Does Loneliness Change Social Judgments in Ambiguous Situations?: The Effects of Ostracism on Lonely Individuals

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A Thesis Submitted to the Faculty of Marietta College

In Partial Fulfillment of the Requirements for the

Degree of Master of Arts in Psychology

2018

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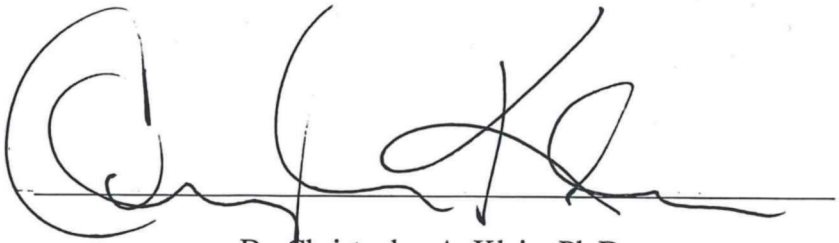

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Abstract

Although lonely individuals experience ostracism fairly often, relatively little research exists on how they respond to it. In what little previous research does exist, ostracism has been found to be an almost universally negative experience for lonely and non-lonely individuals alike. Despite this the current study attempted to explore two different hypothesis that lonely individuals respond differently to ostracism than non-lonely individuals. Specifically, the hypothesis that lonely individuals experience greater social pain in an ambiguous condition that could or could not be seen as ostracism based on their own judgment (the rejection attribution bias), and the hypothesis that lonely individuals might be predisposed to a more generalized sensitivity to social pain based on their previous experiences. The study's findings confirm previous research that explicit ostracism is generally perceived as negative regardless of individual differences such as loneliness, and additionally provided indications in support of both the generalized sensitivity hypothesis and the rejection attribution bias theory in lonely individuals.

Does Loneliness Change Social Judgments in Ambiguous Situations?: The Effects of Ostracism on Lonely Individuals

Most everyone has experienced the feeling of loneliness at some point in their life. The current study sought to explore the relationship between loneliness and ostracism. Although there is extensive literature on the subject of ostracism, relatively little research has covered the interactions that take place between feelings of loneliness and ostracism. What research there has been has mostly served to show that individual differences have little effect on response to ostracism. Despite this, there is some evidence in the literature that loneliness has the potential to moderate the effects ostracism has on the experience of social pain in certain situations (Park et. al., 2016). The current study explored how lonely individuals might perceive an ambiguous situation differently compared to non-lonely individuals. However, first it is critical to understand why connectedness is important to human beings, and why loneliness is such a negative experience.

Human Connectedness

According to Aristotle in his treatise Politics (1920), human beings are social creatures by nature. Just how important social connectedness is to an individual can be understood by examining how much time an average person spends each day with others. Kahneman, Krueger, Schkade, Schwarz, and Stone (2004) examined this by asking participants to systematically reconstruct the events and experiences they had encountered in the previous day. It was found that about eighty percent of participants' waking hours were spent in the company of others, despite many of life's daily activities, such as driving to work etc., requiring solitude by their nature. Essentially, the study suggests that humans spend the majority of their time with others, or preparing themselves to spend time in the company of others.

But the desire of humans to seek the company of others goes beyond simple proximity with other people; it is a desire to form lasting social connections that causes people to actively seek out this company. Indeed, time spent with others including; friends, relatives, spouses, coworkers, and children

has been shown to be rated as more inherently rewarding due to the formation of lasting bonds with these groups (Kahneman et al., 2004). This human need for social connectivity is likely what makes loneliness such a serious condition. Indeed, chronic (non state-based) loneliness is a common experience for many humans, with as many as 15-30% of the population suffering from it (Hawkley & Cacioppo, 2010).

Loneliness

What exactly is loneliness, and how do we know when we are lonely? Loneliness can be defined as a distressing feeling that occurs when one believes that one's social needs are not being met by the quantity, or especially the quality, of one's social relationships (Hawkley & Cacioppo, 2010). This perception of failure to measure up to some internal yardstick describes the cognitive discrepancy model of loneliness (Peplau et. al., 1982). According to the cognitive discrepancy model loneliness is not affected just by an individuals actual social ties, but also by an individual's desired interactions. Social comparisons, whether they be comparing to other individual's relationships or to past experiences of personal relationships, cause loneliness when the current situation does not 'measure up' due to this mismatch (Peplau et. al., 1982).

However, despite the unpleasant feelings of dissonance it causes, loneliness serves an adaptive purpose. Cacioppo and Patrick (2008) proposed an evolutionary basis to the negative subjective experience of loneliness. They argued that our hunter-gatherer ancestors faced tremendous challenges in the form of life in dangerous and inhospitable environments. In order to overcome these challenges, the evolutionary theory of loneliness posits that early humans banded together to form tribes that provided benefits to survival greater than that of living alone. These socially bonded groups allowed humans to be more successful than would otherwise be possible, allowing the group to utilize talents beyond any individual's skill-set. This idea was further explored in a study by Cacioppo el. al. (2006) who examined how loneliness provided evolutionary pressure. Loneliness, being an unpleasant sensation to endure, serves as a kind of "social pain" for human beings. This "social pain" serves a

function similar to the sensations of hunger and thirst in humans. While those feelings motivate humans to eat or drink, loneliness creates a desire for social connectedness which is also evolutionarily beneficial.

This idea is supported by the fact that feeling lonely generally succeeds in motivating individuals to seek social contact with others (Cacioppo et al. 2006), and contact with others has the effect of generally decreasing levels of loneliness. However, this is not always the case. Despite what its adaptive purpose might suggest, "lonely people" are not necessarily just those individuals who happen to be physically alone. Perceived social isolation is what is important, not necessarily objective social isolation (Cacioppo & Hawkley, 2009). In other words, loneliness is at least in part a subjective experience that depends on the individual's perception. In fact individuals who are lonely spend, on average, the same amount of time as others in the company of others. Even in cases where individuals *do* clearly have less social contact than their peers, it is not necessarily the case that they are more lonely (Cacioppo & Hawkley, 2005). Certain individuals, who identify as "loners", may be less lonely than their more socially connected counterparts. These individuals simply do not 'see' themselves as lonely (Cacioppo and Patrick, 2008).

Conversely, it is possible to be physically surrounded by people, yet be a "social outcast" in one's own mind (Cacioppo & Hawkley, 2005). Though lonely people may spend as much time with others as their non-lonely peers, they are not as satisfied by the time they spend with others. While a non-lonely individual may have an interaction with a friend and be happy, a lonely individual may have a similar interaction yet feel unsatisfied as if something they cannot name is missing or lacking in their social connections with others (Cacioppo & Hawkley, 2005). In sum, regardless of actual amount of time an individual spends socially isolated, the important factor is whether the individual *perceives* the quality of their interactions with others to be worthwhile, or not.

The effects of loneliness

Loneliness and self-esteem are related concepts with strong links to one another (Peplau et. al.,

1982). Lonely people often feel worthless, incompetent and unlovable, and low self-esteem is consistently correlated strongly with loneliness in the literature (Russel et. al., 1980). Despite this, loneliness can just as easily be the cause of low self-esteem as it can be the consequence of it (Peplau et. al., 1982). A person low in self-esteem might see themselves as worth less, and assume that others will view them similarly, making them act socially in a self-defeating way that leads to a viscous cycle of loneliness. In contrast, when loneliness is severe and prolonged it can lower a person's self-esteem, particularly if the cause of the loneliness is attributed to personal characteristics or defects (Peplau et. al., 1982)

It is also important to examine the effect a lonely individual has on others, as other's reactions can form an interactive feedback loop that reinforces an individual's feelings of loneliness. Experiencing loneliness can lead to an individual becoming hypervigilant, resulting in them aggressively searching for additional social threats (Cacioppo & Hawkley, 2005). In this state of hypervigilance, a lonely individual is more likely to evaluate ambiguous behaviors of others in a negative manner, and thus act in a way that itself elicits more negative behaviors. This in turn perpetuates their loneliness, leading to chronic loneliness, which is a difficult condition to escape from (Hawkley & Cacioppo, 2010). In fact, this tendency to expect, perceive and overreact to possible rejection may prevent the formation of positive relationships leading to a generalized sensitivity to rejection (Qualter et. al., 2012).

Everyone is capable of feeling lonely, and most people report feeling lonely at least some of the time (Hawkley & Cacioppo, 2010). However, researchers find certain groups are more susceptible to chronic loneliness than others, for example young adults and teens (Hawthorne, 2008; Benner, 2011) and the elderly (Theeke, 2009).

Young adults and teens often find themselves in new social situations as they move to a new grade in school, enter the workforce, or experience other major life events. Large life-changing events like these can be stressful, and one may expect even a well-developed social network to be put under

strain by them. Worse off are those young adults and teens who may not yet have developed a truly supportive social network, making them particularly at risk. Perhaps not surprisingly, 11.8% of young adults surveyed in an Australian sample reported at least some social isolation, and an additional 9.9% reported being either isolated or very isolated (Hawthorne, 2008). In contrast, the same study found that 9% of the general population reported some social isolation, and only 7% reported being isolated or very isolated.

At the other end of the spectrum, the elderly comprise one of the most commonly studied groups in loneliness research. Among the elderly, chronic loneliness has been measured as high as 19.3% (Theeke, 2009), and it is not hard to understand why. As a person ages, they often experience the loss of one or more individuals, such as a husband or wife, who were very close to them. The loss of critical aspects of their social networks help explain why senior citizens have high levels of perceived social isolation. Even in younger populations, traumatic loss is a common cause of loneliness.

Loneliness is predominantly a trait or individual difference, making it difficult to directly manipulate (Cacioppo & Patrick, 2008). Additionally, there is evidence in twin studies to support a significant genetic component (Boomsma et. al., 2007), with a 48% heritability estimate. Because of this, studies that examine the effects of loneliness on the individual often use preexisting levels of loneliness to assign subjects to groups. However despite the difficulties, some attempts have been made to induce loneliness in the lab. One common way this is done is using a “future alone” paradigm. For example, Baumeister, Nuss, and Twenge (2002) had participants complete a false personality inventory. Participants were then given bogus predictions about their future. Participants in the “future alone” condition were told they were likely to spend much of their lives lonely, ending up alone in life. Individuals in this condition showed decreased performance on cognitive tasks when compared to those who were not told they would end up alone, a similar finding to studies which have examined already lonely individuals (Cacioppo & Hawkley, 2009). While it is not always feasible to create loneliness in

the lab, there are more immediate effects of social isolation that can also be examined.

Ostracism

While loneliness and ostracism are related concepts, it is important to realize the differences between them, and how the two conditions may interact. Ostracism is defined as "being ignored or excluded" by others (Williams, 2007, pg. 1). Thus, while loneliness results from perceived social exclusion, ostracism involves the deliberate, overt social exclusion of an individual by a group of people. Unlike loneliness, which is a protracted subjective condition that progressively wears at the individual, ostracism can be immediately inflicted on another by an outside source.

Again, because humans are social creatures by nature, the pain of social exclusion from one's in-group is a serious one. As Williams (2001) points out, ostracism produced by banishment was historically one of the most severe punishments handed out by kings. In fact, it was perceived as so severe to only be just slightly less worse than death and torture. Even today, solitary confinement is used as a punishment of last resort in prisons (Cacioppo & Patrick, 2008). Williams (2001) also notes that our ape ancestors used ostracism to punish those who did not comply with social rules.

A common way to induce ostracism in the laboratory is through the use of a computer game called cyberball (Williams, Cheung, and Choi 2000). Cyberball is a computer program that simulates a game of catch with several simulated others. When a participant plays cyberball, they are told they are playing with other subjects across a network connection; however, these other participants are computer controlled. The program can be set by the experimenter to manipulate how often the ball is passed to them. In this way, the experimenter can manipulate the level of "ostracism" experienced by participants.

The feeling of ostracism induced by cyberball, or any social situation involving rejection, is not trivial. Ostracized individuals experience lower levels of belonging, self-esteem, control, and meaningful existence (Williams & Jarvis, 2006). In fact, the need of ostracized participants to belong is so strong that they will even knowingly answer a question incorrectly in order to conform with the

rest of the group (Williams et al., 2000). Despite the similarities between loneliness and ostracism, very few studies have been done to examine the relationship between these constructs. While cyberball may at first seem a poor model of everyday social situations, it is important to keep in mind how much modern technology has changed the way we interact with one another.

As mentioned, the feeling of loneliness may have served our ancestors as a motivation to maintain and seek out social bonds with others (Cacioppo & Patrick, 2008). While social connectedness is just as important today, the way we make those connections has changed. Ostracism can occur via digital interactions, such as cyberball, or just as easily as in face-to-face social interaction. However, digital interaction lacks many of the social cues that allow an individual to determine if they are being ostracized by others. Because of this, digital communications are particularly subject to the judgment of the individual receiving them. Indeed, previous research (Taylor & Harper, 2003) has shown that simply not receiving an expected message by a format as impersonal as an sms message is enough to make someone feel left out and dejected despite not knowing the motivation of the other party. For lonely individuals, judgment of others' motivations can be particularly problematic in this digital setting.

Loneliness and Social Judgment

How lonely individuals judge the motivation of others is particularly relevant to the current study, which sought to examine the effects of ostracism on lonely individuals. Previous research examining the connections between feelings of loneliness and ostracism has largely failed to find an interaction between loneliness and ostracism manipulations when using post-test measures. It is possible that this is due to total ostracism being a 'strong' social situation (McDonald & Donnellan, 2012). That is, total ostracism is almost universally negative and individual differences in personality have little impact on how individuals respond to it.

However, there is evidence that loneliness does play a role in how individuals react to and perceive ostracism by their peers. Wesselmen et. al. (2012) found that loneliness did moderate affect in

an ostracism situation using a cyberball paradigm similar to other ostracism research. The study used a dial device in order to allow participants to record their mood state during the course of the cyberball program, unlike most ostracism research which relies on participants retrospectively reporting their feelings during ostracism. By doing this, Wesselmen et. al. (2012) found lonely individuals had slower affect decrease when ostracized, and quicker affect increase when included. But what causes lonely individuals to respond to the same situation differently than their non-lonely peers?

Lonely individuals desperately want to be included with their peers, but tend to feel anxious and distressed in social situations (Wesselmen et. al, 2012). Because of this, lonely people are particularly sensitive to social information, particularly exclusion related cues (Wesselmen et. al, 2012). This increased level of social monitoring could lead to differences in the way in which lonely individuals judge situations, particularly ambiguous ones.

When considering the negative effects of loneliness on cognitive abilities and judgment, it is important to remember that loneliness evolved to encourage people to seek out social connections. To achieve this, loneliness often has the effect of causing the individual to feel unsafe in the world, triggering the fight-or-flight response (Cacioppo & Patrick, 2008). Because of this, chronic loneliness has many of the same effects that extended periods of fear have on cognitive performance. One example of these negative effects comes from an experiment conducted by Cacioppo et. al (2000), which used a dichotomous listening task in which individuals were required to identify consonant-vowel pairs from certain ears. This study found that individuals who were identified as lonely were less able to impose conscious control in order to listen to the appropriate stream of information. This deficit of certain executive functioning seen in lonely individuals is a common finding across multiple studies (Cacioppo & Patrick, 2008), and is perhaps one of the mechanisms responsible for many of the errors in judgment seen in lonely individuals.

Maladaptive functions of loneliness in chronically lonely individuals is a common theme in previous research. While ostracism, or social exclusion, usually causes non-lonely individuals to have

an increased motivation to make new friends and create a positive impression on others immediately after experiencing ostracism (Maner, Baumeister, & Schaller, 2007), in chronically lonely individuals this effect is very different. Maner et. al. (2007) found that the desire to reconnect when faced with ostracism did not hold true for individuals with high fear of negative evaluation. The authors also found that lonely individuals have a tendency to develop this increased social monitoring for rejection, as well as other unhealthy cognitions, over time. According to Cacioppo et. al. (2009), one of the reasons this occurs is due to learned helplessness, where individuals who are constantly lonely eventually learn not to reach out any more based on their previous experiences. Additionally, the decreased executive functioning discussed above, and a fear response to possible rejection also play a role. In fact, lonely individuals are more likely to perceive others as "critical, competitive, denigrating, or otherwise unwelcome" (Cacioppo & Patrick, 2008, pg. 15). Baumeister et. al (2002) showed that when participants were made to feel excluded they evaluated others more harshly, and were more willing to administer punishment in the form of white noise to other participants. Lonely individuals also appear to be less able to interpret the meaning and intention of others, as shown in a study by Pickett and Gardner (2005) which had lonely individuals judge the emotional timbre of anger, fear, happiness, and sadness on faces. The more lonely the individual was, the less accurate their interpretations were of others.

In order to examine how participants react to ambiguous situations, participants in the current study were asked to participate in an interactive game of catch via a network with their peers. This game was in fact a simulated interaction using the cyberball program. During this they were either clearly ostracized, clearly included, or subjected to an ambiguous condition. These three conditions are similar to those in the original cyberball experiment (Williams et al., 2000) which operationalized the ambiguous condition as about 20% inclusion. Williams et. al. (2000) found that the participants in the ambiguous condition indeed did feel statistically significantly better than the total ostracism condition, though participants still had negative feelings overall.

In addition to allowing for replication of previous studies, the use of cyberball in the current study has the added benefit of inherent ambiguity in interpreting the intent of the other 'participants'. If an individual is ostracized via cyberball, they do not have access to social cues which only occur while being ignored and excluded in the presence of others (Williams 1997, 2001). Instead, in the 'cyber ostracism' situation created by cyberball, individuals are left to judge whether they are being 'ostracized' due the deliberate intent of their partners or not. However, this ambiguity does not detract from the impact of ostracism via digital means. Smith and Williams (2004) conducted a study to examine the effects of ostracism via methods as impersonal as sms messages, and found that even 'imagined' ostracism was sufficient to inflict psychological pain. This is important because participants in the 'imagined' group were not able to observe their partners continuing the conversation after their exclusion from it, they could only use their judgment to assume what was occurring. Participants who were excluded from continued communication experienced many negative effects including: significantly lower mood, lower state levels of belonging, control, self-esteem, and meaningful existence than participants in the other conditions.

Just as there are many different emotional effects of ostracism, there are many different ways to measure those effects. One construct used in Onoda et. al. (2010) is that of 'Social Pain', which they measured using a modified version of a social pain scale developed from questions from Williams, Cheung, and Choi (2000). Onoda et. al. (2010) conducted a study which examined the relationship between trait self-esteem and ostracism. Although there is sparse literature that shows a relationship between loneliness and the ostracism when looking for differences after the completion of the task (Wesselmann et. al, 2012), Onoda et. al. (2010) managed to achieve significant results using a conceptualization of 'self-esteem'. Although self-esteem and loneliness are different, Onoda et. al. (2010) viewed self-esteem as a “sociometer” that indicated how included or excluded an individual currently was. Onoda et. al. (2010) define sociometer theory to hypothesize that low self-esteem increases in the absence of social contact and serves as an incentive to increase social contact. This

function of 'self-esteem' is comparable to the evolutionary advantages of loneliness discussed previously, in that they both serve as a motivating factor for seeking out new social bonds. Onoda et. al. (2010) performed a standard cyberball manipulation with a simple inclusion and exclusion condition while subjects in their high self-esteem and low self-esteem groups were in an fMRI scanner. They found a significant difference in activation in the dorsal anterior cingulate cortex and prefrontal cortex activation, which they suggested may mean they are involved in the processing of social pain. Importantly, Onoda et. al. (2010) also found that individuals with lower trait self-esteem reported increased social pain relative to individuals with higher self-esteem when undergoing the cyberball task. Because of the functional similarity between Onoda et. al.'s (2010) conceptualization of self-esteem to the contact seeking motivating factor of loneliness, I felt that attempting to replicate their results with lonely, rather than low self-esteem, individuals would also produce differences in lonely individuals' levels of social pain.

Based on the literature regarding the judgment of lonely individuals (Maner, Baumeister, & Schaller, 2007; Cacioppo & Patrick, 2008; Baumeister, Nuss, and Twenge, 2002; Pickett and Gardner, 2005, and others), the current study expected lonely individuals would interpret an ambiguous ostracism situation differently than their non-lonely peers, but how would lonely individuals' experiences of social pain in an ambiguous ostracism condition differ from those of their non-lonely peers, and why? Park, Jensen-Campbell, & Miller (2016) conducted a study examining the effects of relational victimization on social cognition that explored two alternative hypothesis for how participants in their study could respond to ostracism. The first of these theories that they proposed is that victimized individuals might develop a rejection attribution bias, or RAB. In RAB Park et. al. (2016) propose that evolutionary pressure for an ostracism detection system favored a bias toward false alarms, because the consequences for not detecting rejection would be far worse. Additionally they explain that, according to RAB, individuals who have a history of rejection may recall past rejections and engage in cue distortion in ambiguous situations, attributing ambiguous behavior to intentional

rejection. Like those who have experienced relational victimization, lonely individuals have a history of past negative experiences of rejection to draw from.

The second theory that Park et. al. (2016) proposed is that those who were relationally victimized might instead develop a more generalized sensitivity to social pain. They argue the initial social trauma causes changes to biological functioning such that the body remembers the previous traumas. Due to this, the possibility of future pain is overestimated when faced with a possible new source of stress in the form of rejection, causing a hypersensitivity to social pain. This makes victims more likely to respond negatively not just in ambiguous social situations but in all social situations in which they are included. Park et. al. (2016) note that this idea is more consistent with previous literature in the field indicating a more generalized sensitivity than RAB proposes. Indeed, when exposed to an ambiguous situation in their study, Park et. al. (2016) found that those who had suffered relational victimization displayed increased levels of social pain in all conditions, indicating a generalized sensitivity rather than a rejection attribution bias in their case.

The Current Study

The current study sought to examine how lonely individuals respond to an ambiguous situation in which it is unclear whether they have been ostracized. To accomplish this, participants were asked to participate in a virtual ball toss game, cyberball, with two computer controlled players as discussed previously. Participants in the study were assigned to one of three groups: a clearly included condition (33% inclusion), a clearly ostracized condition (no inclusion after initial passes), and an ambiguous condition (20% inclusion) as seen in Williams et al. (2000). Following completion of the cyberball task study participants completed the Cyberball Questionaire (v2) used in Park et. al. (2016) which contains several manipulation checks and sub-scales including a measure of negative mood state and a measure of threatened needs which were used in the current study to measure the experience of social pain. The current study proposed two alternative hypothesis, similar to those explored by Park et. al. (2016). However, regardless of which of these proved true it was expected that the overall pattern shown in the

Williams et. al. (2000) study would remain true for both lonely and non-lonely individuals; with participants in the ambiguous condition feeling significantly better than the total ostracism condition, the total ostracism condition being the most unpleasant and clear inclusion being the most pleasant.

However, should the experience of loneliness cause lonely individuals to form a rejection attribution bias I expected that the effects of lonely individuals errors in judgment and increased social monitoring for rejection discussed previously would cause them to perceive this ambiguous condition more negatively than non-lonely individuals. Under RAB theory, lonely individuals have a similar history of rejection to that seen in those who have experienced relational victimization in Park et. al. (2016), and are already predisposed to seeing others actions as potentially hostile due to that history of rejection. Learned helplessness biases as well as their enhanced social monitoring for rejection also could play a role in this. In combination with their difficulty in gauging emotional intent caused at least partially by their decreased executive abilities inhibiting focus, lonely individuals should feel ostracized significantly more than non-lonely individuals when they are placed in an ambiguous social situation in which they are at least partially included. Therefore I predicted, if RAB theory held true, that based on previous research into the judgment of lonely individuals (Maner, Baumeister, & Schaller, 2007; Cacioppo & Patrick, 2008; Baumeister, Nuss, and Twenge, 2002; Pickett and Gardner, 2005, and others), that individuals who score high on the UCLA Loneliness Scale would show significantly higher social pain ratings when they are exposed to social exclusion via cyberball, particularly in the 'ambiguous' condition, than individuals who scored low on the UCLA Loneliness Scale. Additionally, I predicted in this case that individuals with high levels of loneliness would show lower affect when tested following exposure to the ambiguous condition.

Alternatively it is possible that similar to victims of relational aggression in Park et. al. (2016), lonely individuals may simply have a more generalized sensitivity to social pain. This would be consistent with much of the previous research on loneliness and ostracism, and could occur if loneliness causes the symptoms similar to post-traumatic stress seen relational aggression victims (Park

et. al., 2016). In fact, the literature does suggest that loneliness triggers a state of hypervigilance for future threats (Qualter et. al., 2012). If the generalized sensitivity hypothesis holds true, I expected that individuals who scored high on the UCLA Loneliness Scale would show a significantly higher social pain rating across all ostracism conditions compared to their non-lonely peers. Lonely individuals would still experience the most pain in the exclusion condition, and the least pain in the inclusion condition, but even when included they should experience greater pain levels than those who do not score high on the UCLA Loneliness Scale. Additionally, in the case of the generalized sensitivity hypothesis, I predicted that affect levels for lonely individuals would be lower than their non-lonely counterparts regardless of condition, with no special significance for the ambiguous condition.

Method

Participants

Two hundred and nineteen Participants were recruited through Amazon's Mechanical Turk program. Participants completed the study for a token incentive amount. The study took place online using Millisecond's Inquisit software to gather data. Subjects were told they were participating in a study examining how different personality types cooperate in a digital environment, and informed consent was obtained.

Materials

UCLA Loneliness Scale. (Russell, 1996) The UCLA Loneliness scale measures existing trait levels of loneliness and is comprised of 20 items each using a Likert scale. Roughly half of the questions in the scale are reverse scored. The scale is scored out of a total of 80 points possible, with participants scoring above 44 being categorized as highly lonely and those scoring below 28 as experiencing low levels of loneliness. The UCLA Loneliness Scale (Version 3) has been shown to be reliable, with coefficient α ranging from .89 to .94 (Russell, 1996). The scale has also shown test-retest reliability over a 1 year period (r = .73), supporting the argument that the scale measures loneliness as a trait rather than a transient mood state.

Cyberball task. Participants interacted in a simulated three way game of catch with two computer controlled 'partners' via the cyberball program originally developed by Williams, Cheung, and Choi (2000). The cyberball program displays a graphic representing the player on the screen, as well as two pictures representing the other 'players' which are ostensibly playing via network. The program uses these simple graphics to approximate the game of catch. Using groups similar to some of those used in the original cyberball study there were three distinct ostracism-inclusion conditions. In the included condition participants received the ball the expected number of times (about 33%), with throws between the players being entirely randomized. The exclusion condition experienced total ostracism receiving the ball 0% after a period of brief inclusion at the beginning of the program. And the ambiguous condition received the ball about 20% of the time, less than the 33% that would be expected in a 'fair' game, with the passes randomized between players to maintain this percentage.

Cyberball Questionnaire (v2). (Park et. al., 2016) The Cyberball Questionnaire (v2) is a scale that assess a participants feelings of rejection and threat while playing cyberball. The questionnaire consists of 31 items on a 5 point Likert scale. The measure also contains manipulation checks that have been used in previous studies (Zadro et. al., 2004) including one item where participants reported on the percentage of times they received the ball, and a self report measure of inclusion. The scale also included 2 items which assesses perceived rejection ("I was ignored", "I was excluded") which have an internal consistency of .90 and were summed together to create a measure of perceived rejection.

The Cyberball Questionnaire (v2) includes several subscales, including one which measures threatened needs. This sub-scale consisted of five items which assess threatened belonging, four items which assess threatened control, five items which assess threatened self-esteem, and six items which assess threatened meaningful existence. These items are used in the current study as a measure of social pain as they have been in previous studies (Park et. al., 2016). The **α** for the entire threatened needs sub-scale is .96 and the **α** for it's component groups were as follows: threatened belonging (**α** = .93), threatened control (**α** = .81), threatened self-esteem (**α** = .88), and threatened meaningful existence

(**α** = .90). Similarly to Park et. al., (2016), because these measures were highly intercorrelated in previous research (*r*s ranging from .63 to .81) we summed together all the items from the subscales to create an overall measure of threatened needs and social pain.

The Cyberball Questionnaire also includes five questions about how participants felt while they were playing cyberball. This portion consisted of different negative mood indicators such as "I felt angry" and "I felt sad" and was used for the purposes of this study to measure negative affect. The inter-item reliability for these items was .82, and responses will be summed to create a negative mood score.

Procedure

Participants were recruited online using Amazon's Mechanical Turk program. Participants completed the study for token monetary compensation. Participants were told that they would be participating in an experiment to examine how different personality types handle social interaction via a digital medium. Upon signing up for the study via Mechanical Turk, participants were required to run an Inquisit program containing the experimental files. Informed consent was obtained digitally via this platform. Participants were not told the specific nature of the study as it regards loneliness and ostracism.

Participants were then administered the UCLA Loneliness scale via Inquisit, and this data was later used to divide them into high and low loneliness groups via a median split. Next, articipants were randomly assigned via inquisit to one of three cyberball conditions; the included condition, the fully ostracized condition, or the ambiguous condition. Participants were then given instructions for the Cyberball task via the Inquist program, and were told they would be completing this task with other Mechanical Turk participants over a network. To support this cover story, randomized Mechanical Turk IDs and 'avatars' were displayed for the simulated players in the cyberball task. After completion of the cyberball task, participants were given the Cyberball Questionnaire (v2) (Park et. al., 2016) to assess the effect of the cyberball manipulation.

Before completing the study, all participants were debriefed and informed as to the true nature of the experiment. They were also given the opportunity to ask questions about the study, as well as given contact information to learn more about the results.

Results

Preliminary Analysis

Measures for the current study were collected from 219 participants using the UCLA Loneliness Scale and the Cyberball Scale (v2). Scores from the UCLA Loneliness Scale in the current study across all participants had a $M = 43.93$ and a $SD = 13.46$. Scores on the UCLA Loneliness Scale were transformed using a median split at 43 to create a categorical variable indicating high ($N = 106$) and low ($N = 107$) loneliness groups. Because six subjects scores fell directly on the median, their scores were not included in the analysis. Additionally, because the threatened needs subscales within the Cyberball Scale (v2) have been shown to be highly intercorrelated in the past with *r*s ranging from .63 to .81 (Park et. al., 2016) and similar correlations were found in the current study for all Cyberball Scale (v2) measures (see Table 1), data from these subscales were summed together to create an additional measure of total threatened needs. This new 'Threatened Needs Index' score had a mean of 68.45 across all participants, and a standard deviation of 25.02.

Prior to conducting the analysis of variance (ANOVA) tests relevant to my hypotheses, I first examined the assumptions relevant to this statistical test and there were two things of note. According to an inspection of boxplots, there were a minor number of outliers in the data. However, upon review of the subjects' answers, it was determined that these were intentional responses consistent with other answers given and they were kept in the analysis. Additionally, according to Levene's test for equality of variance, the majority of the ANOVAs violated the assumption of homogeneity of variances, ($p < .05$). However, because the group sample sizes were approximately equal and large and the dependent variables were roughly normally distributed it is appropriate to run the two-way ANOVAs anyway because they are somewhat robust to heterogeneity of variance in these circumstances (Jaccard, 1998).

A summary of all ANOVAs conducted below can be found in Table 2 in the appendix.

Manipulation Checks

The Cyberball Questionnaire (v2) included several manipulation checks to ensure that participants perceived the expected level of exclusion from the Cyberball task. The first of these asked participants to estimate what percentage of ball passes they received. A two-way ANOVA found a statistically significant main effect of ostracism condition (or level of exclusion) on estimated percentage of throws received, $F(2, 207) = 167.97$, $p < .01$, partial $\eta^2 = .62$. A Tukey post-hoc test suggested that all ostracism conditions differed significantly from each other at $p < .05$. The means given in Table 3 indicate that participants in the inclusion condition reported the highest estimated throw percentage, while those in the exclusion condition reported the lowest, thereby indicating a successful manipulation. Results from the two-way ANOVA did not yield a statistically significant main effect of loneliness on estimated percentage of throws received, $F(1, 207) = .18$, $p = .67$, partial $\eta^2 = .01$. There was also no significant interaction effect, $F(2, 207) = .25$, $p = .78$, partial $\eta^2 = .01$.

Additionally, participants were asked as another manipulation check several questions to measure their level of perceived rejection. A two-way ANOVA found a statistically significant main effect of ostracism condition on participants perceived rejection, $F(2, 207) = 248.31$, $p < .01$, partial $\eta^2 = .70$. A Tukey post-hoc test showed that all ostracism conditions differed significantly from each other at $p < .05$. Examining the means in Table 4 shows that participants in the exclusion condition reported the highest levels of perceived rejection while those in the inclusion condition reported the lowest, as was expected for this manipulation check. There was no significant main effect of loneliness, $F(1, 207) = 1.10$, $p = .30$, partial $\eta^2 = .01$. The ANOVA also failed to detect an interaction effect, $F(2, 207) = .58$, $p = .56$, partial $\eta^2 = .01$.

Participants also were asked to self-report “to what extent they were included by the other participants in the game”. A two-way ANOVA found a statistically significant main effect of ostracism condition on participants self-reported inclusion, $F(2, 207) = 121.80$, $p < .01$, partial $\eta^2 = .54$. A Tukey

post-hoc test demonstrated that all ostracism conditions differed significantly from each other at $p < .05$. Examining the means in Table 5 shows that participants in the inclusion condition reported the highest levels of self-reported inclusion, while those in the exclusion condition reported the lowest levels, this is again consistent with the expected outcome for this manipulation check. There was no main effect of loneliness, $F(1, 207) = .14$, $p = .71$, partial $\eta^2 = .01$. Furthermore, there was no significant interaction between the two variables, $F(2, 207) = .78$, $p = .46$, partial $\eta^2 = .01$.

Examining the Primary Variables

The current study explores the dueling theories of the RAB hypothesis; which predicts that lonely individuals should respond differentially to social exclusion, particularly under ambiguous conditions, and the generalized sensitivity hypothesis, which predicts that lonely individuals will experience greater social pain across all exclusion conditions when compared to their non-lonely peers. The two primary measures of interest to these theories are social pain, as measured by the threatened needs index and negative affect, as measured by the negative mood score.

A two-way ANOVA found a statistically significant main effect of ostracism condition on participants' threatened needs index scores, $F(2, 207) = 171.19$, $p < .01$, partial $\eta^2 = .62$. Because the current study's hypothesis made no direct predictions about a main effect of ostracism condition a Tukey post-hoc test was conducted. The Tukey post-hoc test demonstrated that all ostracism conditions differed significantly from each other at $p < .05$. Examining the means in Table 6 showed that participants threatened needs index scores were highest in the exclusion condition, and lowest in the inclusion condition. The ANOVA also found a significant main effect of loneliness on threatened needs index scores, $F(1, 207) = 16.18$, $p < .01$, partial $\eta^2 = .07$. Because loneliness level consists of two states, a significant main effect indicates that high and low loneliness participants differed significantly on their threatened needs index scores. Examining the means in Table 6 shows that highly lonely individuals scored higher on the threatened needs index than their peers across ostracism conditions, which is generally supportive of generalized sensitivity theory. The last portion of the ANOVA,

examining the interaction effect, failed to find a significant result, $F(2, 207) = 2.22$, $p = .11$, partial $\eta^2 = .02$. To evaluate one of the experimental hypotheses a preplanned contrast was conducted which found that high loneliness individuals in the ambiguous condition had threatened needs index scores that were significantly higher than their low loneliness counterparts $F(1, 207) = 8.78$, $p < .01$. To understand the significance of this finding, post-hoc comparisons using a Sidak correction were conducted. These found that high loneliness individuals in the inclusion condition had threatened needs index scores that were significantly higher ($p < .01$), while high loneliness individuals in the exclusion condition had threatened needs index scores that did not differ significantly from low loneliness participants ($p = .53$). This relationship can be seen in Figure 1 and is consistent with what is predicted by RAB theory. To confirm these findings Pearson correlations were run for each of the ostracism conditions using the raw UCLA loneliness scores of participants. Scores on the UCLA loneliness scale were not shown to be significantly correlated with threatened needs index scores in the exclusion condition, $r(71) = .109$, $p = .36$. In the ambiguous condition an increase in score on the UCLA loneliness scale was moderately correlated with an increase in threatened needs index scores, $r(71) = .34$, $p < .01$. Finally, in the inclusion condition an increase in score on the UCLA loneliness scale was strongly correlated with an increase in threatened needs index scores, $r(71) = .53$, $p < .01$. Scatter-plots showing the distribution of UCLA loneliness scores and scores on the threatened needs index for each of the ostracism conditions can be seen in Figures 2-4.

A two-way ANOVA found a statistically significant main effect of ostracism condition on participants negative mood score, $F(2, 207) = 102.19$, $p < .01$, partial $\eta^2 = .50$. A Tukey post-hoc test demonstrated that that all ostracism conditions differed significantly from each other at $p < .05$. (see Table 7 for the means for this effect). Participants had the highest negative mood score in the exclusion condition and the lowest in the inclusion condition, as would be expected from a negative experience such as ostracism. The ANOVA also found a significant main effect of loneliness, $F(1, 207) = 16.85$, $p < .01$, partial $\eta^2 = .08$. High loneliness participants displayed higher negative mood scores across

ostracism conditions, again supportive of the generalized sensitivity theory (see Table 7). The ANOVA again failed to find a significant interaction effect, $F(2, 207) = .759$, $p = .47$, partial $\eta^2 = .01$. Another preplanned contrast was conducted which found that high loneliness individuals in the ambiguous condition had negative mood scores that were significantly higher than their low loneliness counterparts $F(1, 207) = 8.72$, $p < .01$. To understand the significance of this finding, post-hoc comparisons using a Sidak correction were conducted. These found that high loneliness individuals in the inclusion condition had negative mood scores that were significantly higher ($p < .01$), while high loneliness individuals in the exclusion condition had negative mood scores that did not differ significantly from low loneliness participants ($p = .168$). This relationship can be seen in Figure 5 and is consistent with what is predicted by RAB theory. To confirm these findings Pearson correlations were run for each of the ostracism conditions using the raw UCLA loneliness scores of participants. Scores on the UCLA loneliness scale were not shown to be significantly correlated with negative mood score in the exclusion condition, $r(71) = .15$, $p = .22$. In the ambiguous condition an increase in score on the UCLA loneliness scale was moderately correlated with an increase in negative mood score, $r(71) = .3$, $p = .01$. Finally, in the inclusion condition an increase in score on the UCLA loneliness scale was moderately correlated with an increase in negative mood score, $r(71) = .42$, $p < .01$. Scatter-plots showing the distribution of UCLA loneliness scores and negative mood scores for each of the ostracism conditions can be seen in Figures 6-8.

Exploring the Subscales of the Threatened Needs Index

While the current study did not make any specific predictions about the results of the various subscales of the threatened needs index, additional exploratory two-way ANOVAs were conducted to examine these. A two-way ANOVA found a statistically significant main effect of ostracism condition on participants levels of threatened belonging, $F(2, 207) = 209.48$, $p < .01$, partial $\eta^2 = .67$. A Tukey post-hoc test demonstrated that all ostracism conditions differed significantly from each other at $p < .05$. Specifically, participants threatened belonging scores were highest in the exclusion condition, and

lowest in the inclusion condition (see Table 8). The ANOVA also found a significant main effect of loneliness, $F(1, 207) = 21.65$, $p < .01$, partial $\eta^2 = .07$. Examining the means in Table 8 showed that high loneliness participants, when examined across conditions, had higher threatened belonging scores than their low loneliness peers. Finally, the ANOVA failed to find a significant interaction effect for the variables, $F(2, 207) = 2.11$, $p = .12$, partial $\eta^2 = .02$.

A two-way ANOVA found a statistically significant main effect of ostracism condition on participants levels of threatened self-esteem, $F(2, 207) = 70.56$, $p < .01$, partial $\eta^2 = .41$. A Tukey post-hoc test demonstrated that all ostracism conditions differed significantly from each other at $p < .05$. Examining the means from Table 9 showed that participants threatened self-esteem scores were highest in the exclusion condition, and lowest in the inclusion condition. The ANOVA also found a statistically significant main effect of loneliness, $F(1, 207) = 15.58$, $p < .01$, partial $\eta^2 = .07$. Examining the means in Table 9 showed that highly lonely individuals had greater threatened self-esteem scores across ostracism conditions than their peers. The ANOVA again failed to detect an interaction effect for the variables $F(2, 207) = .39$, $p = .68$, partial $\eta^2 = .01$.

A two-way ANOVA found a statistically significant main effect of ostracism condition on participants levels of threatened meaningful existence, $F(2, 207) = 182.50$, $p < .01$, partial $\eta^2 = .64$. A Tukey post-hoc test demonstrated that all ostracism conditions differed significantly from each other at $p < .05$. Examining the means in Table 10 showed that participants threatened meaningful existence scores were highest in the exclusion condition, and lowest in the inclusion condition. The ANOVA also found a statistically significant main effect of loneliness, $F(1, 207) = 10.80$, $p = .01$, partial $\eta^2 = .05$. Examining the means in Table 10 showed that highly lonely individuals had greater threatened meaningful existance scores across ostracism conditions than their peers. The ANOVA failed to detect an interaction effect for the variables $F(2, 207) = 1.59$, $p = .21$, partial $\eta^2 = .02$.

A two-way ANOVA found a statistically significant interaction between ostracism condition and loneliness for threatened control score, $F(2, 207) = 8.48$, $p < .01$, partial $\eta^2 = .08$. The interaction is

depicted in Figure 9. Because the interaction was significant I conducted a simple main effect analysis to further probe the data. High loneliness individuals in the exclusion condition showed significantly decreased levels of threatened control compared to their low loneliness counterparts, $F(1, 207) = 7.9$, $p < .01$, partial $\eta^2 = .04$. In contrast, high loneliness individuals in the inclusion condition showed significantly increased levels of threatened control compared to their low loneliness counterparts, $F(1, 207) = 7.13$, $p < .01$, partial $\eta^2 = .03$. High and low loneliness individuals in the ambiguous condition did not differ significantly on threatened control scores, $F(1, 207) = 2.55$, $p = .11$, partial $\eta^2 = .01$. Main effects of the ANOVA are not reported because the interaction effect is disordinal.

Discussion

The current research sought to investigate whether lonely individuals responded differently to ostracism induced via the Cyberball program, in particular whether lonely individuals responded differently in ostracism conditions that were somewhat ambiguous. The study examined two alternative theoretical explanations for why and how lonely individuals might respond differently to ostracism from their peers: the rejection attribution bias theory (RAB), and a second theory proposing a more generalized sensitivity to social pain.

The rejection attribution bias theory (Park et. al., 2016) proposed that individuals have an evolutionary bias toward false alarms and that those who have a history of rejection, such as lonely individuals, are more likely to recall past rejections and thus engage in cue distortion. Similar to Park's (2016) work with relationally victimized individuals, lonely individuals in the current study showed no difference in the number of ball tosses they thought they received or in perceived rejection. In fact, the only significant effect for these measures was the main effect of ostracism condition, which showed that the cyberball manipulations were operating as expected. If perhaps the learned biases posited by RAB theory were operating on a more emotional level rather than directly effecting perception of the ostracism situation, it would be expected that individuals who scored high on the UCLA loneliness scale would exhibit increased negative affect and social pain in ambiguous situations due to those past

experiences making them more likely to attribute ambiguous behaviors as intentional rejection. While there was no significant interaction effect for the threatened needs index or negative mood score, planned comparisons did reveal that highly lonely individuals in the ambiguous ostracism condition experienced greater social pain as measured by the threatened needs index as well as increased negative affect compared to low loneliness participants as would be expected under RAB theory. To better understand this finding, follow-up post-hoc comparisons were ran which found that high and low loneliness participants did not differ significantly on either of these measures in the exclusion condition. This finding for the exclusion condition is consistent with previous research showing that ostracism is a 'strong' social situation (McDonald & Donnellan, 2012). These findings provide support for the idea of RAB in lonely individuals in ambiguous situations. However, the significant main effects of loneliness found in the analysis, combined with the post-hoc comparisons showing that high loneliness individuals in the inclusion condition also had significantly higher scores on the threatened needs index and negative mood scale, indicate that generalized sensitivity theory is also worth further exploration.

Generalized sensitivity theory (Park et. al., 2016) states that past experiences make lonely individuals, who have been exposed to constant exclusion, more sensitive to social pain in general. There is a fair amount of support for this sort of hypervigilance behavior in lonely people in the literature (Cacioppo & Hawkley, 2005, 2010). If the generalized sensitive theory were true, the data would be expected to show that individuals scoring high on the UCLA loneliness scale would show greater threatened needs measures across all exclusion conditions. In fact total threatened needs, or the threatened needs index, as measured by the Cyberball Scale (v2) were indeed shown to be significantly higher for individuals who scored high on the UCLA loneliness scale. High loneliness individuals were also found to suffer from greater negative affect across all ostracism conditions as measured by the negative mood score. It is important to note that these findings were significant even in the overt inclusion condition. While this may not be particularly surprising given lonely individuals' ability to

see even positive social interactions as potentially less fulfilling (Cacioppo & Hawkley, 2005), it does suggest that the data from the current study generally supports the conclusion that lonely people, like Park's (2016) relationally victimized individuals, might be subject to a generalized sensitivity to social pain.

While conducting exploratory analysis on the subscales of the threatened needs index (which confirmed the main effect of loneliness described above relating to the generalized sensitivity hypothesis for threatened belonging, threatened self-esteem, and threatened meaningful existence), a significant interaction between ostracism and loneliness was found for threatened control score. While there is an increased risk for type I error due to the number of tests being conducted, it is intriguing to examine some of the possible implications of this result. Of note is the fact that high loneliness individuals actually had lower threatened control scores in the exclusion condition. Threatened control questions in the relevant subscale consisted of items such as "I felt I was unable to influence the action of others". While speculatory, future research might examine whether highly lonely individuals are somehow used to this 'loss of control' or perhaps perceive it as less extreme than their low loneliness peers due to their previous experiences.

Limitations

Because data for the current study was collected exclusively through Amazon's Mechanical Turk service, care should be taken when generalizing it to other populations. Additionally, greater care should have been taken to ensure subjects actively engaged with and believed the study deception. Many Mechanical Turk workers are regular participants in various psychological studies and may have prior exposure to various psychological measures and procedures. While there is no evidence in the analyzed data of this being a problem, two participants did voluntarily quit the study prior to providing their data due to previous experience with cyberball tests. Although the study did ask participants if there was any reason that their data should not be included or considered valid, participants should have been directly asked if they had participated in a cyberball study before and whether they believed

their interaction with their 'partners' was genuine. Also, the study should have used the available software to ensure workers took appropriate time to mindfully answer each question and did not rush study completion for incentives.

Future Directions

The findings from the present study suggest several directions for future research. The research provides support for both the rejection attribution bias theory and the generalized sensitivity hypothesis in lonely individuals. In addition to replicating these findings, future studies could seek to better define under what conditions lonely individuals are more likely to evaluate rejection differently than their peers. Specifically, future studies could have a wider variety of intensity in several different ambiguous levels of cyberball exclusion to determine at which points lonely and non-lonely individuals differ in their responses to ostracism, and at what point ostracism becomes so clearly excluding that they converge. Future studies could also gather subjects from a broader population to increase generalizability and eliminate some of the concerns regarding self selection inherent in using Mechanical Turk.

Future research also could consider examining whether these findings occur in real world situations. One way this could be accomplished would be by creating a more believable simulated social interaction. Subjects could be asked to participate in a sms group texting exercise with confederates acting as their peers. This exercise would give participants a cell phone with several numbers programmed into it that they would be allowed to send messages to during the testing procedure. Participants would be under the impression they were free to choose which other participants they wanted to interact with and for how long via these messages. Confederates, or the researcher acting as multiple "confederates" via computer program, would be instructed to respond at different time intervals based on the ostracism condition the subject was assigned to.

The data also appears to suggest another interesting potential avenue for future research. The significant interaction effect between ostracism and loneliness for threatened control presents questions

that would be interesting to explore in a future study if the findings are replicable. Specifically, why do lonely individuals appear to be 'inoculated' against increased levels of threatened control in the exclusion condition.

Conclusion

While there is extensive research on both loneliness and ostracism, relatively little in comparison has explored the relationship between them. The current study extends and builds on the work of Park et. al., (2016) to provide support to the idea that lonely individuals experience a general sensitivity to social pain, as seen in the significant main effect of loneliness on threatened needs and affect. Additionally, the current study finds novel support for the idea of the rejection attribution bias in lonely individuals as shown by pre-planned contrasts. While it is troubling that lonely individuals appear to both evaluate ambiguous social situations more negatively and experience increased distress compared to their non-lonely peers even when being included, hopefully future research will continue to help us understand how best to provide them with the support they need.

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Appendix

UCLA Loneliness Scale

TABLE 1
UCLA Loneliness Scale (Version 3)

Instructions: The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described by writing a number in the space provided. Here is an example:

How often do you feel happy?

If you never felt happy, you would respond "never"; if you always feel happy, you would respond "always."

NEVER	RARELY	SOMETIMES	ALWAYS
1	2	3	4

*1.	How often do you feel that you are "in tune" with the people around you?	_____
2.	How often do you feel that you lack companionship?	_____
3.	How often do you feel that there is no one you can turn to?	_____
4.	How often do you feel alone?	_____
*5.	How often do you feel part of a group of friends?	_____
*6.	How often do you feel that you have a lot in common with the people around you?	_____
7.	How often do you feel that you are no longer close to anyone?	_____
8.	How often do you feel that your interests and ideas are not shared by those around you?	_____
*9.	How often do you feel outgoing and friendly?	_____
*10.	How often do you feel close to people?	_____
11.	How often do you feel left out?	_____
12.	How often do you feel that your relationships with others are not meaningful?	_____
13.	How often do you feel that no one really knows you well?	_____
14.	How often do you feel isolated from others?	_____
*15.	How often do you feel you can find companionship when you want it?	_____
*16.	How often do you feel that there are people who really understand you?	_____
17.	How often do you feel shy?	_____
18.	How often do you feel that people are around you but not with you?	_____
*19.	How often do you feel that there are people you can talk to?	_____
*20.	How often do you feel that there are people you can turn to?	_____

Scoring:
Items that are asterisked should be reversed (i.e., 1 = 4, 2 = 3, 3 = 2, 4 = 1), and the scores for each item then summed together. Higher scores indicate greater degrees of loneliness.

Note.

Cyberball Questionnaire Version 2

For each of the following questions, please circle the number that best represents the **feelings** you were experiencing **during** the game.

	Not at all				Extremely
I felt "disconnected"	1	2	3	4	5
I felt rejected	1	2	3	4	5
I felt like an outsider	1	2	3	4	5
I felt I belonged to the group	1	2	3	4	5
I felt the other players interacted with me a lot	1	2	3	4	5
I felt good about myself	1	2	3	4	5
My self-esteem was high	1	2	3	4	5
I felt liked	1	2	3	4	5
I felt insecure	1	2	3	4	5
I felt satisfied	1	2	3	4	5
I felt invisible	1	2	3	4	5
I felt meaningless	1	2	3	4	5
I felt non-existent	1	2	3	4	5
I felt important	1	2	3	4	5
I felt useful	1	2	3	4	5
I felt powerful	1	2	3	4	5
I felt I had control over the course of the game	1	2	3	4	5
I felt I had the ability to significantly alter events	1	2	3	4	5
I felt I was unable to influence the action of others	1	2	3	4	5
I felt the other players decided everything	1	2	3	4	5
I felt good	1	2	3	4	5
I felt bad	1	2	3	4	5
I felt friendly	1	2	3	4	5
I felt unfriendly	1	2	3	4	5
I felt angry	1	2	3	4	5
I felt pleasant	1	2	3	4	5
I felt happy	1	2	3	4	5

I felt sad	1	2	3	4	5
I felt distressed	1	2	3	4	5

For the next questions, please circle the number or fill in the blank that best represents the **thoughts** you had **during** the game

	Not at all				Extremely
I was ignored	1	2	3	4	5
I was excluded	1	2	3	4	5

To what extent were you included by the other participants during the game?

Not at all 1 2 3 4 5 6 7 8 9 Very Much

What percentage of the throws of the ball were thrown to you? _____

Table 1

Pearson Correlations Table

	Threatened Needs Index	Negative Mood Score	Reported Throw %	Perceived Rejection	Self Reported Inclusion	Threatened Belonging	Threatened Control	Threatened Self-Esteem	Threatened Meaningful Existance
Threatened needs index	1								
Negative Mood Score	.92*	1							
Reported Throw %	-.70*	-.62*	1						
Perceived Rejection	.86*	.81*	-.76*	1					
Self Reported Inclusion	-.76*	-.67*	.72*	-.80*	1				
Threatened Belonging	.96*	.88*	-.73*	.88*	-.76*	1			
Threatened Control	.85*	.71*	-.66*	.81*	-.76*	.82*	1		
Threatened Self-Esteem	.93*	.88*	-.56*	.68*	-.61*	.83*	.68*	1	
Threatened Meaningful Existance	.96*	.88*	-.71*	.88*	-.75*	.92*	.81*	.83*	1

Note: All values presented in the table are Pearson correlations and entries marked with a * are significant at the $p < .01$ level

Table 2

Summary of Results from two-way ANOVAs

Variable	Group	*df*	*F*	*p*	Partial *η2*
		Manipulation Checks			
Reported Throw %	Ostracism Condition	2	167.97	.00*	.62
	Loneliness Level	1	.18	.67	.01
	Ostracism*Loneliness	2	.25	.78	.01
Perceived Reject.	Ostracism Condition	2	248.31	.00*	.70
	Loneliness Level	1	1.10	.30	.01
	Ostracism*Loneliness	2	.58	.56	.01
Self Rep. Inclusion	Ostracism Condition	2	121.80	.00*	.54
	Loneliness Level	1	.14	.71	.01
	Ostracism*Loneliness	2	.78	.46	.01
		Primary Measures			
Threat. Needs Index	Ostracism Condition	2	171.19	.00*	.62
	Loneliness Level	1	16.18	.00*	.07
	Ostracism*Loneliness	2	2.22	.11	.02
Neg. Mood Score	Ostracism Condition	2	102.19	.00*	.50
	Loneliness Level	1	16.85	.00*	.08
	Ostracism*Loneliness	2	.759	.47	.01
		Threatened Needs Index Subscales			
Threat. Belonging	Ostracism Condition	2	209.48	.00*	.67
	Loneliness Level	1	21.65	.00*	.10
	Ostracism*Loneliness	2	2.11	.12	.02
Threat. Self-Esteem	Ostracism Condition	2	70.56	.00*	.41
	Loneliness Level	1	15.58	.00*	.07
	Ostracism*Loneliness	2	.39	.68	.01
Threat. Meaning. Exist.	Ostracism Condition	2	182.50	.00*	.64
	Loneliness Level	1	10.80	.01*	.05
	Ostracism*Loneliness	2	1.59	.21	.02
Threat. Control	Ostracism Condition	2	129.20	.00*	.56
	Loneliness Level	1	.76	.39	.01
	Ostracism*Loneliness	2	8.48	.00*	.08

Note: Values marked with * are significant at a $p < .05$ level.

Table 3

Descriptive Statistics for Estimated Throw %

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	3.38	3.42	42
	High Loneliness	5.58	13.21	31
Ambiguous	Low Loneliness	19.82	7.06	34
	High Loneliness	19.84	14.22	38
Inclusion	Low Loneliness	39.84	13.87	31
	High Loneliness	39.59	12.92	37

Table 4

Descriptive Statistics for Perceived Rejection

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	9.40	.96	42
	High Loneliness	9.32	1.30	31
Ambiguous	Low Loneliness	6.24	2.80	34
	High Loneliness	6.53	2.18	38
Inclusion	Low Loneliness	2.39	.96	31
	High Loneliness	2.95	1.67	37

Table 5

Descriptive Statistics for Self Reported Inclusion

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	2.43	2.37	42
	High Loneliness	2.71	2.21	31
Ambiguous	Low Loneliness	4.50	2.05	34
	High Loneliness	4.47	2.02	38
Inclusion	Low Loneliness	8.19	1.74	31
	High Loneliness	7.62	1.67	37

Table 6

Descriptive Statistics for the Threatened Needs Index

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	89.45	13.75	42
	High Loneliness	91.74	15.52	31
Ambiguous	Low Loneliness	64.88	20.06	34
	High Loneliness	75.61	17.91	38
Inclusion	Low Loneliness	36.32	10.15	31
	High Loneliness	48.81	12.25	37

Table 7

Descriptive Statistics for Negative Mood Score

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	31.10	7.56	42
	High Loneliness	33.29	5.77	31
Ambiguous	Low Loneliness	22.59	9.12	34
	High Loneliness	27.26	6.92	38
Inclusion	Low Loneliness	13.68	3.81	31
	High Loneliness	18.19	5.31	37

Table 8

Descriptive Statistics for Threatened Belonging

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	21.02	3.07	42
	High Loneliness	21.94	3.33	31
Ambiguous	Low Loneliness	13.71	4.96	34
	High Loneliness	16.95	4.44	38
Inclusion	Low Loneliness	7.10	2.24	31
	High Loneliness	10.08	3.49	37

Table 9

Descriptive Statistics for Threatened Self-Esteem

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	24.76	8.59	42
	High Loneliness	27.52	8.22	31
Ambiguous	Low Loneliness	18.00	8.24	34
	High Loneliness	22.21	7.73	38
Inclusion	Low Loneliness	9.13	4.54	31
	High Loneliness	14.00	5.18	37

Table 10

Descriptive Statistics for Threatened Meaningful Existence

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	25.24	3.33	42
	High Loneliness	25.71	3.63	31
Ambiguous	Low Loneliness	18.35	5.40	34
	High Loneliness	20.58	4.96	38
Inclusion	Low Loneliness	10.87	2.67	31
	High Loneliness	13.70	3.68	37

Table 11

Descriptive Statistics for Threatened Control

Ostracism Condition	Loneliness Level	Mean	Std. Deviation	N
Exclusion	Low Loneliness	18.43	1.75	42
	High Loneliness	16.58	2.85	31
Ambiguous	Low Loneliness	14.92	3.56	34
	High Loneliness	15.87	2.93	38
Inclusion	Low Loneliness	9.23	2.93	31
	High Loneliness	11.03	2.46	37

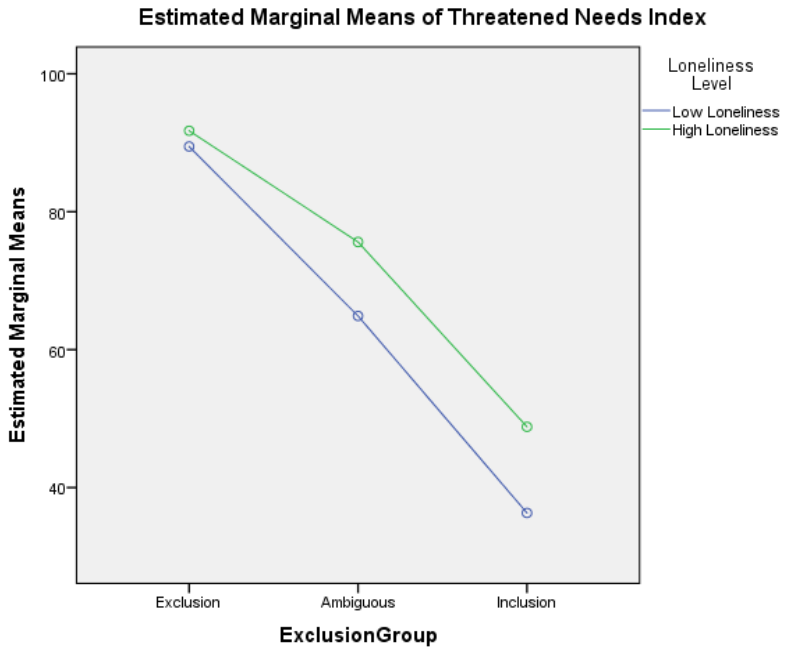

Figure 1 A plot of the threatened needs index results

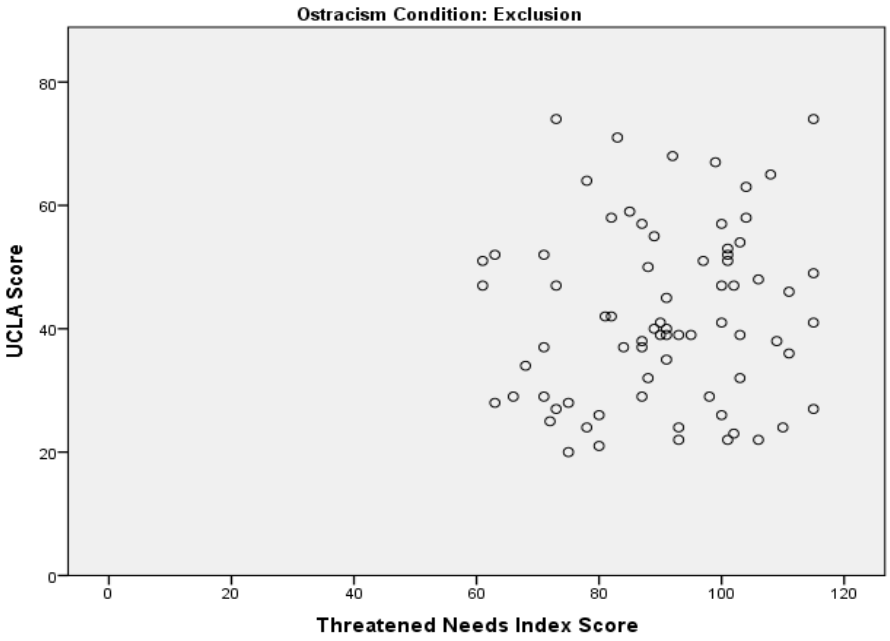

Figure 2 Scatter-plot of threatened needs index scores by UCLA scores in the exclusion condition

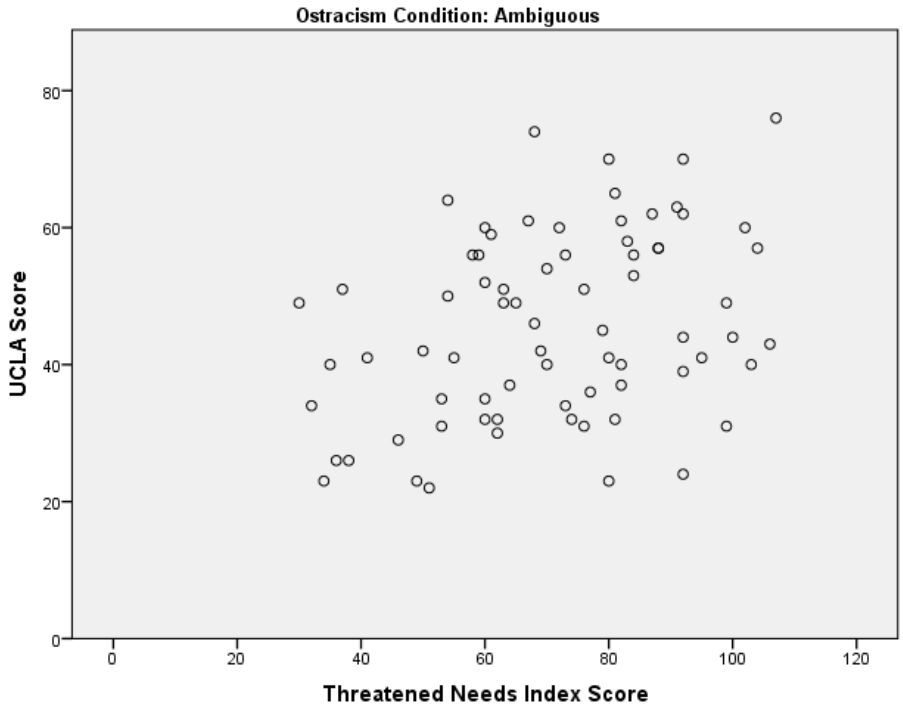

Figure 3 Scatter-plot of threatened needs index scores by UCLA scores in the ambiguous condition

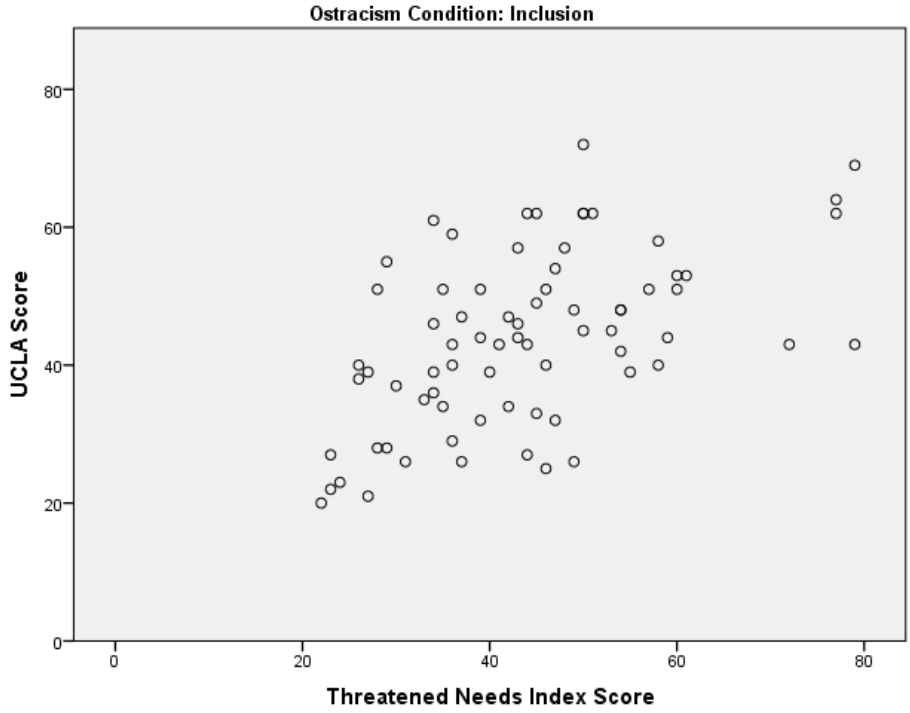

Figure 4 Scatter-plot of threatened needs index scores by UCLA scores in the inclusion condition

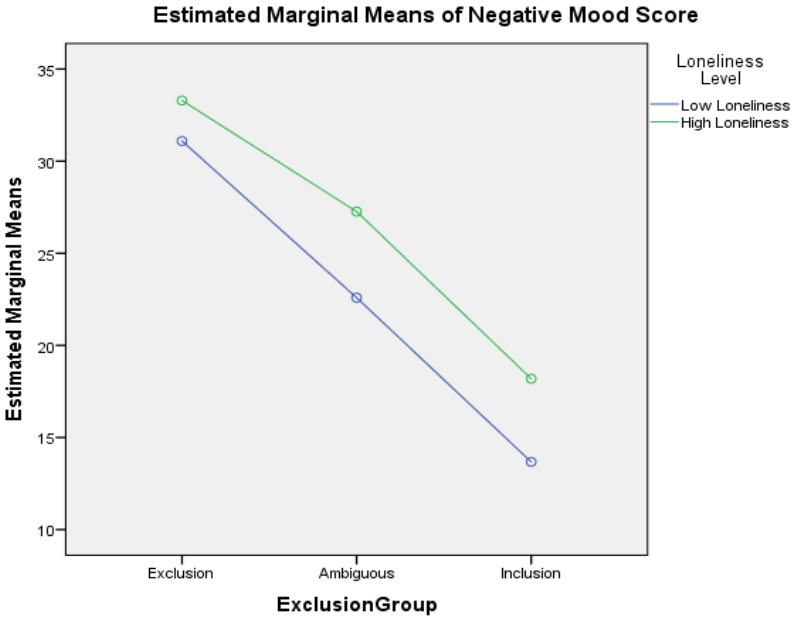

Figure 5 A plot of the negative mood score results

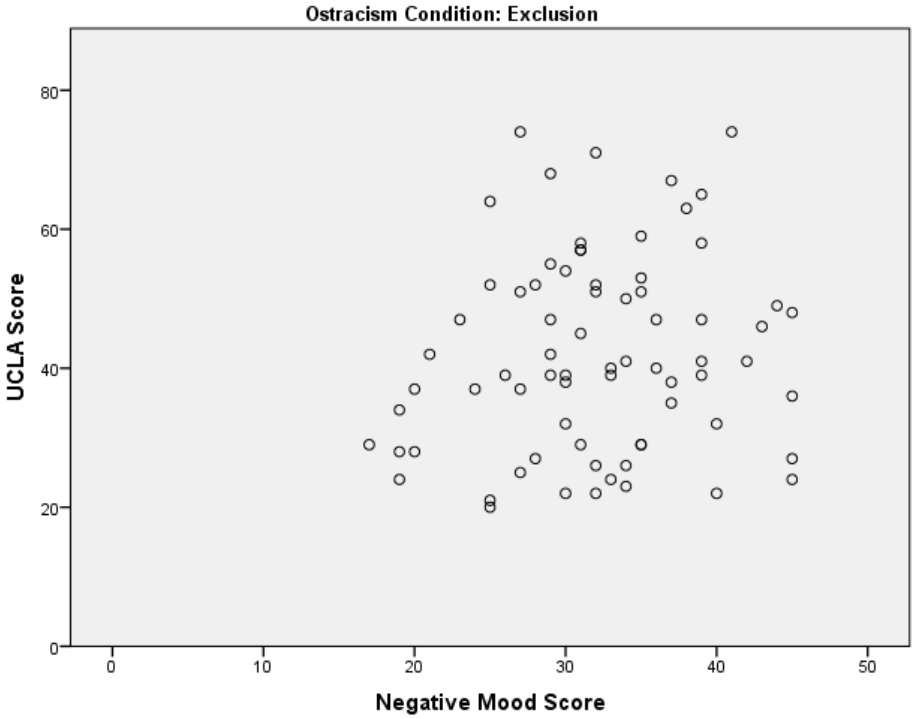

Figure 6 Scatter-plot of negative mood scores by UCLA scores in the exclusion condition

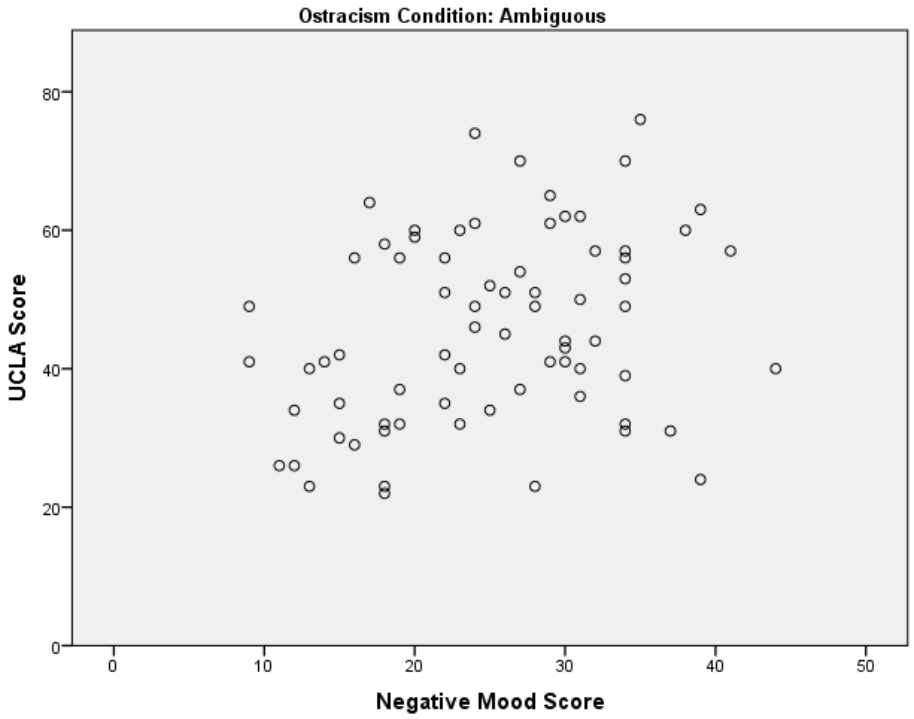

Figure 7 Scatter-plot of negative mood scores by UCLA scores in the ambiguous condition

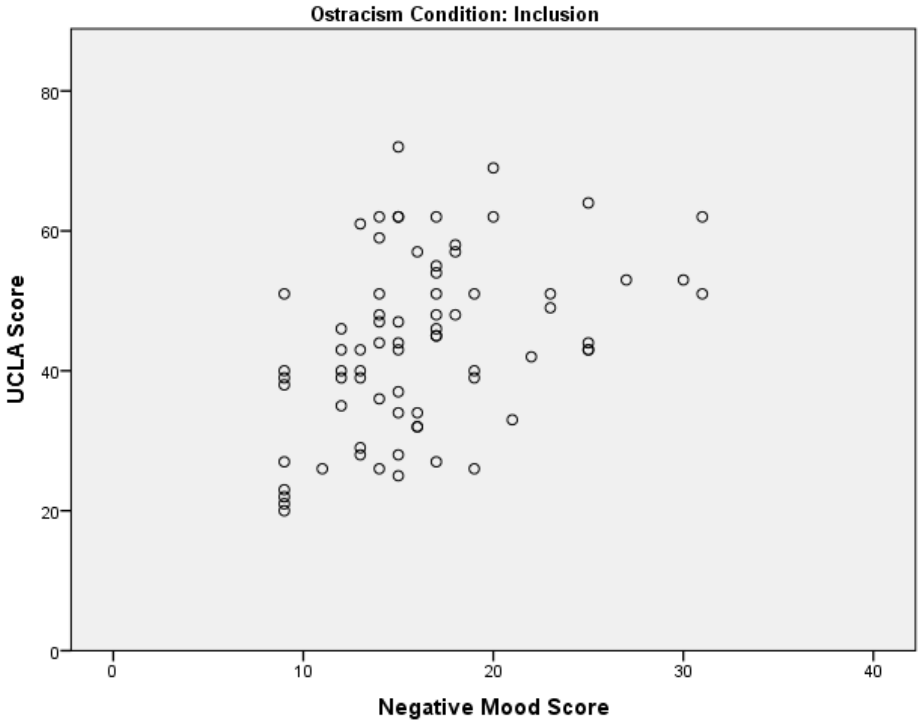

Figure 8 Scatter-plot of negative mood scores by UCLA scores in the inclusion condition

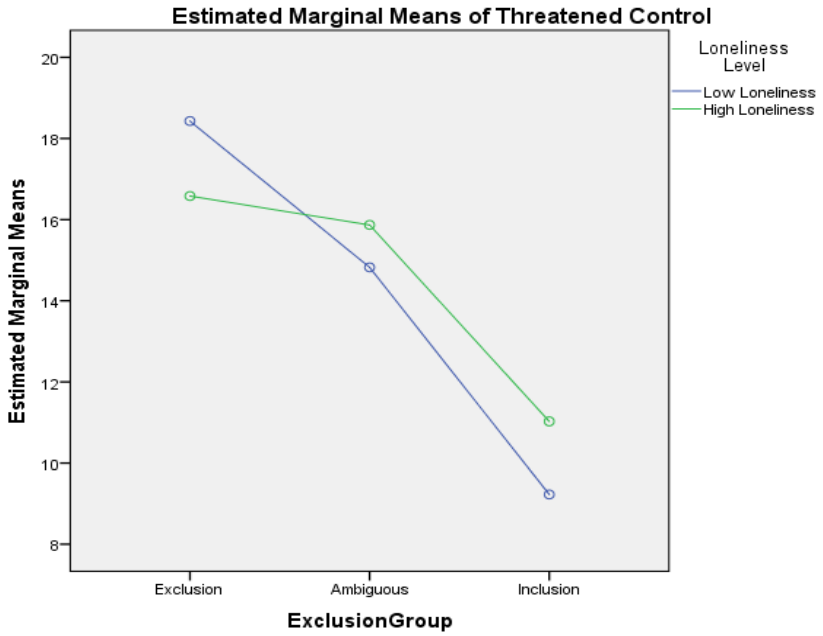

Figure 9 A plot of the interaction effect for the Threatened Control subscale.