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Letting the Outside In:
Connectedness to Nature's Buffering Effects Against Social Rejection

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Abstract

Can the need to belong be met in ways other than relationships with other people? This study tested whether connectedness to nature can serve the same function as interpersonal emotional connections in response to interpersonal rejection. Participants ($n = 75$) either relived an interpersonal rejection experience, or an academic failure. Levels of aggression, negative affect and cognitive deficit, along with their levels of interdependence and connectedness to nature were then measured. Connectedness to nature was found to be activated and elevated in importance by rejected participants who were chronically less emotionally connected to nature. Though connectedness to nature did not moderate effects of negative affect, it did moderate males' aggression in response to rejection. This suggests that under some circumstances connectedness to nature can be functionally analogous to interdependence, and that the natural world can thus fill the same role as social relationships with other people.

Letting the Outside In:
Connectedness to Nature's Buffering Effects Against Social Rejection

In his 2002 documentary *Bowling for Columbine*, Michael Moore (2002) explores the United States' "culture of violence" and how gun violence is accepted and supported by American corporations and "culture." This is the kind of violence that most people think of when they imagine America's "culture of violence," and it is the kind of violence that is shown by the media. But it is not representative of America's real "culture of violence." While the rate of gun violence is much higher than in other countries, the Department of Justice reports that gun violence affects less than two out of every thousand Americans (Bureau of Justice Statistics), whereas more than three quarters of Americans report being subjected to "the silent treatment" by a loved one (Falkner et al. 1997, as cited in Williams, 2007). While this kind of act does not intuitively appear to be violent, relational violence is just as painful and damaging as physical violence.

When neuroscientific advances allowed researchers to objectively examine how rejection is experienced, they found that it is quite literally painful (Williams, 2007). When the brain of someone who is being ostracized is viewed with an fMRI machine, it shows activation in the dorsal anterior cingulate cortex, which is also activated by the experience of physical pain. Furthermore, the degree of activation in this area was highly correlated with patient's self reported degree of distress. Similarly, subjects show increased activation of the right ventral prefrontal cortex during intentional ostracism. This area of the brain is associated with pain moderation, and its degree of activation is negatively correlated with self reported distress. Thus, the psychological distress associated with rejection is neurologically analogous to the pain of physical violence, and like physical harm, rejection leaves its own set of scars.

In the long run, the effects of ostracism and social rejection can build up with devastating consequences. People who are ostracized for long periods of time are at higher risk for depression,

eating disorders, and psychopathological tendencies. Social exclusion even attacks people physically, leading to increased rates of cardiovascular disease, high blood pressure, hypertension, and lowered immune system functioning. Indeed, feelings of social isolation have been linked to the most severe of outcomes; death (Gardner, in press). Ironically, social isolation was also identified as a factor contributing to 87% of post-1995 school shootings in the United States (Williams, 2007), making it a significant health risk not only for the ostracized, but for the ostracizers as well.

The immediate effects of rejection are less dramatic, but no less important than the long term effects. People who have been rejected or ostracized exhibit increased feelings of sadness and anger, decreased feelings of control and belonging, and a decrease in self-esteem (Williams, 2007). Of these outcomes, deficits in feelings of belonging have been the most widely studied, and are theorized to be the cause of ostracism's negative effects. This makes sense when one considers that belonging is effectively the opposite of ostracism and social isolation.

The Need to Belong

Baumeister and Leary's 1995 review of the belonging literature made the case that belonging is a fundamental human need. Their review concluded that for belonging needs to be satisfied, people needed long-lasting, stable relationships that involve both frequent interaction and the perception of mutual affective concern. However, subsequent research has found many other ways in which belonging needs can be satisfied.

Twenge et al.'s (2003, as cited in Gardner, 2005) research has shown, for example, that participants in a study were aggressive to new acquaintances after a rejection experience, and that this was not moderated by a neutral interaction or a positive note from the experimenter. However, those participants who had a positive social interaction with the experimenter showed comparable levels of aggression to participants who had not been rejected in the first place. This positive interaction could be as little as the experimenter thanking them for their participation, which is characterized by neither

temporal stability, affective concern, nor frequency. Thus Baumeister and Leary's claim seems from this evidence to be overstated. The need to belong, while a fundamental human need, can be fulfilled in many ways, each of varying effectiveness.

Social Snacking

What is even more surprising, though, is that some belonging needs can be replenished without any social interaction at all, through a process called “social snacking” (Gardner et al., 2005). Just as a snack is a temporary stand-in when hunger is experienced but a real meal is unavailable, a *social* snack is a temporary stand in for when belonging needs are not met, but positive social interaction is impossible. This can be used either when there are no interaction partners, or when one has been ostracized by the available interaction partners. Common examples of social snacking are looking at photos of family members and rereading old letters from friends; 85% of American adults report keeping such a memento on their desk or in their wallet (Gardner et al., 2005).

When no rejection is experienced, the comfort of a social snack can help to reduce the anxiety of an upcoming public speaking task, and elevate mood (Gardner, in press). However, social snacking is most impressive in its ability to reduce the negative effects of rejection. Twenge et al. (2003, as cited in Gardner, 2005) found that after a rejection experience, participants who wrote about a family member were not significantly more aggressive than those who had not experienced rejection, whereas participants who had been rejected, but wrote about an admired celebrity, still exhibited aggression towards a new acquaintance. This mirrors their findings with positive social interaction, but with only the mental representation of social interaction. By imagining strong interpersonal connections, and creating a mental representation of a social interaction, participants were able to reap the positive benefits of the social interaction without the act itself. This suggests that the mental representation of a positive social interaction is functionally analogous to the interaction itself.

These lines of research show us that experiencing a social interaction and intentionally reliving

a social interaction could both work to restore one's belonging needs, but further research has shown that belonging needs can be met by non-conscious processes as well. This conclusion is suggested by Twenge et al.'s (2003, as cited in Gardner, 2005) finding that participants' self reported mood and feelings of belonging were not correlated with their recovery from rejection. However, it is most convincingly demonstrated by the research of Gardener, Pickett and Knowles (2005). Their paradigm threatened the belonging needs of participants who had a picture of a friend or a celebrity lying face up on their desk. Though participants with a picture of an admired celebrity suffered a decrease in mood after their rejection experience, participants who had a picture of a friend on their desk suffered almost no drop in mood at all (Gardner et al., 2005). This suggests that the processes needed to fulfill belonging needs can be exceedingly subtle, even unconscious.

Group Membership as a Social Snack

Knowles and Gardener (2008) continued to study social snacking, and found evidence of social snacking that was both intangible and non-conscious. In a 2008 study, participants' perceptions of their group membership were measured through both implicit and explicit measures. Knowles and Gardner then asked their participants to relive an experience of either rejection or failure, under the guise of a memory study. Their data showed a surprising difference between participants in the rejection condition and those in the failure condition. Participants with a deficit in their belonging needs exhibited a heightened senses of social identity, and viewed their group memberships as more important. These group memberships were subjectively elevated in both importance and entitativity (cohesiveness) when compared to groups they were not members of. Moreover, by subconsciously activating these constructs, they were buffered against the self esteem and mood drops associated with rejection (Knowles & Gardener, 2008). These group memberships seemed, in essence, to function as a social snack.

Self Concept as a Social Snack

Another way of examining this same construct of enhanced group membership is to look at the way people view themselves. People's self construal can be classified in a number of ways, but the useful one for belonging research is to what degree people view themselves as independent, as opposed to interdependent. Gardner, Knowles and Jefferis (in press) again had their participants relive a rejection experience, but this time asked them to brainstorm a list of their personal qualities. By coding these qualities as either individual or group oriented, it was possible to determine the degree to which the participants spontaneously identified with either their independent or interdependent sense of self. When these self construals were compared to the subjects' responses to rejection, the researchers found that feelings of interdependence buffered against negative mood, aggression, and cognitive deficits, whereas feelings of independence counterintuitively made participants more vulnerable to rejection. In short, when the participants felt that their interpersonal relationships were a defining quality of who they were, this served as a kind of constant but unconscious social snack, and replenished their belonging needs.

This would seem to suggest that any social representation is sufficient to buffer against the effects of rejection, but it is important to note that in these studies some social groups were more effective than others, and that some were not effective at all. Knowles and Gardner (2008) found that while more entitative groups predicted self esteem buffering after a rejection experience, the identities of gender and ethnicity did not. These groups seem not to be entitative enough to protect participants' self esteem. However, the literature shows consistent support for buffering effects through all of the varied ways of creating mental representations of an emotional connection. These emotional connections can be made with an individual or a group, even if that group is not very entitative, so it is plausible that emotional connections to entities besides individuals and groups of people could fulfill the same function.

Connectedness to Nature

Another similar emotional connection is an emotional connection with the natural world, which can be reliably measured with the Connectedness to Nature Scale (CNS; Mayer & Frantz 2004). While it might seem like connecting to nature would be an unlikely candidate for a buffer against rejection by one's fellow humans, the literature shows it to be surprisingly well suited to the task. One of the effects of exposure to nature is an increased ability to reflect on one's problems (Mayer & Frantz, 2008), which would seem like a good counter to the affective blunting with regards to the future that is exhibited in response to chronic social isolation. Nature is also capable of affecting an individual's mood, in that it has been shown to lower feelings of depression, anger, tension and stress (Frantz & Mayer, 2009). These are almost exactly the same emotions that are raised by rejection. Nature is also quite beneficial in the workplace, with a view of nature in one's office buffering against workplace stress and intention to quit, as well as improving one's general wellbeing (Leather et al., 1998). Both emotional connections to other people and a connection to nature share positive correlations with positive affect, life satisfaction, and ultimately feelings of belonging (Mayer & Frantz, 2008). Furthermore, the literature on pet ownership has demonstrated that people's pets can fulfill their belonging needs (Buck & Ginsburg, 1997, as cited in Frantz & Mayer, 2009). This shows that belonging needs can indeed be met by non-human relationships, suggesting that nature as a whole may well constitute a group identity with which people can identify to satisfy these belonging needs

In light of this evidence, I hypothesize that emotional connectedness to nature will serve as a functional analogue to an interdependent self concept, buffering against the negative effects of social rejection. The proposed study will test whether a strong connection to nature will lead to significantly lower levels of negative affect, aggression and cognitive decline after a social rejection. I believe that because the natural world is a less entitative group than most social groups people belong to, it will be less effective in buffering against these negative effects of rejection than feelings of interdependence

are. This study will also test whether emotional connections with nature are activated and elevated in importance after a rejection experience in the same way that social relationships are.

Methods

Participants

The sample consisted of 75 Introductory Psychology students (46 females, 29 males, mean age of 18.6) who were compensated with partial course credit. Students were randomly assigned to either “rejection” or “failure” conditions when they arrived at the testing site. Participants completed the study in individual cubicles, in groups of 1-6. See Appendix for a copy of the experimental materials.

Procedure

Participants took a trait version of the Connectedness to Nature Scale (CNS) and the Singelis (1994) self concept scale two to three weeks in advance of the study as part of a mass-testing session to measure their baseline levels of interdependence and connectedness to nature. Participants were then recruited under the cover story of a study on memory processes. They met the experimenter, who told them more about the (cover) study, and emphasized the importance of reliving the memories to the best of their ability. Once they had signed a consent form, the participants were given a packet of questionnaires and seated alone in a small room or cubicle with no view of the other participants or the outside natural world. They were instructed to fill the packet out in its entirety, then bring it back to the experimenter to be debriefed. The first measure was the baseline measure for the GRE Critical Thinking Task, which consisted of a three minutes to read two passages, followed by twelve multiple choice questions. Participants then completed the initial manipulation, disguised by the cover story as a memory task. This initial manipulation consisted of a writing task where participants were asked to recall an experience in as much detail as possible, for approximately five minutes. Those in the rejection condition read:

“For the next five minutes, we would like you to write about a time in which you felt intensely

rejected in some way, a time that you felt as if you did not belong. This rejection can be interpersonal in nature (e.g., a time in which someone broke up with you, or no longer wanted to be your friend) or can be a rejection from a group (e.g., a time in which you were chosen last for a team, or excluded from a clique).”

Participants in the failure condition read a comparable paragraph:

“For the next five minutes, we would like you to write about a time in which you felt intense failure in an intellectual domain, a time that you felt as if you were not very smart. This failure can be academic in nature (e.g., a time in which you failed a class or an exam) or can be a failure outside of school (e.g., a time in which you tried but failed to understand something important).”

After this manipulation, the participants were given the PANAS-X and the Buss-Perry Aggression Questionnaire (see below), a follow up set of GRE questions, a follow up version of the Singelis (1994) Self Construal Scale, a state CNS measure, and a brief demographic questionnaire.

The final manipulation was another writing task, designed to restore participants to a positive emotional state with feelings of belonging or competence. The task for the rejection condition read:

“For the next five minutes, we would like you to write about one of your most positive social experiences. It might be a time when you and your friends did something that brought you together as a group. It might be a time when you felt truly accepted by your family or other loved ones. Choose whatever event makes you feel most positive.”

Participants in the failure condition read a comparable paragraph:

“For the next five minutes, we would like you to write about one of your most successful achievements. It might be a time when you worked hard on a paper or project, and that hard work paid off. I might be a time when you surprised yourself by how well you did on a test. It might be a time when you were accepted at a job or internship you thought you might not get in to. Choose whichever event makes you feel most competent and successful.”

Participants then returned their packet to the experimenter, at which point they were debriefed as to the actual nature of the experiment, thanked for their participation, and dismissed.

Measures

Premeasures

The Connectedness to Nature Scale ($\alpha = .774$) (CNS, Frantz, Mayer & Sallee, in preparation) consists of ten statements, and participants are asked to rate their agreement with those statements on a scale from 1 to 7, 1 being “strongly disagree” and 7 being “strongly agree.” This measure was used as a premeasure and is hypothesized to be a functional analog of interdependence.

The Singelis (1994) self construal questionnaire served as the measure for interdependence, and was also used by Knowles and Gardner. It is comprised of 30 statements such as “I feel my fate is intertwined with the fate of those around me.” It asks participants to rate from 1 to 7 how much they agree or disagree that each statement is an accurate representation of who they are, with 1 being “Strongly Agree” and 7 being “Strongly Disagree.” Half of the items refer to interdependent traits and the other half refer to independent traits, making it possible to compute two separate scores for independence (not used) and interdependence ($\alpha = .729$).

Dependent Variables

The Positive And Negative Affect Schedule – Extended Form (PANAS-X, Watson & Clark, 1994) consists of 60 emotions such as downhearted and confident. Participants were instructed to rate how much they felt that way on a scale from 1 to 5, 1 being “very slightly / not at all” and 5 being “extremely.” All negative emotions were combined to serve as a measure of overall negative affect ($\alpha = .897$).

The Buss-Perry aggression questionnaire ($\alpha = .862$) (Buss & Perry 1992) served as the measure for aggression, and was also used by Knowles and Gardner. It consists of 29 statements such as “I have threatened people I know,” and participants were asked to rate how characteristic of them each of the

items are from 1 to 7, with 1 being “extremely uncharacteristic of me” and 7 being “extremely characteristic of me.”

The Graduate Record Examination (GRE) Reading Comprehension test served as the measure for cognitive functioning. It consisted of a long and a short written passage from practice GRE exams and multiple choice questions about those passages. The participants were given 3 minutes to read these passages, and then they had an unlimited amount of time to answer 11 multiple choice questions — 6 about the longer passage and 5 about the shorter passage. Of the total 22 questions (pre and post measures), the mean number of correct responses was 8.67, with a standard deviation of 3.0.

The final set of questions were filler questions to reinforce the cover story (e.g. “how hard was it to recall your experiences”) and demographics questions (age, gender, home environment).

Results

Before analysis, the data was checked for preexisting differences and order effects. There were no significant differences between conditions for either trait interdependence ($p = .886$) or trait connectedness to nature ($p = .212$). There was no difference between conditions for the order of presentation of state interdependence, state connectedness to nature, or aggression either (see Table 1 for means by condition, Table 2 for correlation coefficients, and Table 3 for correlation coefficients by condition). There was however, a significant difference [$t(77) = 2.181, p = .032$] between conditions for the order of presentation of the negative affect scale, the specific effects of which are discussed later. There were no gender differences on trait levels of interdependence ($p = .962$) or connectedness to nature ($p = .131$) nor were there any gender differences for negative affect ($p = .690$) or cognitive deficit ($p = .481$). There was a significant gender difference for aggression, however [$t(77) = 2.389, p = .019$], with males exhibiting more aggression overall than females. More specific gender differences are discussed as they relate to each variable.

The first hypothesis tested was that interdependence and connectedness to nature would

moderate the negative effects of rejection, and lower participants' aggression, negative affect and deficits in cognitive functioning. The data were first analyzed in regards to interdependence to see if Gardener, Knowles and Jefferis's (in press) findings were replicated by this set of data. An ANCOVA was run for each of the dependent variables (aggression, negative affect and cognitive functioning), using condition and gender as the independent variables and interdependence as a covariate, testing for both main effects and interactions between the three.

Aggression

For aggression, there was a significant main effect for condition [$F(1, 67) = 5.684, p = 0.02$], such that participants in the rejection condition expressed higher levels of aggression. There was also a marginally significant main effect for interdependence [$F(1, 67) = 3.023, p = 0.087$], such that participants higher in interdependence expressed lower levels of aggression. There was also a significant interaction between the two [$F(1, 67) = 5.057, p = 0.028$]. Higher interdependence was related to lower aggression, but only in the rejection condition (see Figure 1). These findings replicate the findings observed by Gardener, Knowles and Jefferis. When these same analyses were run without gender as a factor, for males and females independently, a clearer pattern emerged. For females, there was a significant relationship between interdependence and aggression [$F(1, 42) = 4.902, p = .032$] in both conditions such that higher interdependence was related to lower levels of aggression, and there was no difference between condition (see Figure 2). For males, there was no overall effect of interdependence, but there was a significant main effect for condition [$F(1, 25) = 5.763, p = .024$], with the rejection condition eliciting more aggressive responses. There was also a significant interaction between interdependence and condition [$F(1, 25) = 5.230, p = .031$], such that interdependence was only negatively related to aggression in the rejection condition (see Figure 3). This supports the findings observed by Gardener, Knowles and Jefferis.

The same analyses were run using CNS in the place of interdependence, and there was again a

significant main effect for condition [$F(1, 67) = 6.047, p = .017$] and for the interaction between connectedness to nature and condition [$F(1, 67) = 5.131, p = .027$] (see Figure 4). When these analyses were run separately for males and females, there were no significant results for females (see Figure 5), but the results for males mirror the relationship between interdependence and aggression. There was a marginal main effect for condition [$F(1, 25) = 7.966, p = .009$], with the rejection condition eliciting more aggressive responses, as noted above. There was also a significant interaction between connectedness to nature and condition [$F(1, 25) = 6.954, p = .014$], such that interdependence was only negatively related to aggression in the rejection condition (see Figure 6). This supports my hypothesis that trait connectedness to nature can provide the same protective benefits as trait interdependence in response to deficits in the need to belong.

Negative Affect

For negative affect, there were no significant effects for condition or the interaction, but there was a marginally significant main effect for interdependence [$F(1, 67) = 3.554, p = 0.064$], such that participants higher in interdependence had lower levels of negative affect. When these analyses were performed for males and females separately, no such relationship existed for males ($p = .734$), and for females the relationship between interdependence and negative affect across conditions was more pronounced [$F(1, 42) = 6.482, p = 0.015$]. This relationship was such that higher levels of interdependence induced lower levels of negative affect for women ($r = -.373, n = 46, p = .011$) but not for men ($r = -.136, n = 29, p = .482$). There were still no significant effects for condition or the interaction. These findings do not replicate the findings observed by Gardener, Knowles and Jefferis. The same analyses were run using CNS in the place of interdependence, but no significant effects were found.

Because order of presentation significantly affected negative affect, these same analyses were carried out in a second ANCOVA using both order of presentation and condition as independent

variables and interdependence as a covariate, testing for a two way interaction between interdependence and condition, and a three way interaction between interdependence, condition and order of presentation (there was not enough power to include gender in these analyses). There was significant predictive value in this three way interaction [$F(1, 32) = 3.984, p = 0.05$], and further analysis showed a negative correlation ($r = -.458, n = 20, p = 0.04$) between interdependence and negative affect for participants in the rejection condition who took the negative affect measure after the aggression measure, but no significant correlations for any other group (see Figures 7 & 8). This supports the findings of Gardener, Knowles and Jefferis, but only for participants who did not take the negative affect questionnaire directly after the manipulation. These same analyses were run using connectedness to nature in the place of interdependence, but no significant effects were found even when order of presentation was taken into account.

Cognitive Functioning

Cognitive functioning was measured by computing a regression predicting the participant's second GRE score from their first, and using the residual from that regression for future analyses. When an ANCOVA was run for cognitive functioning, there was a main effect of condition [$F(1, 67) = 6.510, p = 0.013$] such that the scores of the participants in the rejection condition improved while the scores of the participants in the academic failure condition declined (unsurprising, considering how recently they had relived an academic failure). There was no main effect for interdependence, but there was a significant interaction between interdependence and condition [$F(1, 67) = 5.026, p = 0.028$] such that the scores of participants in the failure condition with higher interdependence improved, whereas the scores of participants in the failure condition with lower interdependence declined. The opposite relationship was observed in the rejection condition. When these analyses were carried out for males and females separately, no such effect was found for males, but for females the same relationship between condition [$F(1, 42) = 4.619, p = 0.037$] and the condition by interdependence interaction [$F(1,$

42) = 4.102, $p = 0.049$] was observed. This finding directly contradicts the findings of Gardener, Knowles and Jefferis. The same analyses were run using CNS in the place of interdependence, but no significant effects were found.

Activation

The second hypothesis tested was that participants would activate and elevate their emotional connections with other people and the natural world when faced with a deficit in their need to belong, but not their need for competence. This was first tested in regards to interdependence to see if the findings of Knowles and Gardner (2008) were replicated by this set of data. An ANCOVA was run with condition and gender as the independent variables, state interdependence as the dependent variable and trait interdependence as a covariate, testing specifically for the interaction between condition and trait interdependence. There was a main effect of trait interdependence [$F(1, 67) = 48.788, p < .001$] predicting state interdependence. However, no interaction between state interdependence and condition was observed, which does not support the findings of Knowles and Gardner.

When these same analyses were performed using CNS in the place of interdependence, a significant main effect for trait CNS [$F(1, 67) = 74.584, p < .001$], and a significant effect for condition [$F(1, 67) = 6.559, p = .013$]. This condition effect was such that participants in the rejection condition exhibiting a higher (adjusted mean = 4.464) state CNS than those in the failure condition (adjusted mean = 4.353), suggesting that there is greater activation of CNS in the rejection condition in response to social threat. This finding supports my second hypothesis that emotional connections to the natural world can be activated and elevated in importance in response to social stressors. There was also a significant interaction between condition and trait connectedness to nature [$F(1, 67) = 5.873, p = .018$] (see Figure 9).

To examine this interaction, the data was analyzed separately for individuals above and below the median level of trait connectedness to nature (CNS). A second ANCOVA was computed with

condition and gender as the independent variables, state CNS as the dependent variable and trait CNS as a covariate. For participants high in CNS there is a significant main effect for trait CNS [$F(1, 27) = 4.468, p = .044$] predicting trait CNS. By contrast participants low in CNS exhibited no such main effect for trait CNS, but rather a marginally significant main effect for condition [$F(1, 26) = 3.261, p = .083$]. This effect was that those in the rejection condition had a higher (adjusted mean = 3.816) state CNS than those in the failure condition (adjusted mean = 3.331), suggesting that the activation of CNS in the rejection condition observed before is due to participants low in CNS. This would seem to indicate a ceiling effect, wherein only participants who were not already high in CNS were able to elevate the importance of their relationship with the natural world in response to a social rejection experience. There were no interpretable effects of gender on the activation of connectedness to nature.

Discussion

Findings

The results of this study were not as clear as one might hope, but they still provided evidence that emotional connections to nature function in the same way that emotional connections to other people do. Although this study did not fully replicate the findings of Gardner, Knowles and Jefferis (in press) or Knowles and Gardner (2009), the consistent findings suggested that connectedness to nature could be functionally analogous to interdependence in some circumstances.

When aggression was analyzed, there was a partial replication of Gardner, Knowles and Jefferis' (in press) findings that interdependence moderates the effects of rejection. The moderating effects of interdependence on aggression were more pronounced for males than for females, but this is to be expected, because men are generally more aggressive than women. It would not be possible to see the moderating effects of interdependence in a population that does not display aggression, and this is what we see for women. They have lower levels of aggression, and what aggression they have is consistent across condition. Males, by contrast, exhibited higher aggression in response to social threat, and it

was thus possible to measure the moderating effects of interdependence. This same result was observed with connectedness to nature, with males showing a moderation of their aggression in conditions of social threat. This strongly supports the hypothesis that the natural world can be as emotionally salient as one's friends and family in times of social threat, and can help maintain feelings of belonging.

The results of Gardner, Knowles and Jefferis were also replicated with regards to negative affect. Unlike aggression, participants appeared to have much higher levels of negative emotions. This is probably because negative emotions are more socially condoned than acting upon those emotions in aggressive ways. In these analyses, it was only those participants who had had some time between the social threat and the measure of emotions that showed a moderating effect of interdependence. There are two possible explanations for this effect. The first would be that people need time to consider their interpersonal relationships before such social connections can provide a buffering effect against rejection. The second would be that there was a ceiling effect for participants who were more recently socially threatened, and that only after the immediate effects of this rejection fade were they able to use their interpersonal relationships to buffer against this rejection. Either way, this provides partial replication of previous findings.

What is particularly surprising is that though the previous findings were replicated for interdependence, no such result was observed for connectedness to nature. If connectedness to nature did not provide some buffer against the negative effects of rejection, one would not expect to see such a strong finding to the contrary when aggression is analyzed. Conversely, if negative affect were not affected by emotional buffers against social rejection, one would not expect to find a buffering effect of interdependence. I have found no compelling explanation in the literature for why negative affect and aggression should function differently in response to social threats, so I am unable to provide a satisfactory explanation for why connectedness to nature did not buffer against negative affect.

Another interesting finding for negative affect is that across order of presentation and across condition, there is a buffering effect of interdependence. This same cross-condition buffering effect was also observed with women's aggression responses. This seems to indicate an underlying effect of interdependence on negative emotional responses, regardless of whether there is a threat to belonging needs or not. The most straightforward way this could be explained is by the presence of a confounding variable that is correlated with interdependence that affects these responses. Seeley and Gardner (2003) found that participants who were high in other-directed social orientation had greater self regulatory abilities than those low in other-directed social orientation. They believe that their participants who were more concerned with social self-regulation built up a greater ability to self-regulate across situations, and were thus better able to suppress unwanted thoughts and endure physically uncomfortable tests. This would explain why the participants in this study who were higher in interdependence were more able to quell their feelings of aggression and unhappiness.

The null effects for cognitive deficits are not what I had hypothesized, but this is most likely due to the experimental design. The findings that interdependence was positively related to cognitive test performance for participants who had their academic competence threatened but not for those who had their social need threatened is not surprising. One would expect that academic threats would affect people's responses on academic style tests far more than social threats would, and thus it is unsurprising that the effects observed were more pronounced for those in the academic failure group. While academic failure is a good control condition for measuring social rejection's effects on negative emotion and aggression, it is not a useful tool for examining the effects on cognitive abilities. Gardner, Knowles and Jefferis avoided this problem by using cyberball ostracism as the manipulation for testing cognitive abilities.

It is interesting to note that though the findings for cognitive deficits do not suggest what we had hypothesized they would, they are consistent with our previous findings. Participants in the

academic failure condition showed that interdependence could moderate cognitive deficits, above and beyond replenishing belonging needs, just as was observed with negative affect and women's aggression responses. These findings were thus consistent with the theory of Seeley and Gardner (2003), even though they did not replicate the findings of Gardner, Knowles and Jefferis (in press).

Another finding that was not consistent with my hypothesis was the interdependence activation findings. Activation of interdependence in response to social threats was not observed, and I believe it was again due to the specific operationalization of interdependence. The Singelis (1994) Self Construal Scale measures interdependence more in terms of self sacrifice for the good of the group than in ways relationships are meaningful and important to the individual. If participants had been given a scale that was more centered around the social support they receive rather than the sacrifices they make, I would expect them to report much higher levels of interdependence. The theoretical mechanism at work here is that people are using their sense of self as interconnected with other people to fill their belonging needs. Thus I believe that they wouldn't necessarily be more apt to affirm their respect for authority figures than any other time, whereas they would probably be more likely to affirm that their friendships were important for their happiness or other more supportive sentiments. Gardner, Knowles and Jefferis avoided this problem entirely by using an implicit measure of interdependence to measure activation.

The Connectedness to Nature Scale (Frantz, Mayer & Sallee, in preparation) by contrast is very focused on affirming a positive emotional connection with the natural world, and thus does not have the same problem as the measure used for interdependence. Accordingly, there is evidence of activation of connectedness to nature in response to a social threat as I had hypothesized. This activation is mostly observed in participants who are low in trait connectedness to nature, which suggests that there is a ceiling to the activation of connectedness to nature in response to social threat. This is probably not a matter of a ceiling within the measure, as participants were still scoring near the

middle of the range of possible responses.

I believe this ceiling is actually a ceiling of how much connectedness to nature can help replenish individuals' belonging needs. The 2008 findings of Knowles and Gardner suggest that social groups that are more entitative can more completely fulfill belonging needs, so there is likely a limit to how much benefit individuals can receive from their emotional connections with the natural world. This limit is low enough that individuals who are high in trait connectedness to nature do not need to activate these feelings at all, and it is thus only those low in trait connectedness to nature that exhibit this activation. This low ceiling does not mean that connectedness to nature is unimportant, however. The fact that connectedness to nature is activated in response to social threats and serves to moderate aggression (if not negative affect) means that it can be a significant coping mechanism under the right circumstances.

Future Research

There were a number of methodological problems with this study that limited the conclusions that could be drawn. The first was the use of academic failure as an equivalently negative but nonsocial psychological threat to compare with social rejection. This was an appropriate control condition for aggression and negative affect, but it was much too strongly related to cognitive abilities to be used as a neutral control for this variable. Other studies have used memories of major injury as an equivalently negative but nonsocial counterpart to memories of social rejection, and this would have been a much more appropriate measure to use for the present study.

Another problematic measure was the Singelis (1994) Self Construal Scale. I believe that while this scale measured interdependence well enough to be useful for measuring buffering of aggression, negative affect and cognitive deficits, it tapped in to the wrong aspects of interdependence to be useful for measuring the feelings of interdependence activated by social rejection. An explicit measure that tapped into more supportive interpersonal relationships or an implicit measure like word stem

completion of ingroup specific words would have been more useful for this study.

The last main issue with this study is that the sample is very much a sample of convenience, and the external validity of these findings is thus not as high as it could otherwise be. The sample is uniformly young, and probably has a higher socio-economic background than the population of this country, much less the global population. Also, because they are students at Oberlin College specifically, their responses may be different than a more general population. Because academic success is so important at Oberlin, people may have tried harder to answer the GRE questions which would have made the depressing effects of social rejection harder to measure. Also, because Oberlin is generally very concerned with environmental issues and sustainable living, it is possible that a more representative sample would exhibit stronger activation effects for connectedness to nature, as this effect was only observed in low CNS participants.

Future research could pursue a number of different paths based on the findings of this study. One such question suggested by these findings is the connection between interdependence and self-regulation. Seeley and Gardner's 1994 research in this area was only quasi-experimental since it relied on preexisting differences in interdependence, and when Gardner and Knowles (in press) examined the buffering effects of priming and blocking interdependence, they compared it against a neutral control rather than an equivalently negative but nonsocial control condition. It would be interesting to see whether blocking the activation of interdependence in response to a nonsocial threat would block the buffering effects of interdependence, which would suggest that interdependence itself is moderating mood and aggression in conditions of nonsocial threat. If blocking the activation of interdependence did *not* affect the buffering effects associated with high trait interdependence this would support Seeley and Gardner's hypothesis.

Also, it would be interesting to see if the degree of entitativity of salient groups affected how much those groups could buffer against social threats. This study could for example be replicated with

participants being induced to think about their familial or national identity, to see whether activation of the more entitative family group would more effectively buffer against the negative effects of a social threat than the activation of one's national identity. Alternatively, the same experiment could be conducted with nature instead of human groups, with participants being induced to view their connections with the natural world as a whole (as in the CNS) versus their favorite childhood park or camping spot. This would test whether “entitativity” applied to the natural world as well as human groups, and if it affected people's buffering abilities.

Conclusion

This study suggests that feeling connected to the natural world is one of many strategies that can be used to replenish the need to belong. It has shown that people can activate and elevate the importance of their emotional connections with nature in response to social threats, an effect that had previously only been demonstrated with interpersonal emotional connections. This suggests that inclusion in the natural world is an interdependent identity that is meaningful enough to be used alongside interpersonal ties in response to belonging deficits.

Not only was connectedness to nature being activated, but it also functioned in the same way that interpersonal emotional connections did in moderating aggressive responses to social threat. This means that connectedness to nature is not only being accessed in response to a threat, but it is being fruitfully utilized to reduce men's antisocial feelings. This finding would seem to indicate a wide new range of possible options in clinical settings to help people deal with grief, anger management or depression. It also provides strong support for the notion that empirical research needs to take emotional connections with the natural world seriously. If nature is in fact as meaningful to our emotional and cognitive processes as other people are, social psychology will need to expand its horizons significantly if it hopes to fully explain human psychology.

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Appendix

You have three minutes to read these two passages before answering questions about them. Please do not take more than three minutes or look back at the passages after you begin the questions.

Passage 1

Some modern anthropologists hold that biological evolution has shaped not only human morphology but also human behavior. The role those anthropologists ascribe to evolution is not of dictating the details of human behavior but one of imposing constraints - ways of feeling, thinking, and acting that "come naturally" in archetypal situations in any culture. Our "frailties" - emotions and motives such as rage, fear, greed, gluttony, joy, lust, love - may be a very mixed assortment quality: we are, as we say, "in the grip" of them. And thus they give us our sense of constraints.

Unhappily, some of those frailties our need for ever-increasing security among them are presently maladaptive. Yet beneath the overlay of cultural detail, they, too, are said to be biological in direction, and therefore as natural to us as are our appendixes. We would need to comprehend thoroughly their adaptive origins in order to understand how badly they guide us now. And we might then begin to resist their pressure.

Passage 2

Few areas of neuron behavioral research seemed more promising in the early sixties than that investigating the relationship between protein synthesis and learning. The conceptual framework for the research was derived directly from molecular biology, which had shown that genetic information is stored in nucleic acids and expressed in proteins why not acquired information as well.

The first step towards establishing a connection between protein synthesis and learning seemed to be to block memory (cause amnesia) by interrupting the production of proteins. We were fortunate in finding a non lethal dosage of puromycin that could, it first appeared, thoroughly inhibit brain protein synthesis as well as reliability produce amnesia.

Before the actual connection between protein synthesis and learning could be established however we began to have doubts about whether inhibition of protein synthesis was in fact the method by which puromycin produced amnesia. First, other drugs, glutavimides themselves potent protein synthesis inhibitors either failed to cause amnesia in some situations where it could easily be induced by puromycin or produced an amnesia with a different time course from that of puromycin. Second, puromycin was found to inhibit protein synthesis by breaking certain amino acid chain, and the resulting fragments were suspected of being the actual cause of amnesia in some cases. Third, puromycin was reported to cause abnormalities in the brain, including seizures. Thus, not only were decreased protein synthesis and amnesia dissociated, but alternative mechanism for the amnestic action of puromycin were readily suggested.

So, puromycin turned out to be a disappointment. It came to be regarded as a poor agent for amnesia studies, although, of course, it was poor only in the context of our original paradigm of protein synthesis inhibition. In our frustration, our initial response was simply to change drugs rather than our conceptual orientation. After many such disappointments, however, it now appears unlikely, that we will make a firm connection between protein synthesis and learning merely by pursuing the approaches of the past our experience with drugs has shown that all the amnestic agents, often interfere with memory in ways that seem unrelated to their inhibition of protein synthesis. More importantly, the notion that the interruption or intensification of protein production in the brain can be related in cause and effect fashion to learning non seems simplistic and unproductive. Remove the battery from a car and the car will not go Drive the car a long distance at high speed and the battery will become more highly charged. Neither of these facts proves that the battery power the car, only knowledge of the overall automotive system will reveal its mechanism of locomotion and the role of the battery within the system.

Circle the single best answer for each question based on what is said or implied in the passages you have just read.

Passage 1

1. The author implies that control to any extent over the "frailties" that constrain our behavior is though to presuppose
 - A. That those frailties and adaptive are recognized as currently beneficial and adaptive
 - B. That there is little or no overlay of cultural detail that masks their true nature.
 - C. That there are cultures in which those frailties do not "come naturally" and from which such control can be learned
 - D. A full understanding of why those frailties evolved and of how they function now
 - E. A thorough grasp of the principle that cultural detail in human behavior can differ arbitrarily from society to society.

2. It can be inferred that in his discussion of maladaptive frailties the author assumes that
 - A. Evolution does not favor the emergence of adaptive characteristics over the emergence of maladaptive ones
 - B. Any structure or behavior not positively adaptive is regarded as transitory in evolutionary theory
 - C. Maladaptive characteristics, once fixed, make the emergence of other maladaptive characteristics more likely
 - D. The designation of a characteristic as being maladaptive must always remain highly tentative
 - E. Changes in the total human environment can outpace evolutionary change.

3. The primary purpose of the passage is to present
 - A. A position on the foundations of human behavior and on what those foundations imply
 - B. A theory outlining the parallel development of human morphology and of human behavior
 - C. A diagnostic test for separating biologically determined behavior patters from culture - specific detail
 - D. An overview of those human emotions and motive's that impose constraints on human behaviour
 - E. A practical method for resting the pressures of biologically determined drives.

4. Which of the following most probably provides an appropriate analogy from human morphology for the "details" versus "constraints" distinction made in the passage in relation to human behaviour?
- A. The ability of most people to see all the colors of the visible spectrum as against most peoples inability to name any but the primary colors
 - B. The ability of even the least fortunate people to show compassion as against people's inability to mask their feelings completely
 - C. The ability of some people to dive to great depths as against most people's inability to swim long distance
 - D. The psychological profile of those people who are able to delay gratification as against people's inability to control their lives completely
 - E. The greater lung capacity of mountain peoples that helps them live in oxygen-poor air as against people's inability to fly without special apparatus.

Passage 2

5. The primary purpose a the passage is to show that extensive experimentation has
- A. Mot supported the hypothesis that learning is directly dependent on protein synthesis
 - B. Cast doubt on the value of puromycin in the newer behavioral study of learning
 - C. Revealed the importance of amnesia in the neuron behavioral study of learning
 - D. Demonstrated the importance of amino acid fragmentation in the induction of amnesia.
 - E. Not yet demonstrated the applicability of molecular biology to behavioral research.
6. According to the passage, neuron behaviorists initially based their belief that protein synthesis was related to learning on which of the following?
- A. Specific research into learning on which of the following
 - B. Traditional theories about learning
 - C. Historic experiments on the effects puromycin
 - D. Previous discoveries in molecular biology
 - E. Now technique in protein synthesis.
7. This passage was most likely excerpted from
- A. A book review in a leading journal devoted to genetic research.
 - B. A diary kept by a practicing neuron behavioral research
 - C. An article summarizing a series of scientific investigations in neuron behavioral research.
 - D. A news paper article on recent advances in the biochemistry of learning
 - E. A technical article on experimental techniques in the field of molecular biology.

8. It can be inferred from the passage that after puromycin was perceived to be a disappointment, researchers did which of the following?
- A. They continued to experiment with puromycin until a neuron anatomical framework was developed.
 - B. They continued to experiment with puromycin, but also tried other protein synthesis inhibitors
 - C. They ceased to experiment with puromycin and shifted to other promising protein synthesis inhibitors.
 - D. They ceased to experiment with puromycin and reexamined through experiments the relationship between genetic information and acquired information.
 - E. They continued to experiment with puromycin, but applied their results to other facts of memory research.
9. In the example of the car (lines 62-70) the battery is meant to represent which of the following elements in the neuron behavioral research program?
- A. glutarimides
 - B. acquired information
 - C. puromycin
 - D. amnesia
 - E. protein synthesis
10. The passage all of the following as effects of puromycin except
- A. Fragmentation of amino-acid chain
 - B. Inhibition of protein synthesis
 - C. Brain seizures
 - D. Memory loss
 - E. Destruction of genetic information
11. Which of the following statements would be most likely to come after the last sentences of the passage?
- A. It is important in the future, therefore for behavioral bio- chemist to focus on the several components of the total learning system.
 - B. The ambivalent status of current research, however should not deter neuron behaviorists from exploring the deeper connection between protein production and learning.
 - C. The failures of the past, however must not impede further research into the amnesic of protein-synthesis inhibitors.
 - D. It is important in the future, therefore, for behavioral biochemist to emphasize more strongly place of their specific findings within the overall protein synthesis model of learning.
 - E. It is a legacy of this research, therefore, that molecular biology's genetic models have led to disagreement among neuron behaviorists.

Please rate each of the following items in terms of how characteristic they are of you. Use the following scale for answering these items.

- | | | | | | | |
|--|---|---|---|---|---|--------------------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| extremely
uncharacteristic
of me | | | | | | extremely
characteristic
of me |
-
- _____ 1) Once in a while I can't control the urge to strike another person.
- _____ 2) Given enough provocation, I may hit another person.
- _____ 3) If somebody hits me, I hit back.
- _____ 4) I get into fights a little more than the average person.
- _____ 5) If I have to resort to violence to protect my rights, I will.
- _____ 6) There are people who pushed me so far that we came to blows.
- _____ 7) I can think of no good reason for ever hitting a person.
- _____ 8) I have threatened people I know.
- _____ 9) I have become so mad that I have broken things.
- _____ 10) I tell my friends openly when I disagree with them.
- _____ 11) I often find myself disagreeing with people.
- _____ 12) When people annoy me, I may tell them what I think of them.
- _____ 13) I can't help getting into arguments when people disagree with me.
- _____ 14) My friends say that I'm somewhat argumentative.
- _____ 15) I flare up quickly but get over it quickly.
- _____ 16) When frustrated, I let my irritation show.
- _____ 17) I sometimes feel like a powder keg ready to explode.
- _____ 18) I am an even-tempered person.
- _____ 19) Some of my friends think I'm a hothead.
- _____ 20) Sometimes I fly off the handle for no good reason.
- _____ 21) I have trouble controlling my temper.
- _____ 22) I am sometimes eaten up with jealousy.
- _____ 23) At times I feel I have gotten a raw deal out of life.
- _____ 24) Other people always seem to get the breaks.
- _____ 25) I wonder why sometimes I feel so bitter about things.
- _____ 26) I know that "friends" talk about me behind my back.
- _____ 27) I am suspicious of overly friendly strangers.
- _____ 28) I sometimes feel that people are laughing at me behind me back.
- _____ 29) When people are especially nice, I wonder what they want.

This scale consists of a number of words and phrases that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now. Use the following scale to record your answers:

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely
_____ cheerful		_____ daring		_____ irritable
_____ sad		_____ shaky		_____ upset
_____ active		_____ sleepy		_____ lively
_____ angry at self		_____ blameworthy		_____ loathing
_____ disgusted		_____ surprised		_____ delighted
_____ calm		_____ happy		_____ angry
_____ guilty		_____ excited		_____ ashamed
_____ enthusiastic		_____ determined		_____ confident
_____ attentive		_____ strong		_____ inspired
_____ afraid		_____ timid		_____ bold
_____ joyful		_____ hostile		_____ at ease
_____ downhearted		_____ frightened		_____ energetic
_____ bashful		_____ scornful		_____ fearless
_____ tired		_____ alone		_____ blue
_____ nervous		_____ proud		_____ scared
_____ sheepish		_____ astonished		_____ concentrating
_____ sluggish		_____ relaxed		_____ disgusted with self
_____ amazed		_____ alert		_____ shy
_____ lonely		_____ jittery		_____ drowsy
_____ distressed		_____ interested		_____ dissatisfied with self

You have three minutes to read these two passages before answering questions about them. Please do not take more than three minutes or look back at the passages after you begin the questions.

Passage 1

Disequilibrium at the interface of water and air is a factor on which the transfer of heat and water vapor from the ocean to the air depends. The air within about a millimeter of the water is almost saturated with water vapor and the temperature of the air is close to that of the surface water. Irrespective of how small these differences might be, they are crucial, and the disequilibrium is maintained by air near the surface mixing with air higher up, which is typically appreciably cooler and lower in water vapor content. The turbulence, which takes its energy from the wind mixes the air. As the speed of wind increases, so does the turbulence, and consequently the rate of heat and moisture transfer. We can arrive at a detailed understanding of this phenomenon after further study. The transfer of momentum from wind to water, which occurs when waves are formed is an interacting-and complicated phenomenon. When waves are made by the wind, it transfers important amounts of energy-energy, which is consequently not available for the production of turbulence.

Passage 2

For a period of more than two centuries paleontologists have been intrigued by the fossilized remains of pterosaurs, the first flying vertebrates. The issues, which puzzle them, are how these heavy creatures, having a wingspan of about 8-12 meters managed the various problems associated with powered flight and whether these creatures were reptiles or birds.

Perhaps the least controversial assertion about the pterosaurs is that they were reptiles. Their skulls, pelvises, and hind feet are reptilian. The anatomy of their wings suggests that they did not evolve into the class of birds. In pterosaurs a greatly elongated fourth finger of each forelimb supported a winglike membrane. The other fingers were short and reptilian, with sharp claws. In birds the second finger is the principal strut of the wing, which consists primarily of feathers. If the pterosaurs walked on all fours, the three short fingers may have been employed for grasping. When a pterosaurs walked or remained stationary, the fourth finger, and with it the wing, could only turn upward in an extended inverted V- shape along each side of the animal's body.

In resemblance they were extremely similar to both birds and bats, with regard to their overall body structure and proportion. This is hardly surprising as the design of any flying vertebrate is subject to aerodynamic constraints. Both the pterosaurs and the birds have hollow bones, a feature that represents a savings in weight. There is a difference, which is that the bones of the birds are more massively reinforced by internal struts.

Although scales typically cover reptiles, the pterosaurs probably had hairy coats. T.H. Huxley reasoned that flying vertebrates must have been warm-blooded because flying implies a high rate of metabolism, which in turn implies a high internal temperature. Huxley speculated that a coat of hair would insulate against loss of body heat and might streamline the body to reduce drag in flight. The recent discovery of a pterosaur specimen covered in long, dense, and relatively thick hair like fossil material was the first clear evidence that his reasoning was correct.

Some paleontologists are of the opinion that the pterosaurs jumped from s dropped from trees or perhaps rose into the light winds from the crests of waves in order to become airborne. Each theory has its associated difficulties. The first makes a wrong assumption that the pterosaurs hind feet resembled a bat's and could serve as hooks by which the animal could hang in preparation for flight. The second hypothesis seems unlikely because large pterosaurs could not have landed in trees without damaging their wings. The third calls for high aces to channel updrafts. The pterosaurs would have been unable to control their flight once airborne as the wind from which such waves arose would have been too strong.

Circle the single best answer for each question based on what is said or implied in the passages you have just read.

Passage 1

1. This passage principally intends to:
 - A. resolve a controversy
 - B. attempt a description of a phenomenon
 - C. sketch a theory
 - D. reinforce certain research findings
 - E. tabulate various observations

2. The wind over the ocean usually does which of the following according to the given passage?
 - I. Leads to cool, dry air coming in proximity with the ocean surface.
 - II. Maintains a steady rate of heat and moisture transfer between the ocean and the air.
 - III. Results in frequent changes in the ocean surface temperature.
 - A. I only
 - B. II only
 - C. I and II only
 - D. II and III only
 - E. I, II, and III

3. According to the author the present knowledge regarding heat and moisture transfer from the ocean to air as
 - A. revolutionary
 - B. inconsequential
 - C. outdated
 - D. derivative
 - E. incomplete

4. According to the given passage, in case the wind was to decrease until there was no wind at all, which of the following would occur?
 - A. The air, which is closest to the ocean surface would get saturated with water vapor.
 - B. The water would be cooler than the air closest to the ocean surface.
 - C. There would be a decrease in the amount of moisture in the air closest to the ocean surface.
 - D. There would be an increase in the rate of heat and moisture transfer.
 - A. The temperature of the air closest to the ocean and that of the air higher up would be the same.

Passage 2

1. As seen in the above passage scientists generally agree that:
 - A. the pterosaurs could fly over large distances because of their large wingspan.
 - B. a close evolutionary relationship can be seen between the pterosaurs and bats, when the structure of their skeletons is studied.
 - C. the study of the fossilized remains of the pterosaurs reveals how they solved the problem associated with powered flight
 - D. the pterosaurs were reptiles
 - E. Pterosaurs walked on all fours.

2. The view that, the pterosaurs rose into light winds from the crest of the waves to become airborne, is viewed by the author as
 - A. revolutionary
 - B. unlikely
 - C. unassailable
 - D. probable
 - E. outdated.

3. As inferred from the passage, the skeleton of a pterosaur is distinguishable from that of a bird by the
 - A. length of its wingspan
 - B. hollow spaces in its bones
 - C. anatomic origin of its wing strut
 - D. evidence of the hooklike projections on its hind feet
 - E. location of the shoulder joint joining the wing to its body.

4. From the viewpoint of T.H.Huxley, as given in the passage, which of the following statements is he most likely to agree with?
 - A. An animal can master complex behaviors irrespective of the size of its brain.
 - B. Environmental capabilities and physical capabilities often influence the appearance of an animal.
 - C. Usually animals in a particular family group do not change their appearance dramatically over a period of time
 - D. The origin of flight in vertebrates was an accidental development rather than the outcome of specialization or adaption
 - E. The pterosaurs should be classified as birds, not reptiles.

5. According to the passage which of the following is a characteristic of the pterosaurs?
 - A. The pterosaurs were not able to fold their wings when not in use
 - B. Like the bats, they hung upside down from branches
 - C. They flew in order to capture prey
 - D. They can be said to be an earlier stage in the evolution of the birds
 - E. They lived principally in a forest like habitat.

6. The organization of the last paragraph of the passage can best be described as:
 - A. New data is introduced in order to support a traditional point of view
 - B. Three explanations are put forth and each of them is disputed by means of specific information
 - C. An outline of three hypotheses are given and evidence supporting each of them is given
 - D. Description of three recent discoveries is presented, and their implications for future study are projected
 - E. The material in the earlier paragraphs is summarized and certain conclusions are from it.

7. According to the passage, some scientists believe that pterosaurs
 - A. Lived near large bodies of water
 - B. Had sharp teeth for tearing food
 - C. Were attacked and eaten by larger reptiles
 - D. Had longer tails than many birds
 - E. Consumed twice their weight daily to maintain their body temperature.

NATURE BUFFERS SOCIAL REJECTION 36

Please answer each of these questions in terms of *the way you feel right now*. There are no right or wrong answers. Using the following scale, in the space provided next to each question simply state as honestly and candidly as you can what you feel.

	1	2	3	4	5	6	7
	Strongly Disagree			Neutral		Strongly Agree	
	1	2	3	4	5	6	7
I often feel a strong connection to nature	1	2	3	4	5	6	7
I think of nature as a family that I belong in.	1	2	3	4	5	6	7
I see myself as a part of the greater circle of life.	1	2	3	4	5	6	7
Humans are more important than plants and animals.	1	2	3	4	5	6	7
I feel related to animals and plants	1	2	3	4	5	6	7
I feel I belong to the Earth and that the Earth belongs to me.	1	2	3	4	5	6	7
I feel that all living things in this world are connected, and I am a part of that.	1	2	3	4	5	6	7
There is something that every living thing shares.	1	2	3	4	5	6	7
Like the tree in the forest, I feel I belong to nature.	1	2	3	4	5	6	7
I don't feel part of nature	1	2	3	4	5	6	7

This is a questionnaire that measures a variety of feelings and behaviors in various situations. Listed below are a number of statements. Read each one as if it referred to you. Beside each statement write the number that best matches your agreement or disagreement. Please respond to every statement. Thank you.

1=STRONGLY DISAGREE

4=DON'T AGREE OR

5=AGREE SOMEWHAT

2=DISAGREE

DISAGREE

6=AGREE

3=SOMEWHAT DISAGREE

7=STRONGLY AGREE

- ___ 1. I enjoy being unique and different from others in many respects.
- ___ 2. I can talk openly with a person who I meet for the first time, even when this person is much older than I am.
- ___ 3. Even when I strongly disagree with group members, I avoid an argument.
- ___ 4. I have respect for the authority figures with whom I interact.
- ___ 5. I do my own thing, regardless of what others think.
- ___ 6. I respect people who are modest about themselves.
- ___ 7. I feel it is important for me to act as an independent person.
- ___ 8. I will sacrifice my self interest for the benefit of the group I am in.
- ___ 9. I'd rather say "No" directly, than risk being misunderstood.
- ___ 10. Having a lively imagination is important to me.
- ___ 11. I should take into consideration my parents' advice when making education/career plans.
- ___ 12. I feel my fate is intertwined with the fate of those around me.
- ___ 13. I prefer to be direct and forthright when dealing with people I've just met.
- ___ 14. I feel good when I cooperate with others.
- ___ 15. I am comfortable with being singled out for praise or rewards.
- ___ 16. If my brother or sister fails, I feel responsible.
- ___ 17. I often have the feeling that my relationships with others are more important than my own accomplishments.
- ___ 18. Speaking up during a class (or a meeting) is not a problem for me.
- ___ 19. I would offer my seat in a bus to my professor (or my boss).
- ___ 20. I act the same way no matter who I am with.
- ___ 21. My happiness depends on the happiness of those around me.
- ___ 22. I value being in good health above everything.
- ___ 23. I will stay in a group if they need me, even when I am not happy with the group.
- ___ 24. I try to do what is best for me, regardless of how that might affect others.
- ___ 25. Being able to take care of myself is a primary concern for me.
- ___ 26. It is important to me to respect decisions made by the group.
- ___ 27. My personal identity, independent of others, is very important to me.
- ___ 28. It is important for me to maintain harmony within my group.
- ___ 29. I act the same way at home that I do at school (or work).
- ___ 30. I usually go along with what others want to do, even when I would rather do something different.

Please circle the answer that you think is best.

1. How long ago was the memory you chose to relive?

Less than a week ago Less than a month ago Less than a year ago More than a year ago

2. How difficult was it to relive the sensory aspects of the experience?

Extremely Easy Easy Somewhat Easy Difficult Extremely Difficult

3. How difficult was it to relive the emotional aspects of the experience?

Extremely Easy Easy Somewhat Easy Difficult Extremely Difficult

4. How unique is this memory?

Extremely Unique Unique Somewhat Unique Not Unique

5. In general, how often do you relive old memories?

Extremely Often Often Somewhat Often Rarely Almost Never / Never

6. How did reliving this memory make you feel about yourself?

Extremely Good Good Neutral Bad Extremely Bad

1. How old are you? _____

2. What is your major? _____

3. What is your gender? _____

4. The area in which I grew up is in a more (please check one)

___ Urban environment

___ Suburban environment

___ Rural environment

___ Other _____

Thank you so much for your time and attention

Please return this packet to the experimenter

Tables

Table 1
Means and Standard Deviations for Covariates and Dependent Variables, by Condition

		M	SD
Failure	Trait Interdependence	4.75	0.55
	Trait CNS	4.22	0.81
	Aggression	2.64	0.54
	Negative Affect	1.68	0.57
	GRE (Standardized Residual)	-0.26	0.85
	State Interdependence	4.84	0.57
	State CNS	4.17	1.27
Rejection	Trait Interdependence	4.76	0.66
	Trait CNS	4.45	0.77
	Aggression	2.83	0.69
	Negative Affect	1.71	0.62
	GRE (Standardized Residual)	0.25	1.07
	State Interdependence	4.72	0.52
	State CNS	4.6	0.98

Table 2

Correlation Coefficients of Covariates and Dependent Variables

	Trait Interdependence	Trait CNS	Aggression	Negative Affect	GRE (Standardized Residual)	State Interdependence
Trait CNS	.168	-				
Aggression	-.247*	-.111	-			
Negative Affect	-.269*	-.031	.336**	-		
GRE (Standardized Residual)	-.078	.089	.221	-.089	-	
State Interdependence	.644**	.220	-.223*	-.188	-.179	-
State CNS	.038	.755**	-.041	-.020	.091	.132

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3

Correlation Coefficients of Covariates and Dependent Variables by Condition

Condition	Trait				GRE (Standardized Residual)	State	
	Interdependence	Trait CNS	Aggression	Negative Affect	Residual)	Interdependence	State CNS
Trait Interdependence	-	0.04	-0.42**	-0.36*	-0.3	0.7**	-0.17
Trait CNS	0.31	-	-0.28	0.14	-0.01	0.04	0.63**
Aggression	0	0.03	-	0.48**	0.17	-0.29	-0.1
Negative Affect	-0.17	-0.17	0.13	-	0.01	-0.27	0.09
GRE (Standardized Residual)	0.23	0.13	0.22	-0.25	-	-0.24	0.08
State Interdependence	0.6**	0.41*	-0.12	-0.1	-0.07	-	0.05
State CNS	0.22	0.84**	-0.05	-0.13	0.01	0.23	-

Note: Table split by Condition with Rejection above the diagonal and Failure below the diagonal

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Figures

Figure 1

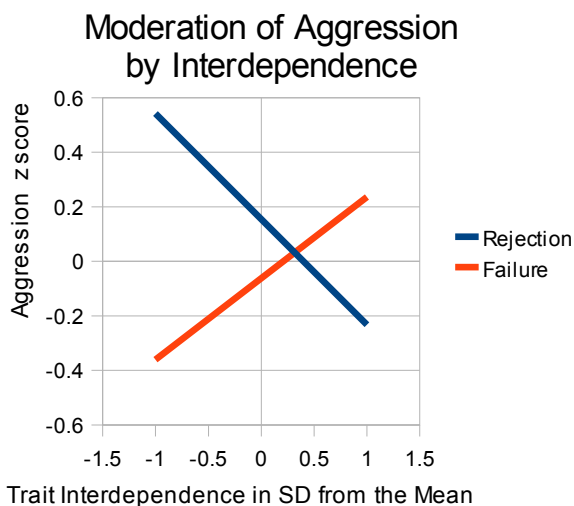


Figure 2

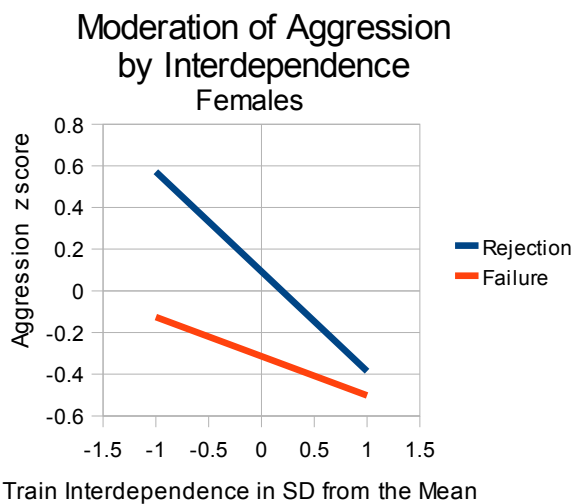


Figure 3

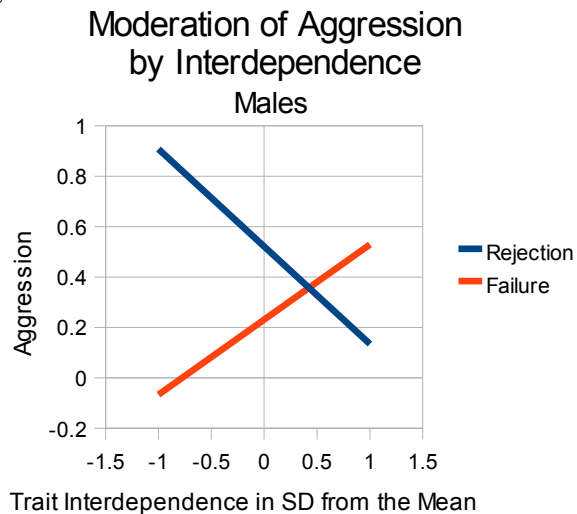


Figure 4

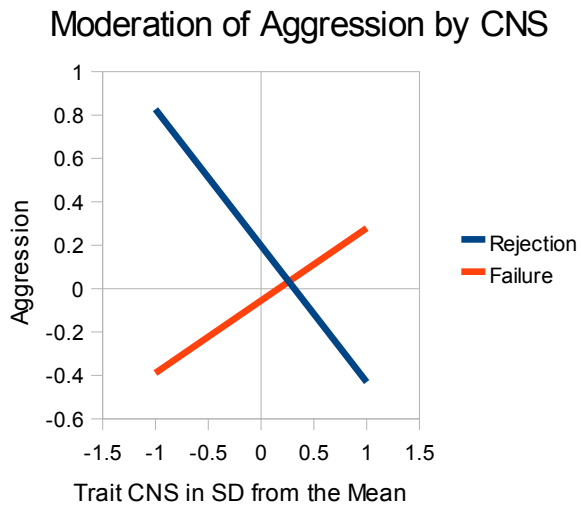


Figure 5

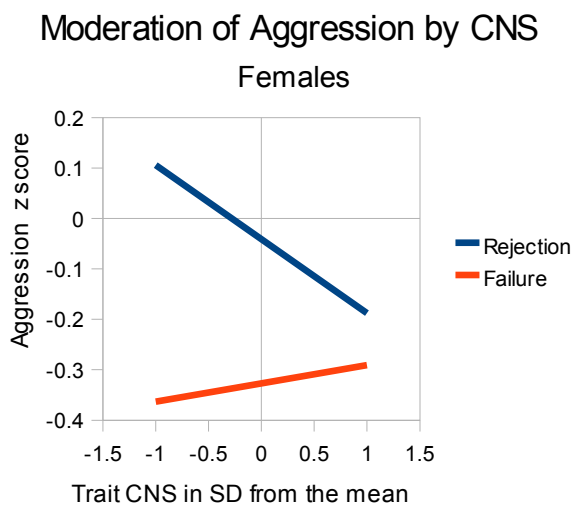


Figure 6

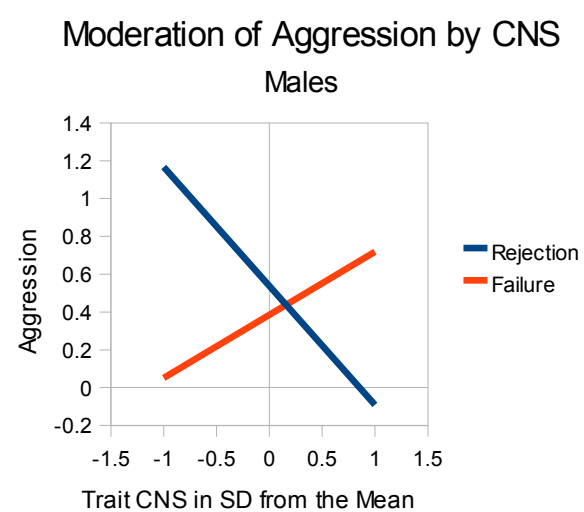


Figure 7

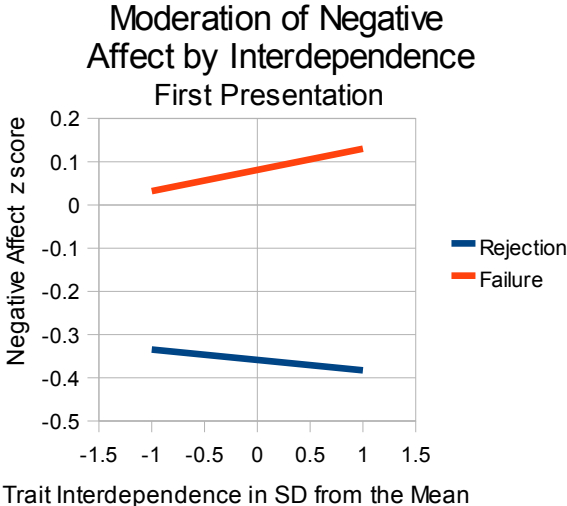


Figure 8

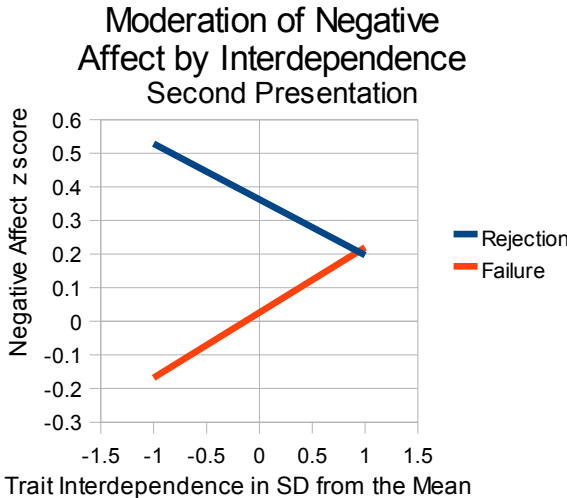


Figure 9

