

Theoretical Contribution

AN EVOLUTIONARY SOCIAL PSYCHOLOGICAL APPROACH TO STUDYING THE EFFECTS OF OSTRACISM

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Abstract

Ostracism—being excluded and ignored—is a pervasive phenomenon that occurs in a variety of contexts and cultures throughout the world. Diary studies indicate it occurs on a daily basis. Ostracism is painful and distressing psychologically to the person experiencing it, even when it is innocuous and brief. Researchers argue humans evolved *detection systems* so that individuals can accurately detect and avoid ostracism. Several forms of evidence needed to support a psychological adaptation, such as cross-cultural, hunter-gather, medical, phylogenetic, and physiological evidence, support this adaptation argument. However, direct experimental evidence that appropriate detecting (and responding to) ostracism promotes nature's criteria (i.e., solves fitness-relevant problems focused on survival and reproduction) would help bolster the case for an adaptation. We review the extant literature through the framework of nature's criteria, and then propose that direct experimental tests of ostracism detection using research methods from evolutionary psychology and animal models will both add further support to an adaptation argument, and offer fruitful ways of approaching unanswered questions in this research area.

Keywords: Ostracism, exclusion, isolation, social threat, social death

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Introduction

Ostracism¹, being excluded and ignored, is a pervasive phenomenon that happens in a variety of contexts and cultures throughout the world (Williams, 2009; Williams & Nida, 2011). Ostracism, either in short- or long-term experiences, is harmful psychologically to the target, and some people report experiencing it on a daily basis (Nezlek, Wesselmann, Wheeler, & Williams, 2012; Williams 2001). Specifically, ostracism thwarts four fundamental human needs (i.e., belonging, self-esteem, control, and meaningful existence) as well as increasing feelings of psychological pain and negative affect (Williams, 2009). Individuals who face chronic ostracism or isolation often experience severe negative outcomes (e.g., depression, physical health problems, and mortality; Baumeister & Leary, 1995; Cacioppo & Hawkley, 2003; Cacioppo & Patrick, 2008; Williams, 2001). Because of the prevalence of ostracism and its harmful impact, much psychological research over the past several decades has focused on understanding the effects of ostracism.

Researchers have argued that the detection of ostracism has adaptive advantages from an evolutionary perspective (Kerr & Levine, 2008; Spoor & Williams, 2007). These arguments make intuitive sense, and are confirmed by several forms of evidence that are often used to argue for psychological adaptations (Schmitt & Pilcher, 2004). Considerable cross-cultural, hunter-gatherer, and phylogenetic evidence support the adaptation argument (see Gruter & Masters, 1986; Williams, 2009). The psychological evidence for adaptation, however, still needs experimental data collected from an evolutionary psychology approach to strengthen this argument. Nairne (2010) argues that any psychological adaptation would have evolved subject to the constraints of *nature's criteria*, which are differential survival and reproduction. Thus, any adaptation at some point in our ancestral past must have either directly or indirectly enhanced inclusive fitness. Research in both evolutionary and social psychology has benefited from each discipline's approach in other topic areas (von Hippel, Haselton, & Forgas, 2007); an evolutionary social psychological approach to studying ostracism would also make considerable strides in both a basic theoretical understanding of the phenomenon, and applied aspects of how the deleterious effects of ostracism can be predicted and combated. We will review the extant social psychological literature on ostracism through Nairne's (2010) framework of identifying evolved psychological adaptations. Note that identifying true psychological adaptations is notoriously difficult, in part, because we often lack needed information about the ancestral environments in which those adaptations presumably evolved. However, one can build support for an evolutionary locus, especially compared to other theoretical accounts, through converging empirical evidence (Andrews, Gangestad, & Matthews, 2002; Nairne, 2010). We will focus specifically on ostracism's threat to the survival goal because if an individual does not have the necessary social relations to survive then the reproduction goal becomes moot. We will close with suggestions on how to merge evolutionary and social psychological methods to offer direct tests of the adaptation argument, and speculate on the implications

¹ The terms ostracism, rejection, and social exclusion are often used interchangeably in the research literature, even though there are debates about their similarities and differences (Leary, Twenge, & Quinlivan, 2006; Williams, 2009). We acknowledge these debates but elect to use the term *ostracism* throughout this manuscript for simplicity.

such research will have on understanding the effects of ostracism in individuals' everyday lives.

Ostracism Threatens Survival

Humans are, and have always been, social animals dependent on one another for survival (e.g., assistance with obtaining safety and substance). Researchers from various social sciences argue that ostracism has served a useful social function throughout time and culture, from humans' evolutionary past to modern day society (Gruter & Masters, 1986; Kerr & Levine, 2008; Kurzban & Leary, 2001; Williams, 2009). Groups of humans and non-human social animals use ostracism as a form of social control on problematic group members. Ostracism can strengthen the group by motivating problematic group members to obey social norms and contribute to group well-being, and ultimately removing members that do not conform (Boehm, 1999, 2008; Dijker & Koomen, 2007; Kurzban & Leary, 2001; Ouwkerk, Kerr, Gallucci, & Van Lange, 2005; Wesselmann, Wirth, Pryor, Reeder, & Williams, 2012; Williams, 2001; Zippelius, 1986). Indefinite ostracism has been described as *social death* for tribal and ancestral humans because it severed social connections necessary for survival in hunter-gather settings (Boehm, 1986; Williams, 2007).

An evolutionary approach to ostracism would argue that because ostracism could lead to death, selection pressures would have favored organisms that could detect (and respond to appropriately) cues of ostracism. Such organisms would survive long enough to reproduce and pass their genetic material to future generations, thus fulfilling nature's criteria for an adaptation. Three areas of social psychological research give us evidence for this type of fitness-enhancing effect: Research comparing physical and social pain, the research focused on detecting ostracism, and the research examining responses of ostracized individuals focused on re-inclusion.

Understanding physical and social pain. Researchers have argued that the survival threat inherent in ostracism led to an overlap in humans' neurological and physiological systems to detect both physical and social pain (Eisenberger & Lieberman, 2005; MacDonald & Leary, 2005). According to these researchers, the primary function of physical pain sensors in the brain is to detect injury or other physical threats to an organism's survival and focus attention to the source of the pain. Because ancestral humans could face just as much survival threat from ostracism as a physical injury, humans should have evolved a method of detecting *social* pain as well as physical pain. Social pain is a negative emotional state evoked by experiences of exclusion or devaluation in interpersonal relationships (MacDonald & Leary, 2005; MacDonald & Jensen-Campbell, 2011), and likely evolved as a mechanism to alert individuals when their inclusionary status was in jeopardy (Eisenberger & Lieberman, 2005).

Several studies have been conducted that lend credence to the idea that ostracism and other types of social exclusion can cause social pain. Social cognitive neuroscientists have manipulated ostracism while having participants in an fMRI scanner (Eisenberger, Lieberman, & Williams, 2003; Onoda et al., 2010). Their data suggest that individuals who experience ostracism show more activation in their dorsal anterior cingulate cortex (dACC) and right ventral pre-frontal cortex than included individuals. These regions of the brain are associated with processing experiences of physical pain; thus, the researchers concluded that humans experience ostracism as pain at the neurological level. Other research demonstrates that participants report feeling social pain using self-report

phenomenological measures typically used for measuring physical pain (i.e., pain scales used in medical contexts; Chen, Williams, Fitness, & Newton, 2008). Further, individuals who take a regular dose of acetaminophen self-report feeling less distress when being ostracized compared to individuals who are given a placebo, suggesting that numbing one to physical pain may also numb one to social pain (DeWall et al., 2010).

This research is suggestive of an evolved overlap between detecting physical and social pain, but there are nuances unique to social pain. Recent research demonstrated that both physical pain and social pain threaten basic human psychological needs, albeit differently. Researchers manipulated physical pain via a cold-pressor task and social pain via an ostracism manipulation, and found that both physical pain and social pain decreased participants' psychological need satisfaction, but social pain threatened it the most (Riva, Wirth, & Williams, 2011). Social pain, such as that caused by ostracism, is distinct from physical pain further in that it can be re-experienced when an individual dwells upon the initial incident. A series of studies asked participants to relive either an autobiographical memory that involved a physical injury or a social injury (i.e., betrayal by a person close to them) that had occurred within the past five years (Chen et al., 2008). Participants were asked to write about their respective memory in detail, and afterwards were asked to indicate (using standardized pain measures) how much pain they remembered feeling at the time of the incident. Finally, participants were asked to use those same pain measures to indicate how much pain they were experiencing "right now." Below is a real example of the types of physical injuries participants wrote about:

I play football...I was taking a step with my left foot in the air when [another player] blocked me. His helmet and shoulder pads hit me right in the right ankle. I turned sharply and heard a pop. All of a sudden I was in agonizing pain. I was yelling and cursing. It hurt so bad. I tried to get up and walk it off but soon fell back down...I was scared, angry, confused, shocked, and in a lot of pain. It turned out I broke my fibula and tore the deltoid ligament on the inside of my ankle. I had a plate and four screws surgically put in my ankle. I had to rehab for about 4 months.

Here is a real example of the types of social pain (i.e., betrayal) that participants wrote about²:

I was in the eighth grade and five of my best friends for no knowledgeable reason, drew a very mean and hateful picture of me and had everyone in the eighth grade class sign it and write crude and provocative remarks. They then handed it to me with the whole class in the cafeteria watching and laughing. I spent the rest of the day in the principal's office crying, while he called everyone who signed it into his office one by one. It was the worst betrayal I have ever felt, and I never forgave my group of friends really. I never was close to them again after that, and soon found other friends, but never became as close to others because of this incident. I felt like an idiot and foolish for not knowing that my "friends" were like that and that I had no idea what was going on. I also felt extremely hurt, like I was a loser. I felt like never having friends again. I also felt very confused, I had no idea what I did to deserve this. I was also very depressed and lonesome.

² Note that although the experiments' instructions asked participants to write about betrayal, rather than ostracism specifically, many participants' memories involved being ostracized by someone.

Participants typically recalled their instance of physical or social pain as being painful (i.e., high on the standardized pain measures) when it occurred. Interestingly, participants who were assigned randomly to recall physical pain did not report feeling any current pain after recalling the event. Participants who recalled social pain, however, showed a significant difference in the amount of pain they were feeling “right now” after the recall task. These data suggest that social pain is recalled as being similar to physical pain phenomenologically, but social pain is unique in that it can be re-experienced. Collectively the research supports pain overlap theory by offering biological and medical evidence consistent with an adaptation (Schmitt & Pilcher, 2004), one that would increase an individual’s chance of surviving because the individual could detect a social threat to survival similar to detecting a physical threat.

Detecting cues of ostracism. Several researchers argue humans evolved *detection systems* so that individuals can accurately detect and avoid ostracism/exclusion (Kerr & Levine, 2008; Leary, Tambor, Terdal, & Downs, 1995; Pickett, Gardner, & Knowles, 2004; Spoor & Williams, 2007). Williams (2009) argues these detection systems are necessarily crude, set to detect the slightest cue of ostracism.

Ostracism hurts regardless of whether it occurs in a face-to-face situation (Williams & Sommer, 1997) or in electronic social interactions (i.e., texting: Smith & Williams, 2004; online games: Williams, Cheung, & Choi, 2000; chat-rooms: Williams, Govan, Crocker, Tynan, Cruickshank, & Lam, 2002; virtual environments: Kassner, Wesselmann, Law, & Williams, in press). Ostracism still threatens need satisfaction when participants are told explicitly that the ostracism was unintentional or planned by a computer program (Eisenberger et al. 2003; Zadro, Williams, & Richardson, 2004). Ostracism even hurts under conditions where inclusion costs participants money (van Beest & Williams, 2006) or when the ostracizers are members of a despised outgroup (e.g., the Ku Klux Klan; Gonsalkorale & Williams, 2007). Recent evidence suggests that even being ostracized from a game where inclusion increases the chances that one’s character will die still threatens need satisfaction (van Beest, Williams, & van Dijk, 2011). The summary of all this research is that ostracism hurts regardless of the medium, source, or situational characteristics surrounding the event.

Even simple non-verbal cues (e.g., lack of eye contact) are sufficient to induce ostracism. Survey data suggest that people withhold eye-contact purposefully as a form of ostracism (Williams, Shore, & Grahe, 1998) and report the lack of eye-contact as one of the most likely cues they are being ostracized by others (Sommer, Williams, Ciarocco, & Baumeister, 2001). Laboratory research demonstrated that the lack of eye-contact from a virtual confederate (animated using Microsoft PowerPoint) was sufficient to induce feelings of ostracism and relational devaluation (Wirth, Sacco, Hugenberg, & Williams, 2010). The minimal cues of ostracism have also been demonstrated in field research. Pedestrians who were “looked at as though air” (i.e., having someone look in their direction, but not giving them direct eye-contact or acknowledgement) by a confederate passerby reported feeling more social “disconnection” than individuals who were acknowledged by the confederate (Wesselmann, Cardoso, Slater, & Williams, 2012). Other research on the minimal cues for detecting ostracism suggest that simply observing the ostracism of another individual can cause empathic pain in the observer (Wesselmann, Bagg, & Williams, 2009). Taken together, this body of research supports the argument that humans are sensitive to minimal cues of ostracism. An *ostracism detection system* would be most adaptive if it were sensitive to minimal cues of ostracism

because the more quickly individuals can detect a threat to survival the more quickly they can respond appropriately to safeguard their longevity by being re-included (Williams, 2009).

Responses focused on survival (i.e., re-inclusion). Williams (2009) argues that an ostracized individual's responses should be focused on recovering threatened need satisfaction, and a likely way is to seek re-inclusion. Several empirical studies support this claim. Ostracized participants are more likely than included participants to look for an explanation for their experience, making both internal and external attributions (Wirth & Williams, 2009). Ostracized individuals also are more likely to focus on strategies for re-inclusion (Molden, Lucas, Gardner, Dean, & Knowles, 2009), comply with social influence tactics (Carter-Sowell, Chen, & Williams, 2008), and show interest in new groups (Maner, DeWall, Baumeister, & Schaller, 2007) than those individuals who are included. Ostracized individuals are also more likely to engage in non-conscious mimicry (Lakin, Chartrand, & Arkin, 2008), and be more attentive to cues relevant to inclusion (Bernstein, Sacco, Brown, Young, & Claypool, 2010; Bernstein, Young, Brown, Sacco, & Claypool, 2008; DeWall, Maner, & Rouby, 2009; Pickett, Gardner, & Knowles, 2004) than included individuals. Not only are ostracized individuals more attentive to social information than included individuals, but they have a better memory for it as well (Gardner, Pickett, & Brewer, 2000). These latter findings support the general argument that episodic memory is improved when processing survival-relevant information (Nairne, 2010; Nairne, Thompson, & Pandeirada, 2007).

How an Evolutionary Approach Can Influence Future Research

Nairne (2010) argues that one can bolster support for an evolutionary locus by conducting experiments that directly test how a proposed adaptation fulfills nature's criteria (differential survival and reproduction). Although psychological adaptations do not necessarily maximize fitness in modern environments—in fact, ancestrally-generated adaptations can be maladaptive in modern settings—demonstrating a *mark* of nature's criteria on processing efficiency can be diagnostic. We have reviewed the extant research with a specific focus on how the appropriate detection of (and response to) ostracism would be beneficial to survival (and thus be adaptive). This theoretical argument is post-hoc, however. We will now discuss several potential avenues of research for directly testing how the reactions and responses to ostracism fulfill nature's criteria in experiments.

Ostracism and Survival

Previous research has found a correlation between chronic isolation and negative health outcomes/mortality in both humans and non-human social animals (Baumeister & Leary, 1995; Cacioppo & Hawkey, 2003; Goodall, 1986), lending credence to the argument that ostracism is *social death* (Boehm, 1986; Williams, 2007). This research is largely correlational in nature, because one ethically cannot conduct experiments that would increase mortality rates in human participants. There have been a few experimental studies that demonstrate the negative physiological effects of short-term ostracism manipulations (Dickerson & Kemeny, 2004; Gunnar, Seban, Tout, Donzella, & van Dulmen, 2003; Josephs et al., in press; Moor, Crone, & van der Molen, 2010); these negative effects could lead to serious health problems if experienced chronically.

Direct experimental research on ostracism's survival threat to humans may be lacking, but there is research using animal models that may offer interesting implications for understanding ostracism from an evolutionary perspective. Researchers interested in the physiological and psychological effects of chronic stress have begun using social animals such as prairie voles to examine research questions that can not be ethically or practically studied in human beings. Prairie voles are a useful animal model because they form socially monogamous pair-bonds, engage in biparental care of offspring, and regulate cardiac functions similar to humans (Grippe, 2009). Research with this animal model has used extended social isolation as an experimental manipulation of chronic stress, and finds that prairie voles isolated for four weeks are more likely to show adverse physiological and psychological reactions than voles that have regular social interactions. These reactions are increased aggression (Grippe, Wu, Hassan, & Carter, 2008), maladaptive cardiac functioning (Grippe, Lamb, Carter, & Porges, 2007), increased levels of stress hormones (Ruscio, Sweeny, Hazelton, Suppatkul, & Carter, 2007), anhedonia (Grippe, Cushing, & Carter, 2007), and learned helplessness (Grippe et al., 2008); each of these is an outcome reported in correlational research on chronic ostracism or isolation in humans (Cacioppo & Patrick, 2008; Williams 2001; 2009). The similarity in outcomes between chronic isolation manipulated in experiments with prairie voles and those self-reported by humans who are chronically ostracized suggest that using animal models may be a fruitful avenue of studying the survival threat of chronic ostracism experimentally (Wesselmann & Williams, in press).

Survival and (Over)Detection of Ostracism

Williams (2009) argues that humans should not only be sensitive to crude cues of ostracism, but humans should be biased towards over-detection such that ostracism may be perceived when it is not objectively occurring. This over-detection ought to occur because the cost of perceiving ostracism falsely is a lower cost to survival than the cost of being oblivious to an actual ostracism episode. Such an over-detection bias would be consistent with error management theory (Haselton & Buss, 2000; Haselton & Nettle, 2006; see also Smoke Detector Principle, Nesse, 2001), which argues that organisms should adopt detection biases that least threaten survival. Evidence for an error management theory approach to ostracism over-detection would offer the type of cost-benefit analysis evidence that can help bolster an adaptation argument (Schmitt & Pilcher, 2004).

Many experimental studies of ostracism have examined the effects of unambiguous ostracism, but there is a lack of research on misdiagnosing ostracism. Some research has examined the effects of ostracism manipulations that are ambiguous. For example, Smith and Williams (2004) manipulated ostracism using cell-phones. Participants believed they were interacting with two other individuals (virtual confederates) via texting, and in the ostracism condition participants stopped receiving message replies from the other two confederates. In this situation ostracized participants easily could have attributed the lack of replies to technical failures because they could not see the two confederates continuing the conversation, nor did they receive any confirmation that their texts were being transmitted. Regardless of this potential external attribution, ostracized participants still demonstrated the typical need threat and negative mood effects found in unambiguous ostracism manipulations. Other research using electronic-based communication has found that individuals will often misattribute lag

time between messages as potential ostracism (Bargh & McKenna, 2004; Rintel & Pittam, 1997; Thompson & Nadler, 2002). Participants even experience the negative effects of ostracism (i.e., neurological activity of the dACC, need threat, and negative mood) when they are told explicitly that they are not being included in Cyberball because it is impossible technologically for the other players to include them (Eisenberger et al, 2003)! Future research should test over-detection directly to investigate the potential survival value of detecting false alarms. One particularly interesting investigation would be to see if individuals are more likely to over-detect ostracism when asked to imagine being in a survival-relevant situation or otherwise placed in a survival-focused mindset (see Nairne, 2010).

Heritability and Variability in Ostracism Detection

To qualify as an adaptation—that is, a trait or mechanism that developed directly as a consequence of evolution through natural selection, one would need to establish heritability. At some point in our ancestral past there must have been individual differences among people along the trait dimension, and certain *forms* (such as a sensitivity to detect cues of ostracism) were *selected* because they promoted differential survival and reproduction relative to other forms. Collecting this kind of evidence is difficult, if not functionally impossible, for most psychological adaptations (e.g., see Richardson, 2007).

At the same time, one can attempt to build an empirical case for an evolutionary locus. At this point there is no direct evidence suggesting that sensitivity to ostracism (or its detection) is heritable. However, research on loneliness – the psychological state that occurs when an individual’s perceived social connection falls short of their preference – may offer a reasonable proxy for individual sensitivity to ostracism cues. Cacioppo and Patrick (2008) argue that individuals’ sensitivity to cues of social connection (and ostracism) has a genetic basis that accounts, in part, for individual differences. They further argue that the psychological state of loneliness is an alarm signal that indicates when an individual’s need for social connection is unfulfilled.

Individual differences in loneliness have differential effects on social perceptions. Lonely individuals are hyper-sensitive to social information, particularly when the information is exclusion-relevant (Cacioppo & Patrick, 2008; Gardner, Pickett, Jefferis, & Knowles, 2005). Some evidence suggests lonely individuals may be more accurate at detecting ostracism. Carter-Sowell, Chen, and Williams (2006) found that lonely individuals were more accurate at estimating the amount of ball-tosses they were given in an online ball-tossing game than non-lonely individuals (in which ostracism was defined as receiving fewer ball-tosses than someone who was included equally). The evidence supports loneliness facilitating sensitivity to cues, but there is some debate whether lonely individuals are always more accurate or if they are more likely to misconstrue ambiguous situations as a social threat (Cacioppo & Patrick, 2008). Ultimately loneliness may not be the best proxy for *accurate* sensitivity to ostracism cues, but the research suggests that both heritability and variability of this sensitivity is likely. Future research should validate a measure of accurate detection that demonstrates both the heritability and variability found in loneliness research.

Ostracism's Influence on Reproductive Goals

There is a dearth of experimental research on ostracism's effects on either the desire for or the maintenance of romantic relationships, which would be germane to its potential adaptive role in promoting reproductive success. Ostracism makes individuals interested in starting new interpersonal relationships in general (Maner et al., 2007), but its influence on interest in either short- or long-term romantic relationships is unclear. Future research could investigate how experimental manipulations of ostracism influence an individual's desire for sex, as well as if ostracism increases perceptions of the attractiveness of potential mates. Further, most experimental research on ostracism has not manipulated the sex (i.e., potential mate status) of the source of ostracism to see its effects on the target (c.f., Wirth & Williams, 2009). Future research should also manipulate this factor to investigate potential effects on mating-related outcomes.

There is also scant experimental research on ostracism within existing romantic relationships. Considerable survey and interview data have confirmed that the *silent treatment* – a colloquial term for ostracism – is common in close interpersonal relationships (Williams et al., 1998; Williams, 2001; Zadro, Arriaga, & Williams, 2008). In a survey of over 2,000 Americans, 67% reported using this behavior, and 75% reported having this behavior used on them (Faulkner, Williams, Sherman, & Williams, 1997). The silent treatment has been found to be used primarily as a manipulation tactic in relationships, used punitively to force targets to terminate unwanted behavior (Buss, Gomes, Higgins, & Lauterbach, 1987; Williams & Zadro, 1999). Ostracism may be an effective manipulation tactic in the short term, but research suggests that over time the ostracized partner will develop feelings of withdrawal and resentment (Sommer, Williams, Ciarocco, & Baumeister, 2001). These feelings likely are one of the reasons that the silent treatment is predictive of marital dysfunction and deterioration (Gottman & Krokoff, 1989; Zadro et al., 2008).

Future research should investigate the effects of both short-term ostracism and extended (and potentially reciprocal) uses of ostracism in romantic relationships. There are likely both individual differences and contextual characteristics of the relationship that influence how one responds to ostracism by their romantic partner.

A potential individual difference to examine is attachment style. Research demonstrates that insecurely attached individuals often respond more negatively to relationship threats than securely attached individuals (Campbell et al., 2005; Collins & Feeney, 2004; Simpson, Ickes, & Grich, 1999). Researchers have begun to apply this logic to understanding ostracism in the relationship context. Preliminary data suggest that anxious people interpret being ostracized by a relationship partner as more of a threat to their relationship than less anxious people (Capezza, Arriaga, Reed, Wesselmann, & Williams, 2011). These data suggest that an attachment approach can be a fruitful method of understanding individual reactions to ostracism within the relationship context.

A relationship context variable that offers interesting research questions is relationship commitment. Commitment to a particular interpersonal relationship is characterized by intention to remain in that relationship, psychological attachment to that relationship, and a long-term orientation towards that relationship (Arriaga & Agnew, 2001). Commitment is predicted by factors that promote relationship persistence (Kelley, Holmes, Kerr, Reis, Rusbult, & Van Lange, 2003; Rusbult, Arriaga, & Agnew, 2001): subjective satisfaction with, investments in, and perceived quality of alternatives to the relationship. These three factors predict whether individuals persist in (or terminate) a

relationship by influencing their overall commitment to the relationship (Le & Agnew, 2003).

One could make alternative predictions about how commitment could influence the effects of partner ostracism. Commitment could intensify the negative effects of ostracism; highly committed individuals often view themselves as cognitively interdependent with their partners, and they included their partners as an overlapping part of their self-concepts (Agnew, Van Lange, Rusbult, & Langston, 1998). It is possible that a threat to this relationship, which is seen as such an important part of the highly committed individual's life, would be even more threatening than if that individual was less committed to the relationship.

Alternatively, commitment could mitigate or eliminate the negative effects of ostracism. Commitment predicts a host of relationship-preserving behaviors, from accommodation (i.e., reacting to conflict constructively instead of retaliating; Rusbult, Verette, Whitney, Slovick, & Lipkus, 1991) to willingness to sacrifice (i.e., foregoing self-interest for the well-being of the partner/relationship; Van Lange, Rusbult, Drigotas, Arriaga, Witcher, & Cox, 1997). Higher commitment may also lead individuals to make relationship-enhancing attributions for their partners' negative behavior (Holtzworth-Munroe & Jacobson, 1985), and thus may attenuate the negative effects of ostracism. Highly committed individuals are often willing to tolerate negative aspects of their partners/relationships, from minor imperfections (Arriaga, Slaughterbeck, Capezza, & Hmurovic, 2007) to abusive behavior (Rusbult & Martz, 1995); it is possible that ostracism would also be one of these tolerated aspects of the relationship.

Paradoxical Reactions to Ostracism

A curious paradox that arises in this literature is that ostracized individuals often exhibit anti-social behavior too, which is antithetical to reinclusion (Buckley, Winkel, & Leary, 2004; Chow, Tiedens, & Govan, 2008; Twenge, Baumeister, Tice, & Stucke, 2001; Twenge & Campbell, 2003; Warburton, Williams, & Cairns, 2006; Wesselmann, Butler, Williams, & Pickett, 2010). There is no current consensus in the literature on how to disentangle this behavioral paradox, but some speculations have been made when reviewing the extant literature. Williams and Wesselmann (2011) reviewed the literature on the ostracism→aggression link, and argued that ostracized individuals should respond pro-socially in order to be reincluded, but should respond anti-socially if situational or dispositional factors lead these individuals to perceive reinclusion as unlikely. The adaptive function of pro-social responses to ostracism is intuitive, but any potential adaptive function for aggression is unclear. Aggressive behavior often facilitates more ostracism, which is maladaptive to the survival goal (Williams, 2009). Further, individuals who experience chronic ostracism may resort to extreme violence that will lead to their eventual incarceration or death (Leary, Kowalski, Smith, & Phillips, 2003; Williams & Wesselmann, 2011)! Regardless, future research should directly investigate any potential advantages (if any) aggression may have for fulfilling nature's criteria; if no advantages can be established then it is more likely that aggressive responses to ostracism are an unfortunate by-product of some other process than an actual adaptation.

Understanding and Treating Chronic Ostracism

Williams (2009) argues that if ostracism persists for an extended period of time, individuals will become resigned to their fate and ultimately experience an acceptance of atrophied need satisfactions: Alienation (need to belong), depression (self-esteem), learned helplessness (control), and unworthiness (meaningful existence). Research on chronic ostracism has received little experimental study, but qualitative evidence suggests that consistent exposure to ostracism can lead to extreme consequences. Zadro (2004; see also Williams, 2001) conducted qualitative interviews with over 50 individuals who reported experiencing chronic ostracism from friends, coworkers, or family members. The interviews suggested that chronic ostracism leads to feelings of alienation and isolation, learned helplessness, meaninglessness, depression, and low self-worth.

For direct experimental research on chronic ostracism, we can turn again to research using social animal models. The research using prairie voles finds that social isolation (which fits the conceptual definition of physical ostracism; see Williams, 2009) leads to behaviors that mimic depression and learned helplessness in humans (Grippe et al., 2008), which are two of the outcomes posited by the Williams (2009) model for chronic ostracism. It is unlikely that voles experience alienation or meaninglessness (at least as they are experienced by humans), but the current experimental work suggests that voles are a promising model for experimental manipulations of chronic ostracism. This body of research even offers interesting implications for treating individuals who face chronic ostracism. Grippe and colleagues (Grippe, Trahanas, Zimmerman, Porges, & Carter, 2009) found that doses of the social-affiliative hormone oxytocin can reduce the harmful effects of social isolation in prairie voles.

Gaertner (2009) has begun research examining how oxytocin influences group bonding and social interactions in humans. Preliminary evidence suggests that individuals assigned randomly to high interdependence groups had higher oxytocin levels than individuals in low interdependence groups. Further, oxytocin correlated with perceived entitativity, cooperation, and attraction in high interdependence groups. Taken together, these two lines of research suggest that oxytocin may be an effective treatment for reducing some of the negative effects of chronic ostracism in humans. Future research in this area would be beneficial to both basic and applied research on understanding ostracism and treating the negative effects of ostracism, especially because chronic ostracism can have dire implications for health and mortality (see Cacioppo & Hawkley, 2003).

Policy and Practice Recommendations

An evolutionary approach to studying ostracism would open interesting future research opportunities for both understanding and treating the effects of ostracism. However, we do not think it behooves practitioners to strive to reduce an individual's immediate adverse reaction to the social pain caused by ostracism because this reaction is likely adaptive (see Nesse, 2001 for a similar argument). We believe that the best approach for treating individuals who may be facing extended ostracism is to promote various forms of coping in order to prevent these individuals from entering the resignation stage (Williams, 2009). For example, research finds that positive social interactions with even one other person can attenuate the negative effects of ostracism (DeWall, Twenge, Bushman, Im, & Williams, 2010; Twenge, Zhang, Catanese, Dolan-

Pascoe, Lyche, & Baumeister, 2007). Other research suggests that reminding oneself of a positive social relationship, even if that relationship is parasocial in nature (e.g., a favorite television character) can help individuals recover from laboratory ostracism manipulations (Gardner, Pickett, & Knowles, 2005; Twenge et al., 2007). Practitioners could develop interventions that trained individuals to respond to instances of ostracism by reminding themselves of other positive sources of affiliation.

There may be other avenues for recovery that practitioners can recommend to individuals who have a dearth of positive sources of affiliation. Individuals who subscribe to a particular religion or spiritual world-view may find sources of affiliation, both within a particular community or even with their deity (Aydin, Fischer, & Frey, 2010; Epley, Akalis, Waytz, & Cacioppo, 2008; Wesselmann & Williams, 2010). Individuals may also find potential sources of affiliation and social support using online social networking websites or communities (McKenna & Bargh, 1998). Finally, there may be non-social ways of redefining needs thwarted by ostracism. For example, Warburton et al. (2006) found that ostracized individuals who were given control over a subsequent activity recovered their thwarted need for control and thus did not aggress any more than included individuals. Practitioners may find that encouraging ostracized individuals to engage in various constructive activities (e.g., recreational or creative activities/hobbies) may fortify some (if not all) of their thwarted needs. Only after a practitioner has tried all of these options would we then suggest medical interventions based on the acetaminophen and oxytocin research be considered.

Summary

Several researchers argue humans evolved detection systems so that individuals can accurately detect and avoid ostracism (Kerr & Levine, 2008; Spoor & Williams, 2007). This adaptation argument is supported by several forms of evidence needed to support a psychological adaptation, such as cross-cultural, hunter-gather, phylogenetic, medical, and physiological evidence (see Schmitt & Pilcher, 2004). Much of the psychological evidence can be interpreted as support for an adaptation argument, but direct experimental evidence that appropriately detecting (and responding to) ostracism promotes nature's criteria (i.e., solves fitness-relevant problems focused on survival and reproduction; Nairne, 2010) would help bolster the case.

We propose that direct experimental tests of ostracism detection using research methods informed by both evolutionary psychology and animal models will not only add further support to an adaptation argument, but also offer fruitful ways of approaching unanswered questions in this research area. For example, researchers can better understand the physiological and psychological effects of chronic ostracism on individuals by studying its effects on other social animals in experimental settings. This information may also suggest effective treatments (e.g., oxytocin) for these harmful effects. Thus far, little experimental research has examined ostracism's effects on romantic relationships (either in terms of initiation or relationship sustainability). This area would be most relevant to the reproduction aspect of nature's criteria. Finally, researchers could approach the paradox of anti-social responses to ostracism by investigating its potential (or lack of) adaptive advantages. This information may give suggestions on how to facilitate the pro-social (rather than the anti-social) responses in individuals who face chronic ostracism.

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