level but rather as one that occurs with social norms in mind. Now, the individual asks, "How do the social relationships that I have compare to the social relationships that I think *everyone else* has?" Emotional PI might influence the formation of these social comparisons by propagating an erroneous social norm. The bias of

emotional PI creates skewed reference points from the relationships that people watch others have, which they then use to evaluate their own social relationships. As Jordan et al. (2011) reason, emotional PI occurs when people observe the outward behavior of others in social settings and do not have access to their actual, internal experiences. Especially if these experiences are negative, they are more likely to occur in solitary settings. As a result of being blind to the negative experiences that play behind the scenes, people are unaware of a loneliness that might actually be pervasive and normative.

Social Comparison Orientation

The current study also examines if personality affects one's susceptibility to the impact of emotional PI on relationship dissatisfaction. One factor that might affect the strength of the relationship between emotional PI and dissatisfaction with one's social relationships is social comparison orientation. Social comparison orientation (SCO) is a dispositional tendency to compare oneself to others (Gibbons & Buunk, 1999). When people with high SCO tendencies perceive the situation of a "better-off" person as unlikely to occur for themselves or the situation of a "worse-off" target as a possibility for themselves, they respond with a more negative mood (Buunk & Brenninkmeijer, 2001; Buunk, Ybema, Gibbons, & Ipenburg, 2001; Buunk, Zurriaga, Gonzalez-Roma, & Subirats, 2003). In regard to emotional PI, a high level of SCO could make it more likely for people to compare their own experiences to others, more likely to notice discrepancies, and more likely to believe that their own emotional experiences are more negative and less positive compared to others.

Buunk, Groothof, and Siero (2007) examined the role of social comparison in evaluating participants' satisfaction with their social lives within a sample of first-year medical students, The researchers created a downward comparison condition where they exposed participants to a bogus interview with a fellow first-year student who had a very dissatisfying social life and an upward comparison condition where they exposed participants to a student with a very satisfying social life. In the upward condition, the student was acquainted with many classmates, formed good friendships with some of them, got along well with roommates, and could always find someone with whom to have fun or have a good conversation. In the downward condition, the student had no friends, had hardly any contact with roommates, and was alone often, watching television or studying. Buunk et al. (2007) found that amongst the high SCO participants only, those in the upward social comparison group reported lower satisfaction with their social life than those in the downward social comparison group. These findings illustrate that a disposition towards social comparison increases susceptibility to perceived discrepancies between one's life and others' lives. These findings also support the possibility that SCO could enhance the influence of emotional PI on relationship satisfaction: If one already misperceives the emotional experiences of others, the tendency to compare oneself to others may widen the gap between perceptions of one's actual relationships and social norms.

Therefore the present research examined SCO as a factor that moderates the proposed relationship between emotional PI and dissatisfaction with social relationships. The phenomenon of emotional PI activates the comparison of emotional experiences that Jordan et al. (2011) found to be associated with loneliness. Specifically, the tendency to

engage in social comparisons between one's own emotional experiences and those of others and to feel dissatisfaction as a result will depend on one's SCO.

The Present Research

The current study proposes that negative and positive emotional PI are associated with loneliness through their potential to widen the discrepancy between the relationships that people believe are the norm and those that they have. The ignorance of the full range of other people's experiences creates a false impression that they have very positive lives with few problems or frustrations. In turn, the misperception creates a false social norm against which people evaluate the social relationships in their own life – whether friends, family members, or romantic partners – and feel dissatisfied with them. Consequently, by perpetuating a false norm, we investigate whether the cognitive discrepancy of emotional PI can contribute to relationship dissatisfaction and ultimately, to loneliness.

We hypothesize that both negative and positive emotional PI are present in college students (Hypothesis 1), and that emotional PI is related to greater loneliness via its effects on dissatisfaction with one's social relationships (Hypothesis 2). Specifically, by distorting social norms, emotional PI may affect one's "comparison level" for relationships. Extending the cognitive discrepancy model of loneliness, we hypothesized that relationship dissatisfaction mediates the association between emotional PI and loneliness. Distorted social norms may induce more loneliness because they can create a greater discrepancy between the relationships that people have versus the relationships that they believe everyone else is having.

The current study also hypothesized that SCO influences the effects of emotional PI on perceived relationship quality and loneliness. As stated earlier, SCO indicates that

there are individual differences in people's inclination to compare themselves to others and in the effects that those comparisons have (Bunck et al., 2007). Therefore, we hypothesized SCO could influence the extent to which emotional PI influences people's assessments of their relationships. Based on these findings, the current study predicted that emotional PI will differentially affect people's dissatisfaction with their social relationships, depending on their SCO. See Figure 1 for the current study's conceptual model.

In summary, the current study has the following hypotheses:

Hypothesis 1 (H1): Participants will underestimate the prevalence of their peers' negative experiences (H1a), hereafter referred to as "negative emotional PI." Participants will overestimate the prevalence of their peers' positive experiences (H1b), hereafter referred to as "positive emotional PI."

Hypothesis 2 (H2): Greater emotional PI of both types will be associated with greater loneliness via their effects on relationship dissatisfaction. Social comparison orientation (SCO) will moderate the indirect paths from negative and positive emotional PI to specific loneliness domains via dissatisfaction in the respective relationship types. Specifically, the emotional PI → relationship dissatisfaction → loneliness effect will be stronger for people with a higher tendency to engage in social comparisons.

Emotional PI is the misperception of other people's emotions because of their intentional suppression or misrepresentation of those emotions in public settings (Jordan et al., 2011). By proposing that emotional PI creates unrealistic social norms that lead to greater dissatisfaction with one's social relationships, the current study examines whether relationship dissatisfaction mediates the association between emotional PI and loneliness.

Furthermore, the current study examined if people's tendency to engage in social comparisons, known as social comparison orientation, moderates the relationship between emotional pluralistic ignorance and relationship dissatisfaction. These issues are examined within a population of young adults as they navigate a new social context – college.

Last, the current study expands on previous research on emotional PI and loneliness by including a multidimensional measure of loneliness. Jordan et al. (2011) assessed loneliness using the short-form version of the UCLA Loneliness Scale (Hays & DiMatteo, 1987; Russell, Peplau, & Cutrona, 1980), which measures loneliness as a unidimensional construct. Given evidence suggesting that loneliness is a multidimensional construct (DiTommaso & Spinner, 1997; Hoza, Bukowski, & Beery, 2000), using a single overall score fails to capture individuals' lived experiences of loneliness. The present research extends Jordan et al.'s (2011) findings by using a multidimensional scale of loneliness, the Social and Emotional Loneliness Scale for Adults – Short Form (SELSA-S; DiTommaso, Brannen, & Best, 2004). Consistent with DiTommaso and Spinner's (1993) tripartite theory of loneliness, the SELSA-S assesses loneliness in three types of relationships: family, social, and romantic. By using the SELSA-S, the present research will examine the multidimensional nature of loneliness in the social domains that are relevant for young, college-aged adults – namely their relationships with family, friends, and romantic partners as they navigate transitions and shifting social contexts. Since individuals can report one type of loneliness while being satisfied in other social relationships, using the SELSA-S captures this reality by

allowing a student to report, for example, satisfaction in family relationships but loneliness in romantic relationships.

Method

Participants

The study's sample included 210 individuals, 86% female and 14% male, aged 17-26 years (M = 19.6 years, SD = 1.5) from a university in Washington, DC. For gender identification, one participant self-reported as non-binary. The sample was 61% White; 15% Asian; 8% Spanish, Hispanic, or Latino; 6% Black or African American; 6% self-identified as being from multiple races; 3% self-identified as "other," and <1% self-identified as Native Hawaiian or Pacific Islander. Most participants were single (69%), and 30% self-reported as being in a relationship. One individual was divorced, and one individual self-reported as having "multiple partners." Regarding class year, 33% were sophomores, 29% were freshmen, 21% were juniors, and 17% were seniors.

Measures

Emotional Pluralistic Ignorance

To assess negative and positive emotional PI, the current study used the same 12 common experiences, six negative and six positive, that Jordan et al. (2011) used. The six negative experiences were: had a fight/argument, thought about distant friends/family, thought about enormous workload, was rejected by a boy/girl, received a low grade, and thought about bad personal health habits. The six positive experiences were: received a high grade, attended a fun party, participated in athletics, went out with friends, talked to distant friends/family, and had a great meal.

Estimated prevalence of each experience (peer-prevalence estimate): To obtain a measure of perceived peer norms, we asked participants to estimate what percentage of their classmates they think had each experience at least once in the past month. For example, if participants thought that about one-fourth of their classmates had the experience, they would enter "25%." We instructed participants to restrict their answers to integers between 0 and 100.

Actual prevalence of each experience: Next, we asked participants to report whether they had the experience themselves during the same time period by selecting "Yes" or "No." For example, one item asks participants, "What percentage of *your classmates* do you think thought about distant friends/family at least once in the past month?" followed by "Have *you* thought about distant friends/family at least once in the past month?" We assessed the actual prevalence of each experience by calculating the percentage of participants who answered "yes" to each question.

Negative emotional PI scores: Consistent with our definition of negative emotional PI, we assessed how much each participant *underestimated* the peer prevalence of negative experiences. A negative emotional PI score for each participant was computed as: (average actual prevalence) − (average peer-prevalence estimate). For example, if the average actual prevalence across negative experiences were 70 and a participant's average peer-prevalence estimate were 40, the participant's negative emotional PI score would be 30. Therefore, higher values reflect a greater underestimation of negative experiences, interpreted as greater negative emotional PI. In other words, a higher score indicates that the actual prevalence of negative experiences is higher than the participant's estimated prevalence.

Positive emotional PI scores: Consistent with the definition of positive emotional PI, we assessed how much each participant *overestimated* the peer prevalence of positive experiences. Therefore, a positive emotional PI score for each participant was computed as: (average peer-prevalence estimate) − (average actual prevalence). For example, if a participant's average peer-prevalence estimate were 80 and the average reported prevalence across positive experiences were 60, the participant's positive emotional PI score would be 20. Therefore, higher scores reflect a greater overestimation of positive experiences, interpreted as greater positive emotional PI. In other words, a higher score indicates that the actual prevalence of positive experiences is lower than the participant's estimated prevalence – that is, a participant *overestimated* the peer prevalence of positive experiences.

Dissatisfaction with Social Relationships

Participants completed the Relationship Assessment Scale (RAS-G) that Renshaw, McKnight, Caska, and Blais (2010) developed to assess satisfaction in relationships with family, friends, and romantic partners. Renshaw et al. (2010) revised the original language of the RAS (Hendrick, 1988), which pertained only to romantic relationships, to apply to other types of relationships. For each type of relationship, participants completed a measure consisting of seven items with responses ranging on a Likert-type scale from 1 (*not satisfied*) to 5 (*very satisfied*). Total scores are calculated by averaging all item responses, including two that are reverse-scored. To make the original scale interpretable for our construct of interest – that is, relationship *dis*satisfaction – we reverse-scored all the items in the original measure, except for the two items that were originally designed to be reverse-scored, which we kept the same. With this change,

higher scores reflect more relationship dissatisfaction, while lower scores reflect less relationship dissatisfaction. We administered the measure for romantic relationships only to 63 participants who indicated that they were currently in a romantic relationship and to the one participant who indicated having multiple partners. The values of Cronbach's alpha for family dissatisfaction, friendship dissatisfaction, and romantic relationship dissatisfaction were .90, .89, and .91, respectively.

Loneliness

Participants completed the Social and Emotional Loneliness Scale for Adults - Short Form (SELSA-S; DiTommaso, Brannen, & Best, 2004). The SELSA-S is a multidimensional measure of loneliness that consists of 15 items rated on a 7-point Likert scale with item responses ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Each item belongs to one of three subscales designed to assess loneliness in the family, social, and romantic domains. Each subscale consists of five statements about feelings of loneliness within the past year. The family loneliness subscale assesses feelings toward family relationships. The social loneliness subscale measures feelings toward being part of a social group – i.e., friendships. The romantic loneliness subscale measures the degree to which participants feel they have significant others in their lives. Mean scores are calculated for each subscale. Higher SELSA-S scores indicate greater loneliness. The family loneliness subscale ($\alpha = .88$), the social loneliness subscale ($\alpha = .82$), and the romantic loneliness subscale ($\alpha = .90$) were all highly reliable.

Social Comparison Orientation

To assess social comparison orientation, participants completed Gibbons and Buunk's (1999) Iowa-Netherlands Comparison Orientation Measure (INCOM). The

INCOM is a self-report measure of the tendency to engage in social comparisons that consists of 11 items ($\alpha = .78$). Participants rate each item on a 5-point Likert scale with responses ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The total score is calculated by summing the responses to each question. Higher scores indicate a greater tendency to engage in social comparison behaviors.

Statistical Analyses

To test H1, we examined whether the actual prevalence of each experience significantly differed from the estimated peer prevalence by conducting single-sample *t* tests. To do this, we computed the percentage of the participants' who self-reported a specific experience (i.e. actual prevalence) and the participants' perceived prevalence of behaviors amongst their peers (i.e. peer estimations). We next computed negative and positive emotional PI scores to examine the magnitude of differences between the participants' actual experiences and their estimates of their peers for each experience (i.e., estimation error). Specifically, for each negative experience, we examined if the estimation error was consistent with our operationalization of negative emotional PI: participants *underestimate* the peer prevalence of negative experiences. In other words, participants think fewer peers had the negative experience than they actually did. For each positive experience, we examined if the estimation error was consistent with our operationalization of positive emotional PI: participants *overestimate* the peer prevalence of positive experiences. In other words, participants think more peers had the positive experience than they actually did.

To test H2, we conducted a conditional process analysis, using PROCESS, a macro for SAS that Hayes developed to conduct tests of moderated mediation (Hayes,

2018) . Instead of using a piecemeal approach that focuses on individual pieces of the model, PROCESS tests the model as a whole by examining whether the weight for the moderator in the function that defines the size of the indirect effect is different from zero. Hayes terms this weight the *index of moderated mediation*. PROCESS provides a 95% bootstrap confidence interval for this index. If zero is not within the interval, we can conclude that there is moderated mediation. Hayes (2018) states that when using PROCESS to test whether an indirect effect is moderated, it does not matter whether an interaction involving one of the paths defining the indirect effect is statistically significant using a formal test. The focus is on the index of moderated mediation (namely, whether it is different from zero). This test of moderated mediation requires only a single inferential test, rather than two using the piecemeal approach. It is based on a statistic that directly quantifies the relationship between the moderator and the indirect effect. Additionally, uncertainty about the relationship between the indirect effect and the moderator can be formally expressed in the form of a confidence interval, which cannot be constructed for the inference using the piecemeal approach.

As depicted in the statistical diagram of Figure 2, we predicted that social comparison orientation (*W*) will moderate the indirect effect through its moderation of the effect of emotional PI (*X*) on relationship dissatisfaction (*M*). The conceptual diagram translates into a set of two equations for the two consequent variables in the model: relationship dissatisfaction and loneliness. The two equations representing this model, depicted in the form of a statistical diagram in Figure 2, are: $M = i_M + a_1X + a_2W + a_3XW + e_M$ and $Y = i_Y + bM + c'X + e_Y$. We hypothesize that emotional PI's indirect effect on loneliness via relationship dissatisfaction depends on social comparison orientation and is

thus called "the conditional effect" and estimated with the function $\Theta_{x \rightarrow M} = a_1 + a_3W$. Grouping terms with *X* and factoring out *X* in the first equation, the effect of emotional PI *(X)* on relationship dissatisfaction (*M*) can clearly be seen as conditional on W: $M = i_M + X(a_1 + a_3W) + a_2W + e_M$.

PROCESS provides a single number to quantify the conditional indirect effect of *X* on *Y* through *M*. This number, the indirect effect of emotional PI on loneliness through relationship dissatisfaction, is the product of the conditional effect ($\Theta_{x \rightarrow M} = a_1 + a_3W$) and the unconditional effect (*b*), the pathway from relationship dissatisfaction to loneliness that is not hypothesized to be moderated. The conditional indirect effect is: $b(\Theta_{x \rightarrow M}) = b(a_1 + a_3W) = a_1b + a_3bW$. This product quantifies how differences in emotional PI (*X*) map onto differences in loneliness (*Y*) indirectly through relationship dissatisfaction (*M*) depending on the value of social comparison orientation (*W*). If the indirect effect of emotional PI (*X*) differs systematically as a function of social comparison orientation (*W*), we have a moderated mediation – that is, we can say that the mediation of emotional PI's effect on loneliness by relationship dissatisfaction is moderated by social comparison orientation.

The index of moderated mediation – that is, the weight for moderator *W* in this function – is a_3b. As explained previously, if this slope is flat (i.e., if $a_3b = 0$), then this means that the indirect effect is not related to the moderator. If this slope is not flat (i.e., if $a_3b \neq 0$), then the indirect effect depends on the moderator, and hence the mediation is moderated. The index of moderated mediation corresponds to how much the indirect effect of emotional PI on loneliness through relationship dissatisfaction changes as social comparison orientation changes by one unit. In other words, a_3b quantifies the rate of

change of the indirect effect of emotional PI (*X*) on loneliness (*Y*) through relationship dissatisfaction (*M*) as social comparison orientation (*W*) changes.

Results

H1: Participants will underestimate the prevalence of their peers' negative experiences, showing negative emotional PI (H1a) – that is, mistakenly believing that fewer people have negative experiences than is actually the case. Participants will overestimate the prevalence of their peers' positive experiences, showing positive emotional PI (H1b) – that is, mistakenly believing that more people have positive experiences than is true.

Table 1 shows the actual prevalence of each experience (i.e., the percentage of participants who self-reported having each experience) and the average of participants' peer-prevalence estimates for each experience (i.e., the estimated percentage of their peers who had each experience). The last column in Table 1 shows the average emotional PI score for each experience. We computed the negative emotional PI score for each experience as the difference between the *actual* prevalence of negative experiences and the *estimated* peer prevalence, so positive values indicated an underestimation. The greater the positive value, the greater the underestimation. With the exception of only one experience (had fight/argument), average estimates of the peer prevalence of all the negative experiences differed significantly from the actual prevalence, *p*s < .0001. Of the six negative experiences, half showed evidence of negative emotional PI – that is, participants significantly underestimated the percentage of their peers who had the experience, supporting H1a. These three experiences were: 1) thought about distant friends/family, 2) thought about an enormous workload, and 3) thought about bad personal health habits. In contrast, participants significantly overestimated the percentage

of their peers who were rejected by a boy/girl and who received a low grade. For each participant, we computed an overall negative emotional PI score, which included only the three negative experiences that met the definitional criteria for negative emotional PI: thought about distant friends/family, thought about enormous workload, and thought about bad personal health habits. The average actual prevalence of these three negative experiences was 92.91. Therefore, we computed the negative emotional PI score for each participant as (92.91 – average peer-prevalence estimate). The Cronbach's coefficient alpha of the three negative experiences that met the definitional criteria for our operationalization of negative emotional PI was 0.60.

For each positive experience, we computed the positive emotional PI score as the difference between the peer-prevalence estimates and the actual prevalences, so the greater the absolute value of the difference, the greater the overestimation. Counter to what we hypothesized in H1b, for all six positive experiences, participants significantly *underestimated* the percentage of their peers who had each positive experience. Though the results were in the opposite direction than we hypothesized – that is, participants *under*estimated the percentage of their peers having each experience instead of overestimating, we created a scale that included all six positive experiences, given that *all* six positive emotional PI scores were statistically significant with the estimation errors in the same direction. For each participant, we computed an overall positive emotional PI as the difference between the estimated peer prevalence and the actual prevalence. The average reported prevalence of the six positive experiences was 84.12%. Therefore, we computed the positive emotional PI score for each participant as (average peer-

prevalence estimate – 84.12). The Cronbach's coefficient alpha of the set of positive experiences used in the construct of positive emotional PI was 0.64.

As a secondary analysis, we also explored emotional PI for each experience for the subgroup of participants who indicated that they were in a romantic relationship (N = 63) to determine if they differed in a meaningful way from their peers who were not in romantic relationships. As illustrated in Table 5, this subgroup was very similar to the whole sample. The emotional PI scores for all six positive experiences were statistically significant underestimations. Participants in romantic relationships tended to underestimate the percentage of their peers who had each positive experience. Regarding negative experiences, similar to the overall group, participants in romantic relationships underestimated the prevalence of the following three experiences: thought about distant friends/family, thought about enormous workload, and thought about bad personal health habits. They also significantly underestimated the percentage of their peers who had a fight or argument, adding a fourth experience that meets the definitional criteria of negative emotional PI (that is, an *under*estimation of the peer prevalence of negative experiences). Like the overall group, participants in a romantic relationship significantly overestimated the percentage of their peers who were rejected by a boy/girl. They also overestimated the peer prevalence of receiving a low grade, but this difference was not statistically significant. It seems that the subgroup of participants who were in romantic relationships may be less prone to making estimation errors – at least regarding negative experiences – than those who were not in a romantic relationship.

Table 2 shows the means and standard deviations for our study's primary variables, along with their intercorrelations for the whole sample. The mean negative

emotional PI score was 16.06. This means that on average, participants demonstrated modest underestimations of their peers' negative experiences. The mean positive emotional PI score was -14.37, indicating that on average, participants underestimated their peers' positive experiences. On the INCOM, the measure used to assess social comparison orientation, the lowest possible score that a participant could get is 11, and the highest possible score is 55. Higher scores indicate greater social comparison orientation. In our sample, responses ranged from a minimum score of 23 to a maximum score of 54. The mean score of social comparison orientation among our participants was 40.08 with a standard deviation of 5.70, indicating relatively high levels of social comparison orientation. On our relationship dissatisfaction measures, the lowest possible score that a participant could get is 1, and the highest possible score is 5. Higher scores indicate more dissatisfaction. The distributions of relationship dissatisfaction with both family and friends were positively skewed, showing that most participants reported having lower levels of relationship dissatisfaction. The mean score of dissatisfaction with family relationships among our participants was 1.77 with a standard deviation of 0.76. The mean score of dissatisfaction with friendships among our participants was 1.86 with a standard deviation of 0.71. Last, the mean score of loneliness in friendships among our participants was 2.26 with a standard deviation of 1.06. The mean score of loneliness in family relationships among our participants was 1.86 with a standard deviation of 1.05.

Tables 3 and 4 summarize the means and standard deviations of the primary variables by gender and then by race and ethnicity respectively. There were no significant associations between gender and the study's primary variables. While the general patterns

for emotional PI look similar across race and ethnicity (i.e., the means are similar), we did not have the statistical power to test for racial or ethnic variations in emotional PI.

Table 2 summarizes correlations between negative and positive emotional PI and the primary study variables for the entire study sample. First, negative and positive emotional PI were negatively correlated with each other (r = -0.49, p < .0001), suggesting that those individuals who showed higher levels of negative emotional PI showed lower levels of positive emotional PI. Second, neither PI index was correlated with loneliness in friendships and loneliness in family relationships, or with dissatisfaction in friendships and dissatisfaction in family relationships. Contrary to expectations, positive emotional PI was negatively correlated with dissatisfaction in friendships (r = -0.14, p < .05) and with dissatisfaction in family relationships (r = -0.16, p < .05). Consistent with the conceptual model, there was a strong positive correlation between relationship dissatisfaction and loneliness in all three relationship domains: dissatisfaction in friendships and loneliness in friendships (r = 0.69, p < .0001); dissatisfaction in family relationships and loneliness in family relationships (r = 0.78, p < .0001); and dissatisfaction in romantic relationships and loneliness in romantic relationships (r = 0.75, p < .0001). There was a significant negative correlation between negative emotional PI and social comparison orientation (r = -.15, p < .05). However, social comparison orientation was not associated with positive emotional PI and was not related to relationship dissatisfaction in friendships or family relationships.

H2: Greater negative and positive emotional PI will be associated with greater loneliness via the relationship dissatisfaction that emotional PI generates. The indirect association between emotional PI (of both types) and loneliness will be moderated by social

comparison orientation (SCO). Specifically, the emotional PI → relationship dissatisfaction → loneliness effect will be stronger for people with a higher tendency to engage in social comparisons.

For each type of social relationship domain (family, friends, and romantic partners), we tested two moderated mediation models: one with negative emotional PI as the predictor variable and another with positive emotional PI as the predictor variable.

Family Relationships and Loneliness Model

With negative emotional PI as the predictor variable (please see variable *X* in figure 2), we tested one moderated mediation model in the social domain of family relationships with the following variables: dissatisfaction in family relationships (the proposed mediator, variable *M*), loneliness in family relationships (the outcome variable *Y*), and social comparison orientation (the proposed moderator, variable *W*). The second model, with positive emotional PI as the predictor variable, included the same three variables. For family relationships, the confidence interval for the index of moderated mediation included zero for both models with negative and positive emotional PI as the predictor variable. Thus, analyses provided no evidence of moderated mediation.

Romantic Relationships and Loneliness Model

This analysis included only participants (N = 63) who reported that they were in a romantic relationship when they completed the study. We again tested two separate moderated mediation models: one with negative emotional PI as the predictor variable and the other with positive emotional PI. Both models included dissatisfaction in romantic relationships as the proposed mediator, loneliness in romantic relationships as

the outcome variable, and social comparison orientation as the proposed moderator. Analyses provided no evidence of moderated mediation.

Friendships and Loneliness Model

Like the other two social relationship domains, we tested two moderated mediation models for friendships: one with negative emotional PI as the predictor variable and the other with positive emotional PI. Both models included dissatisfaction with friendships as the mediator variable, loneliness in friendships as the outcome variable, and social comparison orientation as the moderator variable of the relationship between emotional PI and dissatisfaction. Please refer to the conceptual diagram in Figure 1. As described below, both friendship models yielded evidence of moderated mediation.

In the model with negative emotional PI as the predictor variable, the index of moderated mediation based on 5,000 bootstrap samples was significant: a_3b = 0.0013, 95% CI= .0002 - .0024. We found that social comparison orientation moderated the indirect effect of negative emotional PI on loneliness in friendships through dissatisfaction with friendships. Given that the results supported moderation of the indirect effect, we probed the moderation. The SAS PROCESS macro constructed 95% bootstrap confidence intervals for the conditional indirect effect of negative emotional PI on loneliness in friendships through dissatisfaction with friendships at low (16^{th} percentile, SCO = 34.00), moderate (50^{th} percentile, SCO = 40.00), and high (84^{th} percentile, SCO = 45.84) levels of social comparison orientation. Table 7 shows the three conditional effects of negative emotional PI on loneliness in friendships at values of social comparison orientation ($\Theta_{x\rightarrow M}$) corresponding to the 16^{th}, 50^{th}, and 84^{th} percentiles.

Because we did not hypothesize the effect of relationship dissatisfaction on loneliness to be moderated, it is constant across all values of social comparison orientation (estimated as *b* in Table 7 and depicted as *b* in Figure 2). The last column of Table 7 is the product of the second and third columns and contains the conditional indirect effect of *X* on *Y* through *M*, conditioned on the value of *W* in that row. If two people have a social comparison orientation score of 45.84, the person one unit higher in negative emotional PI is estimated to be 0.0126 units higher in loneliness (because the conditional indirect effect is positive – that is, $\Theta_{x \rightarrow M}$ is positive when $W = 45.84$) as a result of the greater loneliness produced by the greater dissatisfaction (because *b* is positive). As summarized in Table 8, when social comparison orientation was high (84^{th} percentile, $W = 45.84$), negative emotional PI was indirectly and positively related to loneliness in friendships via dissatisfaction with friendships. In people with low and moderate social comparison orientation, the bootstrap confidence intervals straddle zero. Therefore, results of the conditional process analysis suggest that at high levels of social comparison orientation only, greater negative emotional PI leads to greater loneliness in friendships by increasing dissatisfaction with friendships. These findings are also illustrated in Figure 3, which depicts social comparison orientation moderating the effect of negative emotional PI on friendship dissatisfaction. Among people high in social comparison orientation, the greater the negative emotional PI, the greater the dissatisfaction with friendships. Figure 4 provides a visual representation of the direct effect of negative emotional PI on loneliness in friendships. The vertical axis corresponds to the estimated difference in loneliness between two people who differ by one unit in negative emotional PI. The dashed line represents the indirect effect of negative emotional PI on loneliness in

friendships operating through dissatisfaction with friendships. The positive slope of this line means that greater negative emotional PI translates into greater loneliness, more so among people who are high in social comparison orientation. We did not hypothesize the direct effect to be moderated, thus there is only one direct effect of negative emotional PI, which is depicted as a horizontal line.

In the model with positive emotional PI as the predictor variable, the index of moderated mediation based on 5,000 bootstrap samples was statistically significant, a_3b = -0.0016, 95% CI = -.0032 – -.0001. Given that the results supported moderation of the indirect effect, we probed the moderation. PROCESS constructed 95% bootstrap confidence intervals for the conditional indirect effect of positive emotional PI on loneliness in friendships through dissatisfaction with friendships at low (16th percentile, SCO = 34.00), moderate (50th percentile, SCO = 40.00), and high (84th percentile, SCO = 45.68) levels of social comparison orientation. Table 9 shows the three conditional effects of positive emotional PI on loneliness in friendships at values of social comparison orientation ($\Theta_{x\rightarrow M}$) corresponding to the 16th, 50th, and 84th percentiles. Like negative emotional PI, because we did not hypothesize the effect of *M* on *Y* to be moderated, it is constant across all values of W (estimated as *b* in Table 9 and depicted as *b* in Figure 2). If two people have a social comparison orientation score of 45.68, the person one unit higher in positive emotional PI is estimated to be 0.0182 units *lower* in loneliness (because the conditional indirect effect is negative – that is, $\Theta_{x\rightarrow M}$ is negative when *W* = 45.68). At high levels of social comparison orientation, greater positive emotional PI generates lower dissatisfaction, which leads to lower loneliness. As summarized in Table 10, at high levels of social comparison orientation, positive emotional PI is indirectly and

negatively related to loneliness in friendships via friendship dissatisfaction. The negative value of the indirect effect means that greater positive emotional PI translates into less loneliness. Among participants high in social comparison orientation, dissatisfaction in friendships decreases the closer the estimated peer prevalence of positive experiences was to the actual prevalence. These findings are illustrated in Figure 5, which shows social comparison orientation moderating the effect of positive emotional PI on friendship dissatisfaction. Among people high in social comparison orientation, the greater the positive emotional PI, the lower the dissatisfaction with friendships. Figure 6 depicts the direct effect of positive emotional PI on loneliness in friendships. We did not hypothesize the direct effect to be moderated, thus there is only one direct effect of positive emotional PI, which is depicted as a horizontal line. The vertical axis corresponds to the estimated difference in loneliness between two people who differ by one unit in positive emotional PI. The dashed line represents the indirect effect of negative emotional PI on loneliness in friendships operating through dissatisfaction with friendships. The negative slope of this line means that greater negative emotional PI translates into less loneliness, more so among people who are high in social comparison orientation.

Combined, the results show that there is no evidence of moderated mediation for family and romantic relationships. Specifically, negative and positive emotional PI do not have an indirect effect on loneliness in both family and romantic relationships through dissatisfaction with those relationships. However, when participants have high levels of social comparison orientation, both negative and emotional PI are indirectly related to loneliness in friendships through dissatisfaction with friendships.

Discussion

Rethinking the Cognitive Discrepancy Model of Loneliness by Examining Emotional PI

The current study examined emotional PI as a refinement to the original cognitive discrepancy model of loneliness, which states that loneliness arises when people perceive a difference between the relationships that they want and those that they actually have (Peplau & Perlman, 1982). We investigated if the discrepancy that leads to loneliness is not between the relationships that people want and those that they have, but rather the difference between the relationships that people believe are the social norm versus their own relationships. We reasoned that the standard by which people judge their own relationships is not their individual, uniquely desired relationships, but rather what they think *everyone else's* relationships are – that is, the perceived social norm. The present research hypothesized that, by influencing social norms, emotional PI is a specific cognitive process that explains how discrepancies between desired and actual relationships develop – that is, how a person comes to perceive the discrepancy that leads to loneliness. Specifically, we hypothesized that emotional PI can cause people to misperceive the social lives of others as better than they actually are. In doing so, we hypothesized that emotional PI leads people to experience dissatisfaction with their own social relationships and ultimately, to loneliness. In addition to investigating relationship dissatisfaction as the mechanism through which emotional PI is associated with loneliness, the current research also examined social comparison orientation as a moderator of emotional PI's effect on relationship dissatisfaction. We reasoned that individuals who were more prone to social comparisons would be more likely to use

emotional PI as a standard to judge relationships, and thus, be more susceptible to relationship dissatisfaction and greater loneliness.

Contrary to previous research by Jordan et al. (2011), the current study examined negative and positive emotional PI as distinct constructs. We first investigated the presence of emotional PI within the current sample and predicted that participants would underestimate the peer prevalence of negative experiences, showing negative emotional PI (H1a) and overestimate the peer prevalence of positive experiences, showing positive emotional PI (H1b). To test this hypothesis, we used the six negative experiences from Jordan et al.'s (2011) study whose prevalence participants had underestimated. In the current study, participants significantly underestimated only three experiences: thought about distant friends and family, thought about an enormous workload, and thought about bad personal health habits. Interestingly, these three experiences all involved thoughts, rather than overt behaviors. Therefore, it is possible that underestimations were caused by the inability to observe others having these thoughts, which might have led to misperceptions. In addition, participants might have felt more comfortable reporting that they had the experience only in thought (an internal, private process) and not in action (an external, observable behavior), accounting for the high percentages obtained for the actual prevalence. For example, participants might have considered *thinking* about bad personal health habits as being distinct from and not an admission of actually *having* bad personal health habits. In contrast, the two negative experiences with overestimations of the peer prevalence involved direct, observable actions: being rejected by a boy/girl and receiving a low grade. It is possible that participants might have accurately reported their observations of others' negative experiences but were reluctant to report their own

negative experiences. In turn, underreporting one's own experiences would have led to a low estimation of the actual prevalence of these experiences in the sample.

In contrast to our expectations, on average, participants significantly *under*estimated the peer prevalence of all six positive experiences. Social desirability could have motivated participants to over-report having each positive experience, elevating the actual prevalence relative to their perceptions of their peers. Alternatively, underestimating the peer prevalence of positive experiences could be part of a constellation of emotional PI that signifies a wholly bleak outlook on life. Under this constellation, people underestimate *both* the peer prevalence of negative and positive experiences, believing that a smaller percentage of their peers have negative experiences than they actually do *and* that life typically affords few positive experiences in general. This possibility is borne out by the moderate negative correlation between negative and positive emotional PI: higher levels of negative emotional PI (i.e. a greater tendency to underestimate negative experiences) are associated with lower levels of positive emotional PI (i.e., a greater tendency to underestimate positive experiences).

The current study also hypothesized that social comparison orientation moderates the indirect association between emotional PI and loneliness via relationship dissatisfaction (H2). This model was tested within three domains of relationships (family, friends, and romantic partners) and three domains of loneliness (in family relationships, friendships, and romantic relationships). Of the three relationship domains that we examined, our tests of moderated mediation yielded statistically significant results only for friendships. Specifically, we found that both negative and positive emotional PI were indirectly related to loneliness in friendships through dissatisfaction with those

friendships, but *only* for participants who endorsed high levels of social comparison orientation. Therefore, a high social comparison orientation renders a person vulnerable to the harmful effects of emotional PI. For these individuals, misperceptions of the social norm can lead to feeling dissatisfied with their own relationships, which ultimately causes loneliness.

Our results for negative emotional PI are consistent with Jordan et al.'s (2011) finding that lower estimations of the peer prevalence of negative experiences predicted greater loneliness. The three negative experiences that showed underestimations of the prevalence of others' negative emotions were associated with greater friendship dissatisfaction. The indirect effect of negative emotional PI on loneliness via friendship dissatisfaction is indeed moderated by a person's social comparison orientation. Participants with a high tendency to engage in social comparisons experienced greater loneliness in their friendships from feeling more dissatisfaction with those friendships because they mistakenly thought fewer of their peers had negative experiences (that is, they believed everyone else was having fun except them).

When interpreting the results for the moderated mediation of positive emotional PI on loneliness in friendships, it is important to remember that participants significantly underestimated all six positive experiences. Greater underestimations of the peer prevalence of positive experiences were associated with greater friendship dissatisfaction for participants high in social comparison orientation. As Figure 6 shows, the indirect effect is negatively related to the moderator – that is, the mediation of positive emotional PI on loneliness in friendships through friendship dissatisfaction is indeed moderated by a person's social comparison orientation. Further, for participants high in social

comparison orientation – again, at least in the 85th percentile – greater positive emotional PI results in less loneliness in friendships by decreasing dissatisfaction with friendships. The negative value of the indirect effect means that participants with high levels of social comparison orientation who overestimate the prevalence of positive experiences in their peers' lives tend to experience *less loneliness* in their friendships. This indirect effect was not observed at low or moderate levels of SCO. While there is evidence of moderated mediation, the direction of the indirect association between positive emotional PI and loneliness ran counter to our hypothesis.

This association was opposite to what we had anticipated: within the context of high social comparison, lower positive emotional PI (i.e., underestimation of others' positive experiences) was associated with more loneliness. Therefore, when people are high in social comparison orientation, overestimating the percentage of their peers who have positive experiences might actually serve as a protective factor. As the overestimation of the peer prevalence of positive experiences increases, dissatisfaction with friendships decreases, which translates into less loneliness. It might be the case that thinking everyone has it bad actually helps people feel more satisfied with their existing friendships.

In summary, our results suggest that the effects of emotional PI on the friendships of people with high social comparison orientation might be twofold: 1) a risk factor when thinking about negative experiences and 2) a protective factor when thinking about positive experiences. In its role as a risk factor, greater negative emotional PI – defined as underestimations of the peer prevalence of negative experiences – was associated with greater loneliness in friendships for those high in social comparison orientation. This

finding supported our conceptualization of emotional PI as a refinement of the cognitive discrepancy theory of loneliness.

It is somewhat surprising that the mediated moderation model was only supported for friendship related dissatisfaction and loneliness. However, given that the sample consisted of college students mostly living away from their families, and few reported that they were currently in romantic relationships, friendships may be at the forefront of a young adult's mind. The participants' environment likely presented few opportunities for emotional PI to occur in the context of family and romantic relationships. Young adults at college typically do not often observe their peers regularly interacting with family members, given that students' relatives are not usually present with them in college settings. Also, while college students certainly spend time with peers who are in romantic relationships and see them interacting with their significant others as a couple, they likely recognize that they are not entirely privy to all aspects of a romantic relationship that only those in the relationship know.

The current study expands previous research in several ways. First, the current study extends understanding of cognitive discrepancies that contribute to loneliness. As discussed previously, the cognitive discrepancy theory of loneliness focuses on discrepancies between one's personal relationship expectations and actual relationship experiences (Peplau & Perlman, 1982). The current study suggests that discrepancies between one's misperceptions of others' positive and negative experiences (i.e. emotional PI) can contribute to loneliness. Second, the current study also elucidated a pathway through which emotional PI leads to loneliness. While Jordan et al. (2011) found that lower estimations of the prevalence of negative experiences predicted greater loneliness,

they did not explain precisely why these lower estimations – what we termed "negative emotional PI" in our study – were associated with loneliness. Our finding that it is through relationship dissatisfaction that emotional PI – both negative and positive – influences loneliness fills the gap in understanding how emotional PI is associated with loneliness

Limitations and Avenues for Future Research

The current study's strengths exist alongside limitations that provide fertile ground for future research. One limitation is that we did not specifically ask participants if their perceptions of peer norms affect their own relationship satisfaction. A future study can address this limitation by first asking participants to estimate the peer prevalence of an experience and *then* asking them how this estimate influences their desired relationships. Using this approach would more directly test whether the association between emotional PI and loneliness supports the cognitive discrepancy model.

Another limitation of the current study is its use of the same set of negative and positive experiences from Jordan et al. (2011), the researchers who introduced emotional PI. However, the experiences identified by Jordan et al. (2011) may not have captured positive and negative experiences that were relevant to our sample. For example, the Jordan et al study sample included equal numbers of male and female undergraduate students, recruited from a medium-sized West Coast university. In contrast, our sample was predominantly female and were recruited 10 years later from an East Coast university. In addition, Jordan et al did not report the racial or ethnic composition of their sample. As a consequence, we cannot determine if our sample was more (or less) racially diverse than Jordan et al's (2011) sample. Therefore, given sample differences in region,

gender distribution, generation, and potential racial diversity, it is possible that the negative and positive experiences identified in Jordan et al's study may not have been well suited to assess emotional PI within our participant population.

Another limitation of the current study is our inability to assess gender and racial differences in emotional PI, and its association with relationship dissatisfaction and loneliness. Our sample was predominantly female and white. It is important to study how loneliness might vary by gender or by race and ethnicity. Women and racial/ethnic minorities often experience discrimination and stigmatization, which may negatively impact their social relationships, including an increase in loneliness (Doyle & Molix, 2016; Majeno et al., 2018). An awareness of the stigma associated with their minority status might make members of this population more attuned to social differences that their white counterparts do not experience. More tailored interventions would come from a deeper understanding of the relevance of emotional PI for racial minorities.

Further, the construct of pluralistic ignorance is defined by a divergence between people's private, internal state (emotions, beliefs, and attitudes) and their observations of others in public. Notably, the three experiences that showed negative emotional PI within our sample were internal, cognitive processes, including: thought about distant friends/family, thought about enormous workload, and thought about bad personal health habits. These experiences are not observable by another person. As discussed earlier, participants might have felt more comfortable reporting about their thoughts than their actions, resulting in only three experiences showing evidence of negative emotional PI, using our definition of the construct.

Relatedly, there are assumptions about the emotional valence associated with each experience, based on Jordan et al.'s (2011) initial findings. However, it is possible that these associations may not hold for different samples. For example, in our study sample participants might not have considered "thought about distant friends/family" as a negative experience per se. It is possible that someone might recall fond memories when thinking about distant friends or family and so the experience is not necessarily a negative one. Conversely, and in a similar vein, "talked to distant friends/family" might not be a positive experience for people who have difficult relationships with their friends or relatives. A future study can address this limitation by including emotional descriptors with each experience, such as "thought about distant friends/family and felt homesick or sad." Finally, some of the experiences are also not interpersonal in nature and thus do not reflect a social experience (e.g., received low grade, thought about bad personal health habits, and received high grade). As a result, these experiences might not be relevant to the dissatisfaction that one experiences in social relationships.

The current study assessed whether significant associations exist between emotional PI and different types of loneliness during young adulthood. Future research should test for the relative magnitude of effects of PI across the different loneliness types to determine which one is most vulnerable to emotional PI. Furthermore, further research should examine if there are age-differences in the impact of PI on different types of loneliness. For example, Furman and Buhrmester (1992) studied participants in the fourth grade, seventh grade, tenth grade, and college to examine their perceptions of their social relationships throughout the course of their development. Fourth graders rated their mothers and fathers as the most frequent providers of support. Furman and Buhrmester

(1992) found that friends are the second major provider of social support to emerge after an individual's parents and remain important sources of social support until college. These findings suggest that believing others have more fulfilling friendships could be particularly distressing to young adults.

We recognize a limitation of our data is its correlational nature. Our study design did not involve any experimental manipulation or measurement over time, and thus we cannot make any definitive claims about causation. It is unclear in which direction the effect of emotional PI runs. Does greater emotional PI lead to greater loneliness, or does being lonely cause people to engage in greater emotional PI? It is also possible that pre-existing mental health issues explain both an increase in emotional PI and in loneliness.

Implications for Clinical Practice

Researchers theorize that loneliness might serve an evolutionary purpose. In other words, loneliness is not just a painful, purely irredeemable experience; it is functional. The function that it seeks to fulfill can be conceptualized as the antonym of loneliness: a sense of belonging. Loneliness acts as a signal that tells those experiencing it to seek social connections. The current study suggests that people will deem these connections satisfying depending on their perceptions of the social norm and their individual social comparison orientation.

The dissatisfaction with social relationships that emerges from a misperception of norms might be one mechanism that activates the cognitive discrepancy that, in turn, develops into loneliness. Interventions designed to reduce loneliness often focus on increasing a person's social support – that is, they operate on an individual level. The current study suggests that loneliness interventions might be more effective if they target

the perceptions that individuals hold *of their peers* – that is, focus on changing the perceived social norm – since these perceptions create a standard against which people evaluate their own social relationships.

Studying loneliness as a multidimensional construct might also generate interventions that are more tailored in their approach. Once we have identified the specific type of loneliness that someone is experiencing, it might be easier to find ways to address it. For example, having more fulfilling friendships might not reduce the loneliness of someone who longs for the intimacy and passion of a romantic relationship.

By examining the influence of a dispositional tendency as a moderator – i.e., social comparison orientation – the current study hoped to identify people who are more susceptible to the harmful effects of emotional PI and at higher risk for relationship dissatisfaction and loneliness. Harmful effects of emotional PI do not apply equally to all people. Our study found that those predisposed to high levels of social comparison orientation are most at risk.

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Table 1

Emotional PI Scores for Negative and Positive Experiences

	Percentages of people who had experience			
Experiences	Estimated	*SD*	Actual	Emotional PI score
	Average of participants' peer-prevalence estimates		% of participants who reported having the experience (responded "yes")	
Negative experiences				Negative emotional PI = (actual – estimated)
Had fight/argument	62.87	31.57	63.77	0.9
Thought about distant friends/family	85.41	21.14	97.10	11.69***
Thought about enormous workload	82.13	20.00	95.15	13.02***
Was rejected by boy/girl	40.83	20.40	27.67	−13.16***
Received low grade	53.42	20.48	47.83	−5.59***
Thought about bad personal health habits	63.12	24.24	86.47	23.35***
Positive experiences				Positive emotional PI = (estimated – actual)
Received high grade	73.30	18.97	93.72	−20.42***
Attended fun party	69.81	18.31	76.33	−6.52***
Participated in athletics	47.69	18.98	60.87	−13.18***
Went out with friends	87.55	13.33	98.07	−10.52***
Talked to distant friends/family	66.65	25.71	81.55	−14.9***
Had great meal	73.24	21.50	94.20	−20.96***

***$p < .0001$.

Table 2

Means, Standard Deviations, and Correlations for Primary Variables in Friendships and Family Relationships

Variable	*M*	*SD*	1	2	3	4	5	6	7
1. Negative emotional PI	16.06	16.24	--						
2. Positive emotional PI	-14.37	11.38	-0.49**	--					
3. Family Dissatisfaction	1.77	0.76	0.03	-0.16*	--				
4. Friends Dissatisfaction	1.86	0.71	0.13	-0.14*	0.15*	--			
5. Friendships Loneliness	2.26	1.06	0.14	-0.08	0.17*	0.69**	--		
6. Family Loneliness	1.86	1.05	0.06	-0.11	0.78**	0.78**	0.29**	--	
7. Social comparison orientation	40.08	5.70	-0.14*	0.04	0.13	0.06	0.03	0.11	--

* $p < .05$; ** $p < .0001$

Note that the computation for negative emotional PI includes only the three experiences that met the construct's definitional criteria

Table 3

Means and Standard Deviations for Primary Variables by Gender

Variable		*M*	*SD*
Negative emotional PI			
	Male	18.71	21.74
	Female	15.43	15.01
Positive emotional PI			
	Male	-15.97	15.63
	Female	-14.09	10.62
Family Dissatisfaction			
	Male	1.66	0.75
	Female	1.79	0.76
Friends Dissatisfaction			
	Male	2.05	0.72
	Female	1.82	0.71
Family Loneliness			
	Male	1.91	1.16
	Female	1.85	1.04
Friends Loneliness			
	Male	2.39	1.11
	Female	2.24	1.06
Social comparison orientation			
	Male	38.61	6.66
	Female	40.26	5.50

Table 4

Means and Standard Deviations for Primary Variables by Race and Ethnicity

	White n = 128		Asian n = 32		Black or African American n = 13		From multiple races n = 12		Spanish, Hispanic, or Latino n = 16		Other n = 7	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Negative emotional PI	15.38	16.65	18.84	17.70	14.13	18.79	16.52	13.50	20.84	11.98	7.00	6.13
Positive emotional PI	-13.79	11.59	-13.47	12.47	-16.36	7.57	-14.19	10.18	-19.88	10.64	-11.12	5.75
Family Dissatisfaction	1.77	0.79	1.66	0.75	1.82	0.65	1.92	0.83	1.90	0.70	1.73	0.63
Friends Dissatisfaction	1.82	0.74	1.98	0.82	1.99	0.59	1.80	0.58	1.78	0.62	2.04	0.55
Family Loneliness	1.80	1.04	1.93	1.30	2.31	1.13	1.82	0.73	1.78	0.78	2.20	0.99
Friends Loneliness	2.21	1.10	2.33	1.07	2.69	1.28	2.23	0.75	2.16	0.89	2.8	0.51
Social comparison orientation	39.95	6.18	40.19	5.12	39.08	4.42	41.83	4.11	39.94	5.37	41.33	5.43

Table 5

Estimation Errors for Participants in Romantic Relationships

	Percentage of people who had experience			Estimation Error = Emotional PI score
	Estimated	*SD*	Actual	
Negative experiences				(actual – estimated)
Had fight/argument	62.63	34.62	76.19	13.56*
Thought about distant friends/family	83.16	23.63	93.65	10.49**
Thought about enormous workload	80.14	22.12	93.65	13.51***
Was rejected by boy/girl	38.87	22.12	23.81	−15.06***
Received low grade	50.89	21.04	46.03	−4.86
Thought about bad personal health habits	62.83	24.62	85.71	22.88***
Positive experiences				(estimated – actual)
Received high grade	70.10	19.61	93.65	−23.55***
Attended fun party	64.97	20.66	74.60	−9.63**
Participated in athletics	45.22	19.56	61.90	−16.68***
Went out with friends	85.27	14.91	100.00	−14.73***
Talked to distant friends/family	62.73	25.15	79.03	−16.3***
Had great meal	71.19	24.20	96.83	−25.64***

*$p < 0.01$
**$p < .001$
***$p < .0001$

Table 6

Means, Standard Deviations, and Correlations of Primary Variables for Participants in Romantic Relationships

Variable	*M*	*SD*	1	2	3	4	5
1. Negative emotional PI	7.36	16.12	–				
2. Positive emotional PI	-17.30	13.39	-0.45*	–			
3. Social comparison orientation	40.09	6.40	-0.15	-0.04	–		
4. Dissatisfaction in romantic relationships	1.83	0.87	-0.14	0.20	-0.03	–	
5. Loneliness in romantic relationships	2.17	1.25	-0.05	0.10	0.17	0.75*	–

* $p < .05$

** $p < .0001$

Table 7

Constructing the Conditional Indirect Effects of Negative Emotional PI on Loneliness in Friendships Through Relationship Dissatisfaction for Various Values of Social Comparison Orientation

Social Comparison Orientation (W)	b	$\Theta_{x \rightarrow M} = a_1 + a_3W$	$b(\Theta_{x \rightarrow M}) = b(a_1 + a_3W)$
34.00	1.0221	-0.0025	-0.0026
40.00	1.0221	0.0050	0.0051
45.84	1.0221	0.0124	0.0126

Table 8

Bootstrap Confidence Intervals for Three Conditional Indirect Effects of Negative Emotional PI on Loneliness in Friendships

Social Comparison Orientation (*W*)	Conditional Indirect Effect	95% Bootstrap Confidence Interval
34.0000	-0.0026	-0.0112 to 0.0060
40.0000	0.0051	-0.0029 to 0.0133
45.8400	0.0126	0.0002 to 0.0248

Table 9

Constructing the Conditional Indirect Effects of Positive Emotional PI on Loneliness in Friendships Through Relationship Dissatisfaction for Various Values of Social Comparison Orientation

Social Comparison Orientation (W)	b	$\Theta_{x\rightarrow M} = a_1 + a_3W$	$b(\Theta_{x\rightarrow M}) = b(a_1 + a_3W)$
34.00	1.0264	0.0005	0.0005
40.00	1.0264	-0.0089	-0.0091
45.68	1.0264	-0.0178	-0.0182

Table 10

Bootstrap Confidence Intervals for Three Conditional Indirect Effects of Positive Emotional PI on Loneliness in Friendships

Social Comparison Orientation (*W*)	Conditional Indirect Effect	95% Bootstrap Confidence Interval
34.0000	0.0005	-0.0129 to 0.0133
40.0000	-0.0091	-0.0202 to 0.0007
45.6800	-0.0182	-0.0340 to -0.0045

Figure 1

A Conceptual Diagram of the Hypothesized Moderated Mediation Model

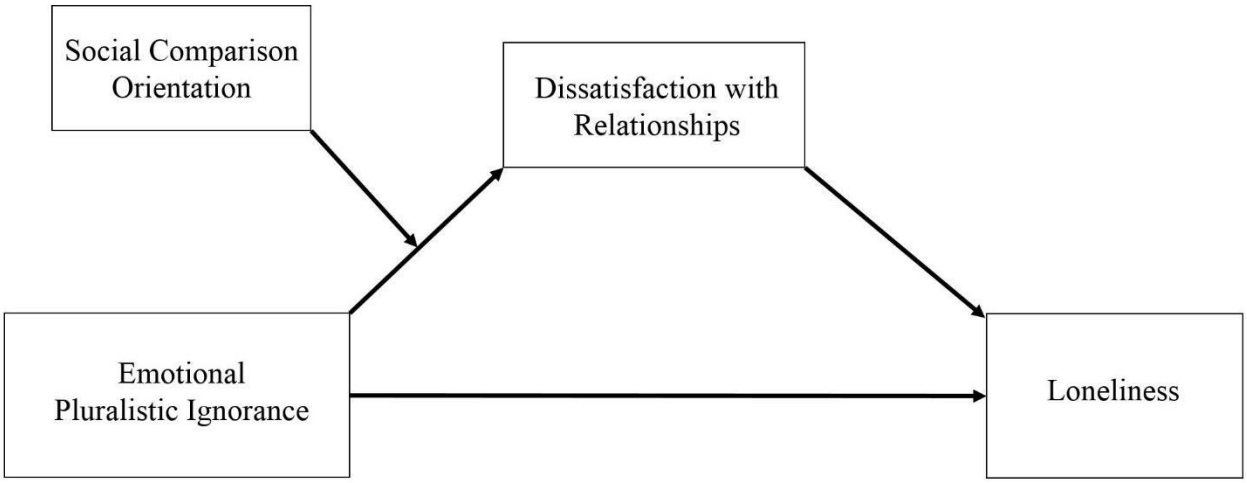


Figure 2

A Statistical Diagram of the Hypothesized Moderated Mediation Model

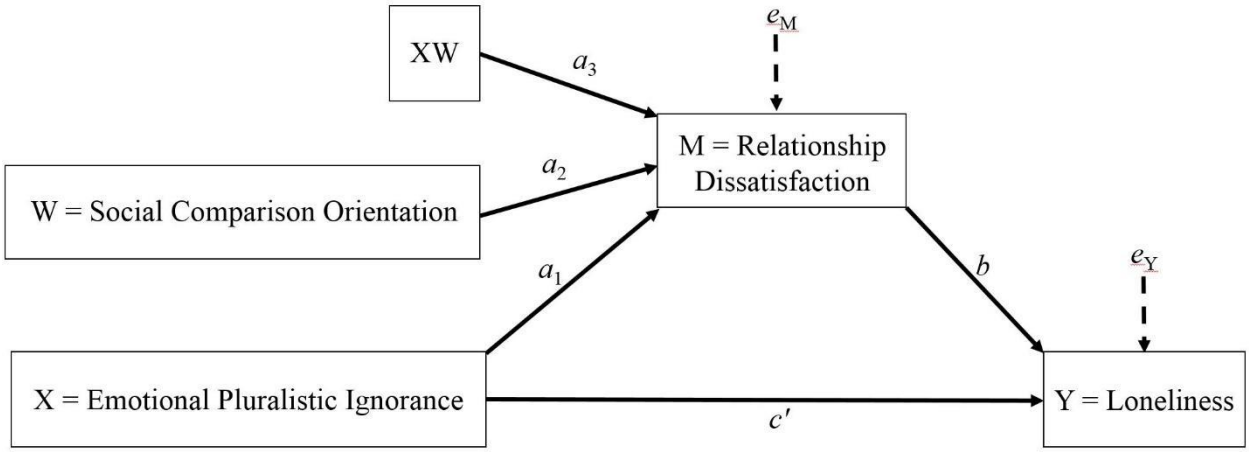


Figure 3

A Depiction of the Association Between Negative Emotional PI and Friendship Dissatisfaction as a Function of Social Comparison Orientation Level

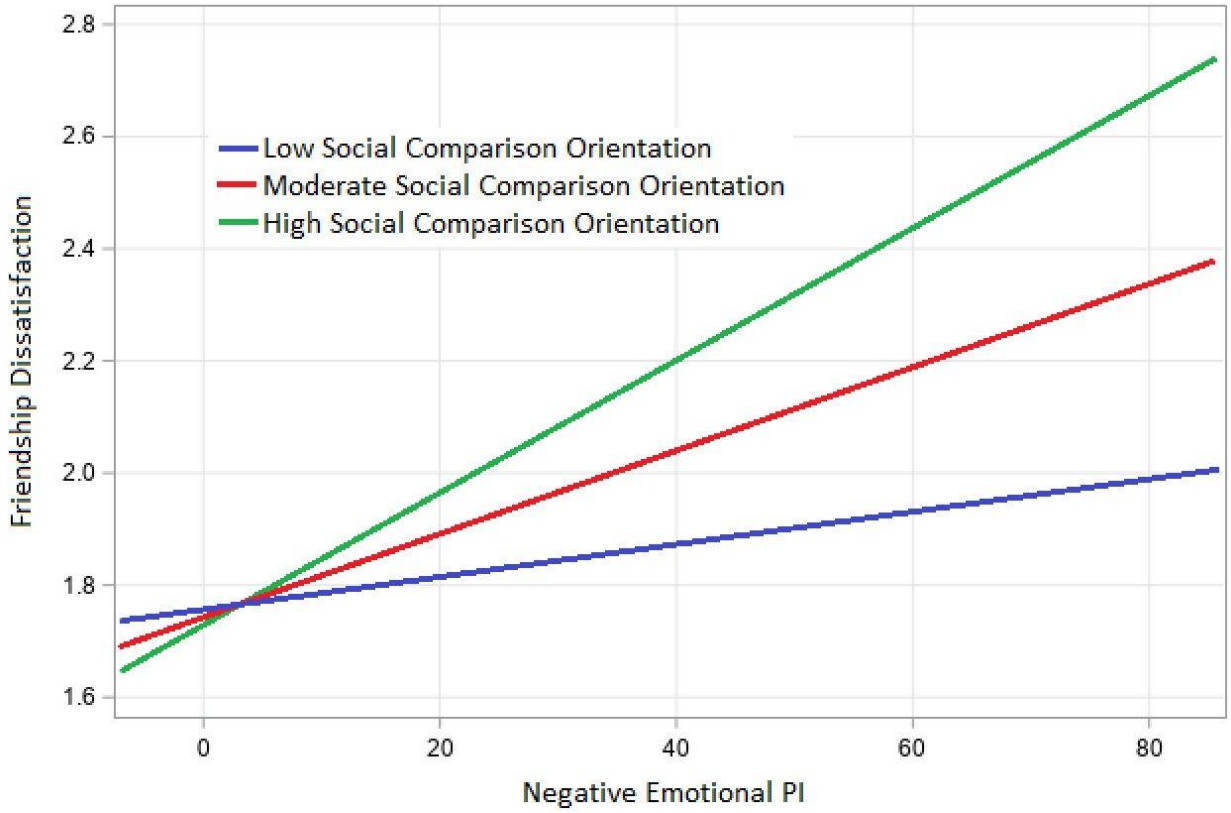


Figure 4

A Depiction of the Conditional Indirect and the Direct Effect of Negative Emotional PI on Loneliness in Friendships

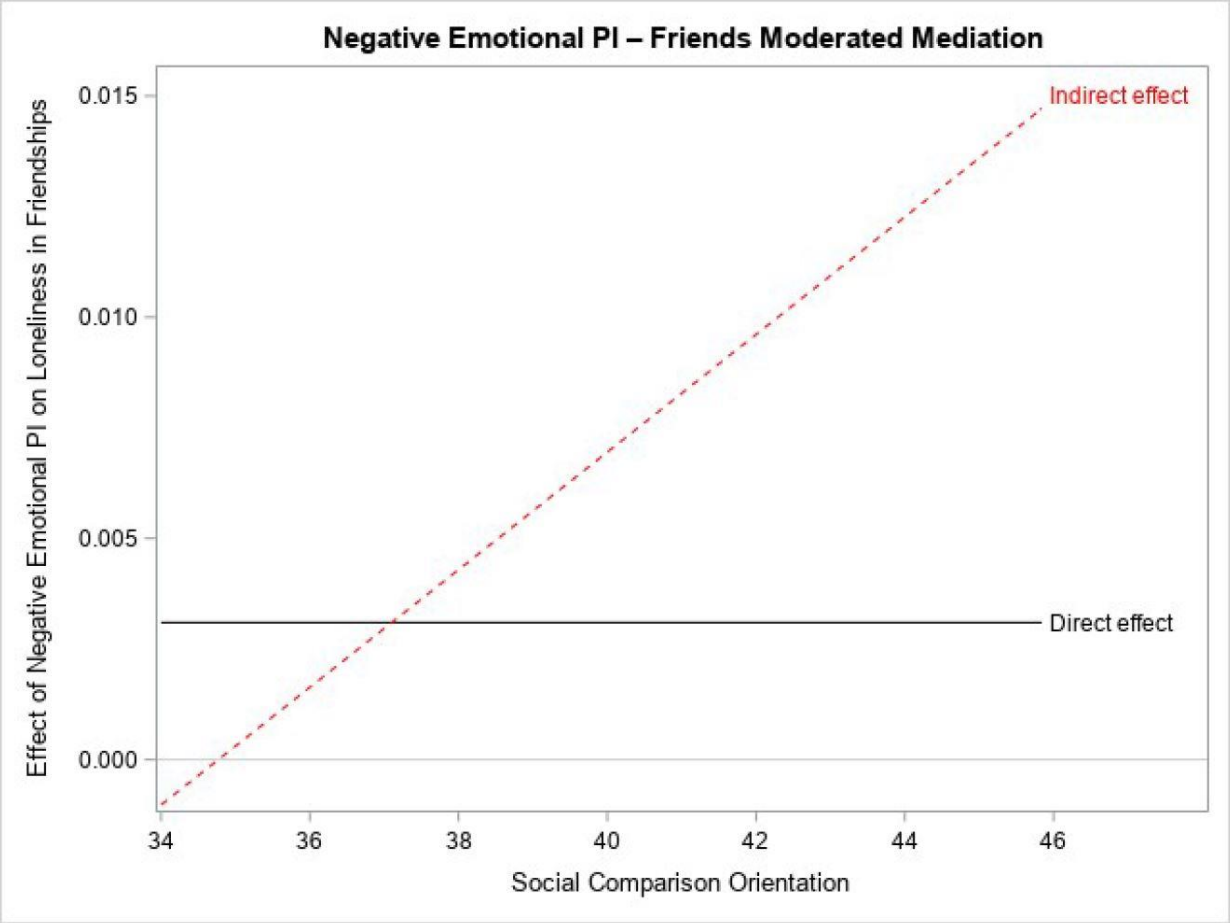


Figure 5

A Depiction of the Association Between Positive Emotional PI and Friendship Dissatisfaction as a Function of Social Comparison Orientation Level

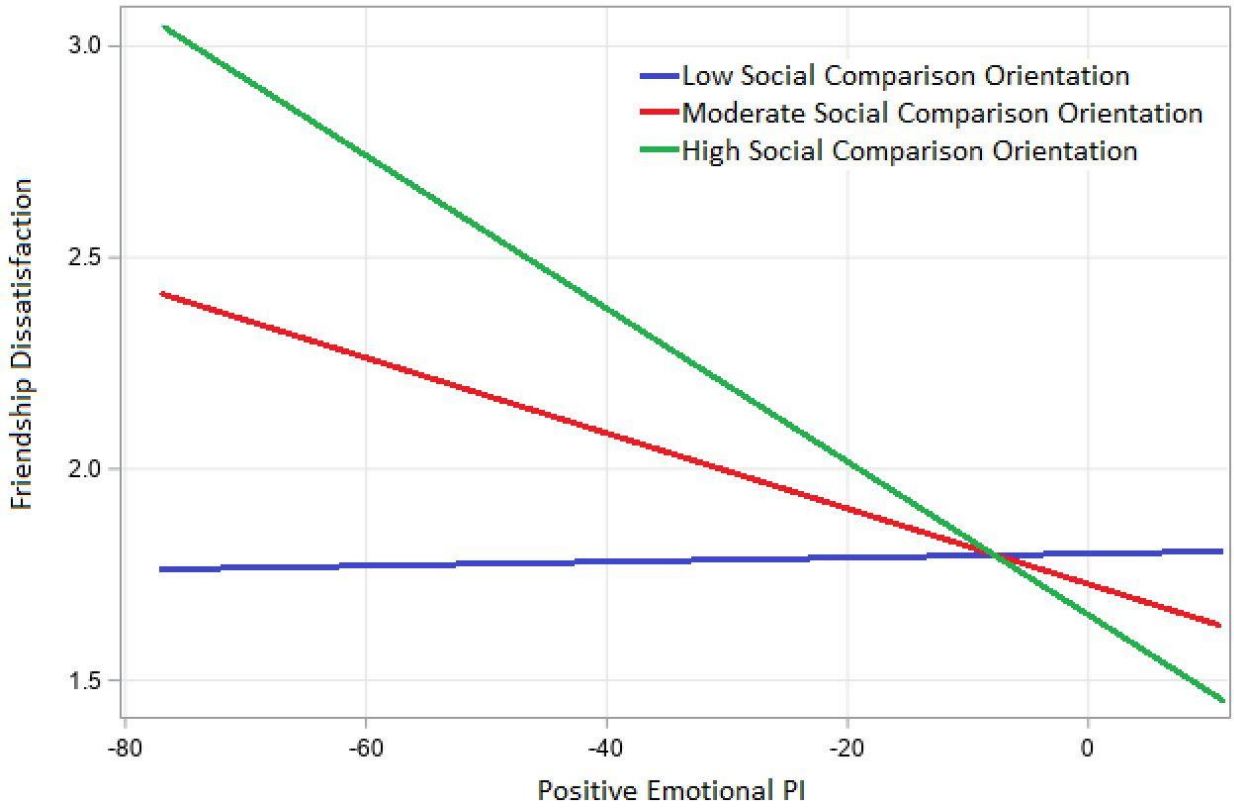
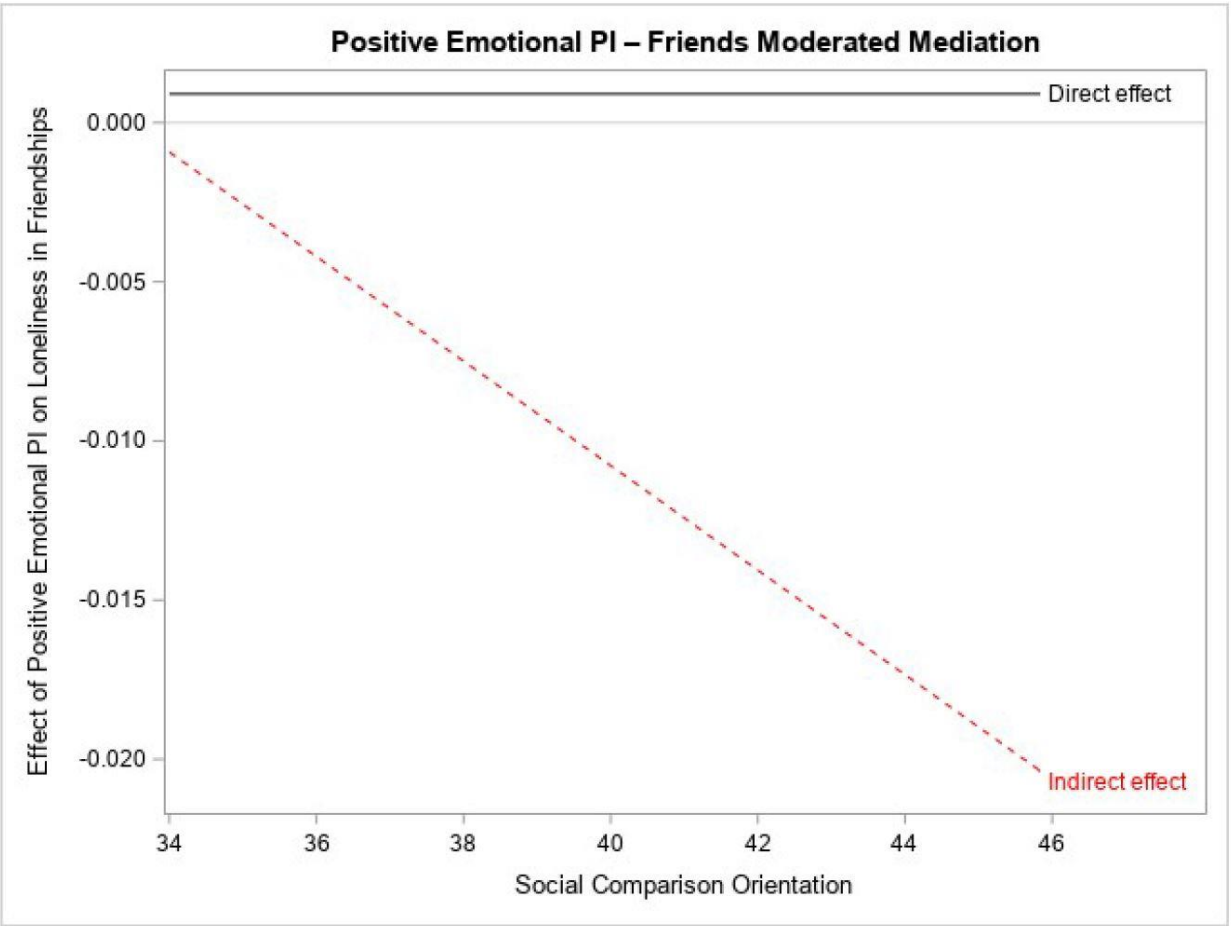


Figure 6

A Depiction of the Conditional Indirect and the Direct Effect of Positive Emotional PI on Loneliness in Friendships