

Sex Differences in the Effect of Neuroticism on Interpersonal Interaction Quality

Michael F. Greenfield & Kathleen C. Gunthert*

American University

Nicholas R. Forand

Ohio State University

**Kathleen C. Gunthert, Ph.D.; Department of Psychology; American University, 4400 Massachusetts Ave., NW, Asbury 323-A, Washington, DC 20016; gunthert@american.edu (email); 00-1-202-885-1701 (phone).*

ABSTRACT - Individuals high in neuroticism report more social problems than those low in neuroticism. This study investigates person-environment mechanisms that underlie this pattern of results and possible sex differences. Participants ($N = 120$) recorded dyadic interpersonal interactions on personal digital assistant (PDA) devices as they occurred over a week and rated the positivity/negativity of each. Neuroticism across the sample predicted the occurrence of negative interpersonal interactions even after accounting for the total number of interactions. Hence, the link between neuroticism and negative interpersonal relations is not likely explained by selection into more interactions overall. Importantly, men exhibited a stronger relationship between neuroticism and the occurrence of negative interpersonal interactions. The results suggest that the interpersonal effects of neuroticism might be sex-dependent.

Individuals high in neuroticism (high-N) report poor social relations, including higher interpersonal stress (Gunthert, Cohen, & Armeli, 1999); less satisfying marital relationships (Kamey & Bradbury, 1995); lower perceived social support (Bolger & Eckenrode, 1991); and higher conflict and antagonism in interpersonal relationships (Lopes et al., 2004). A common explanation for these findings is negatively *biased perceptions* of the environment. High-N individuals perceive more stress than low-N individuals in objectively similar circumstances (McCrae, 1990). This perceptual bias might be due to hypersensitivity and excessive reactivity to negative events (Bolger & Schilling, 1991).

Along with biased perceptions, high-Ns' reports of interpersonal problems might be due to the person-environment mechanism of *evocation*, i.e., the unintentional elicitation or provocation of certain environmental responses (Buss, 1987). For instance, high-N individuals display negative interpersonal behaviors that can evoke adverse environmental reactions; examples of such behaviors include being disagreeable, quarrelsome, and submissive (Cote & Moskowitz, 1998).

A third explanation of the link between neuroticism and interpersonal problems is the person-environment mechanism of *selection*, or the nonrandom process by which individuals enter and avoid environments (Buss, 1987). High-N individuals might select

into more social interactions in general, whether positive or negative. It is noteworthy that a positive relationship has been found between negative affectivity-neuroticism and the overall quantity of social activity in some studies but not others (Berry & Hansen, 1996; Watson, Clark, McIntyre, & Hamaker, 1992, Study 2; for exceptions, see Watson et al., Study 1 and Watson, 1988). It might be that high-Ns seek out social interactions to share and disclose feelings as a form of coping (Berry & Hansen, 1996). In fact, discussing negative emotions has been shown to have positive psychological effects (Pennebaker, 1989). While not typically considered along with biased perceptions and evocation in the literature, higher selection into interpersonal interactions might operate in conjunction with these other processes. High-N individuals might seek out more social interactions in general (selection), elicit negative responses (evocation), and perceive them more negatively than low-N individuals (biased perceptions).¹

Another issue to consider is sex differences in the effect of neuroticism on social outcomes. Some research has shown that neuroticism operates differently within the interpersonal domain for men and women. For example, high-N men in an observational behavioral study displayed more negative emotion with wives and school-age children during times of high job stress than low-N men (Wang, Repetti, & Campos, 2011). This moderation effect was not observed in women. Perhaps some of the difference in the link between negative affectivity and social functioning is related to gender role socialization. Research suggests that parents encourage emotion expression more in girls than boys, thereby providing girls opportunities to practice emotional expression. For instance, when responding to negatively emotional vignettes like a child falling off a bike, mothers and fathers more likely used expressive encouragement (i.e., 'Encourage him or her to talk about how it hurts') if the vignette applied to their daughters (Cassano, Perry-Parrish, & Zeman, 2007). On the other hand, parents might subtly encourage boys to express disharmonious emotions, such as anger, that have clear negative interpersonal consequences. For example, fathers attended more to boys' expression of disharmonious emotions like anger and laughing at another person than girls' expressions (Chaplin, Cole, & Zahn-Waxler, 2005). How one is socialized to handle negative emotion might matter more in the context of neuroticism, when strong negative emotion is often present.

Expression of negative emotion among men can also elicit negative responses from social partners. For example, depressed male undergraduates excessively seeking reassurance from their roommates are more likely to be rejected interpersonally than similarly depressed women (Joiner & Metalsky, 1995). The rejection of emotionally-expressive males might be a function of gender stereotypes, such that negative emotionality in men is less congruent with masculine norms (Broverman, Vogel, Broverman, Clarkson, & Rosenkrantz, 1972). Thus, in the context of high-N, men might experience more interpersonal problems because of being socialized to express disharmonious emotions, as well as social partners' lower tolerance of negative emotionality in men.

The present study uses event-contingent recording (ECR) of interpersonal interactions to examine the role of person-environment mechanisms and sex in the association between neuroticism and the frequency of negative interactions. Participants completed measures of neuroticism and recorded interpersonal interactions on a PDA for a week. We focused on participants' *negative interaction rate*, i.e., the percentage of total

interpersonal interactions that participants perceived as negative. We expected neuroticism to be positively related to the negative interaction rate. This hypothesis builds off previous research on neuroticism (cf. Côte & Moskowitz, 1998; McCrae, 1990) and if supported would suggest that biased perceptions affect how neuroticism is related to social interactions. Though we are not measuring interpersonal behaviors, evocation might also be present within the context of this self-reported data.

We also wanted to explore the role of selection in the association between neuroticism and negative social interactions as it has not been addressed extensively in the literature. Selection would be contributing to the occurrence of negative interactions for individuals high in neuroticism if neuroticism were positively associated with the *quantity* of social interactions. By having more social interactions in general, those higher in neuroticism would have greater opportunity for social interactions to go awry. Hence, we tested whether the number of perceived negative interactions would relate to neuroticism *after accounting for the number of interpersonal interactions overall*. In addition, given that gender socialization and norms might present neurotic men unique social challenges, we examine sex differences in the effect of neuroticism on the frequency of negative interactions.

Method

Participants

Initially 139 undergraduates were recruited from undergraduate psychology courses at a private mid-Atlantic university. Of these, 19 were excluded from the final sample because they did not provide at least 10 interactions (our minimum cut-off to ensure individual participant reliability), their data appeared inattentive (i.e., every item had the same numerical response), or they returned the PDA too late to be included. The final sample of 120 had an average age of 19.7 ($SD = 2.11$) and consisted of 93 (77.5%) women and 27 (22.5%) men. The majority of participants were freshmen or sophomores (72.5%) and White (70.8%). Other racial categories represented included Asian (9.2%); Black (2.5%); and Other (17.5%).

Procedure

At the initial visit, participants were told that the purpose of the study was to investigate the relationship between personality and perceptions of and reactions to interpersonal interactions. Participants completed a questionnaire measuring neuroticism, along with a series of other measures relevant to a larger study (see Forand, Gunthert, German, & Wenzel, 2010). Participants then received a PDA in order to complete the PDA-based survey as soon as possible after every social interaction meeting the following criteria. Participants were asked to record only dyadic face-to-face and phone interactions with “active conversation” lasting 5 minutes or more. These criteria were implemented to ensure that recordings reflected substantial interpersonal contact and to reduce participant burden. Participants were also told to omit conversations that took place through technology: e-mails, online chatting, and text messaging. Participants were also told to omit group interactions. Although we likely excluded a large segment of everyday interpersonal interactions by not recording group interactions, we chose to do so because it would have been difficult for participants to rate more than one individual

on the multiple dimensions assessed in the study (see Forand et al.). Participants reported completing 96% of the interactions within an hour of the interaction having taken place. After 1 week, participants returned the PDA and received a combination of research credit for courses and cash compensation.

Measures

Neuroticism. Neuroticism was assessed with the 12-item neuroticism Scale of the NEO Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992). This scale has items pertaining to anxiety, hostility, depression, self-consciousness, and vulnerability. The NEO-FFI is a widely used personality measure, and its reliability and validity are well established (Costa & McCrae, 1992). For the current sample, Cronbach's alpha was 0.84.

Momentary Measures. Participants were asked to complete a brief survey on their PDA after every interpersonal interaction meeting criteria. This survey included information on time since interaction, identity of the other person in the interaction, and perceptions of the interaction and the other individual in the interaction. The momentary information relevant to the current study was the rating of how positive or negative the interaction was perceived to be, ranging from 1 (*very negative*) to 5 (*neutral*) to 9 (*very positive*). As part of a larger study (see Forand et al., 2010), participants also provided interaction ratings related to communion (i.e., warmth), agency (i.e., dominance of other person), emotional closeness, control, and self-silencing.

Results

Descriptive and Preliminary Analyses

The mean neuroticism score across the sample was 22.59 ($SD = 10.21$). The mean for male participants was 17.59 ($SD = 10.37$) and for women it was 24.04 ($SD = 9.75$). This difference was significant, $t(118) = 2.99$, $p < 0.01$, which is consistent with previous research (Costa, Terracciano, & McCrae, 2001).

The total number of interactions for all participants was 2,206. This corresponds to an average of 18.4 ($SD = 6.7$) interactions per participant week and an average of 2.6 interactions per participant day. Although this rate strikes us as somewhat low, the interaction rate is consistent with Steiger, Gauvin, Jabalpurwala, Seguin, and Stotland (1999), which reported approximately 3 interactions per participant day in a community sample. Men reported an average of 19.33 interactions across the week ($SD = 7.52$), and women reported an average of 18.10 ($SD = 6.45$). This difference was not significant, $t(118) = 0.84$, $p = 0.40$. The range of total interactions per participant was 10 (our minimum cut-off) to 51. Neuroticism was unrelated to total interpersonal interactions recorded in the sample, $r(118) = -0.14$, $p = 0.13$. This suggests that individuals on the higher end of the neuroticism spectrum are not selecting into more interactions in general. Thus, our results do not support selection as a possible link between neuroticism and negative interaction occurrence.

Interactions were scored as negative in quality if rated 1 to 4 on the momentary positivity/negativity item, neutral if rated 5, and positive if rated 6 to 9. Participants rated 8.6% of the 2,206 interactions as negative, 18.7% as neutral, and 72.6% as positive.

When reporting on each interaction, participants indicated with whom they were interacting by choosing from a list of 10 individuals (i.e., roommate, close friend,

romantic partner, acquaintance, romantic interest, parent, other family member, professor, boss or coworker, and other). Within each type of interaction (positive, negative, or neutral), the highest frequency social partner was roommate. Within negative interactions, the next three most frequent social partners were romantic partner, acquaintance, and close friend.

Poisson Model Overview

We next gauge the ability of neuroticism to predict the negative interaction rate, which is the proportion of total negative interactions to total interactions. The numerator of our outcome (i.e., count of negative interactions) is a low-frequency discrete event, with over half (56.7%) of the participants reporting weekly negative interaction totals of 0 or 1. This is in line with results from Flett, Hewitt, Garshowitz, and Martin (1997). This cross-sectional study found that the modal response on 40 items gauging the frequency of various negative interactions (e.g., overt criticism and lack of recognition) was that each negative interpersonal event did not occur. With such a low-frequency outcome, ordinary least squares (OLS) can produce biased standard errors and significance tests (Gardner, Mulvey, & Shaw, 1995).

An alternative analytic strategy given these data is Poisson regression, which can model low-frequency counts of an outcome within the context of the participant's opportunity to have that event occur (Gardner et al., 1995). This opportunity or "offset" describes the degree to which participants are exposed to conditions that allow the outcome to occur (Duntzman & Ho, 2006). With respect to our data, the offset is participants' total recorded interactions.

Neuroticism and sex were entered as explanatory variables with the negative interaction rate as the outcome (Duntzman & Ho, 2006). The model notation is:

$$\log(\mu/n) = \beta_0 + \beta_1(\text{neuroticism}) + \beta_2(\text{sex})$$

where μ refers to the expected count of negative interactions, and n refers to the offset (i.e., total number of interactions). Exponentiating both sides of the equation, the predicted negative interaction rate is the outcome:

$$\mu/n = e^{\beta_0 + \beta_1(\text{neuroticism}) + \beta_2(\text{sex})}$$

To test if sex moderates neuroticism's effect, we fit a second model with the above terms plus a term representing the neuroticism-sex interaction. All predictors were mean-centered in the second model (Aiken & West, 1991).

Poisson Model Summary

A summary of the main effects and interaction models is shown in Table 1. Neuroticism had a main effect on the negative interaction rate (controlling for sex), with increasing neuroticism associated with a higher rate of negative interactions. In contrast to neuroticism, sex was unrelated to the negative interaction rate.

To aid interpretation of the main effects model, we exponentiated neuroticism's estimated regression parameter (i.e., e^{β_1} ; Duntzman & Ho, 2006) to obtain the multiplicative effect of neuroticism on the negative interaction rate. Multiplicative effects greater than 1 indicate positive relationships (Duntzman & Ho, 2006). The exponentiated parameter estimate for neuroticism is 1.02 [95% confidence interval: 1.01 – 1.04]. Therefore, the multiplicative effect for a single point increase in neuroticism is a 2%

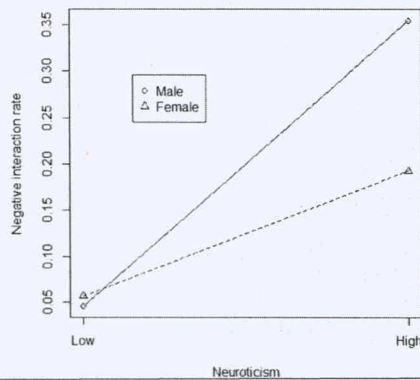
increase in the negative interaction rate (Duntelman & Ho, 2006). The negative interaction rate increase associated with a 10-point increase in neuroticism, calculated by raising the exponentiated parameter estimate of neuroticism to the 10th power, i.e., $(1.0218)^{10}$, is 1.24. Therefore, a 10-point neuroticism increase leads to a 24% increase in the negative interaction rate.

Table 1
*Unstandardized Parameter Estimates for Poisson Model
Predicting the Negative Interaction Rate*

<i>Variable</i>	<i>Parameter Estimate</i>	<i>Standard Error</i>	<i>Significance Level</i>
Main Effects Model			
Neuroticism	0.02	0.01	< 0.01
Sex	0.17	0.18	0.35
Interaction Model			
Neuroticism	0.02	0.01	< 0.01
Sex	0.20	0.17	0.25
Neuroticism*Sex	0.04	0.02	< 0.05

In the interaction model, the interaction coefficient was positive and significant, suggesting that male participants have a stronger relationship between neuroticism and the negative interaction rate than women. A Likelihood Ratio Test (LRT) was conducted to compare the fit of the main effects model versus the interaction model (Duntelman & Ho, 2006). The test was significant, $\chi^2(1, N = 120) = 5.06, p < 0.05$, implying that the interaction model is a better fit to the data. The effects of sex on the relationship between neuroticism and negative interaction rate can be seen in Figure 1. Although both sexes' negative interaction rates increase with greater neuroticism, the rate for men increases more.

Figure 1
*Sex-moderated Relationship Between Neuroticism
and the Negative Interaction Rate*



Note. Low and High Neuroticism refer to ± 1 standard deviation from the sample mean.

Discussion

We used an ECR methodology to test whether the person-environment mechanism of selection partially explains the association between neuroticism and negative dyadic interpersonal interactions. If selection were driving some of the link between neuroticism and negative interpersonal interactions, high-N individuals' reports of more interpersonal problems would be due in part to neuroticism's positive association with social interaction quantity. Greater social involvement would give high-N individuals more opportunity for negative interactions to develop. Selection could operate separately or in conjunction with biased perceptions and evocation. Interestingly, some studies have found negative affectivity-neuroticism to be associated with greater social involvement (Berry & Hansen, 1996; Watson, Lark, McIntyre, & Hamaker, 1992, Study 2). Selection into social settings might function as a coping mechanism for high-Ns if they are able to disclose and share distressing experiences (Berry & Hansen, 1996). Despite the plausibility of selection, neuroticism was not significantly correlated with the quantity of interaction recordings in our sample. The social milieu of our undergraduate sample may have provided all individuals regardless of neuroticism level the same number of social opportunities, thus limiting the chance of a significant correlation. It is unclear whether in a community sample a positive correlation would emerge.

Despite neuroticism being unrelated to the quantity of interactions, neuroticism significantly predicted the negative interaction rate, with a 10-point increase in neuroticism translating to a 24% rate increase. Given that our data are self-reported perceptions of interaction quality, these findings suggest that the interpersonal problems of individuals higher in neuroticism are more likely due to biased perceptions than selection. Indeed, in lab-based interactions among married couples, high-N spouses report more negative perceptions of partners' behaviors once objective behavior quality is controlled (McNulty, 2008). In addition, these data do not rule out the possibility that evocation is present. Neurotic individuals might evoke negative interactions through negative social behaviors like being disagreeable that are then reciprocated by social partners in a transactional manner (Côte & Moskowitz, 1998).

We also found a sex difference in the relationship between neuroticism and the negative interaction rate. Both men and women's rate increased from lower to higher neuroticism, but men's rate increased more drastically. This finding suggests that interpersonal transactions involving a person high in neuroticism might vary for men and for women. While not much research has been done on sex differences in interpersonal perceptions in the context of high-N, research on evocation provides some hints to possible mechanisms. For example, as stated earlier, high-N men display more negative emotion with family members when struggling with job stress (Wang et al., 2011). This trend could follow from men being socialized to express disharmonious emotions like anger (Chaplin et al., 2005). Additionally, other people might respond more negatively to displays of other negative emotions, like depression or anxiety, in men (Joiner & Metalsky, 1995). Although high-N men are more vulnerable to experiencing depression and anxiety, emotional expression might violate male gender norms in others' minds; the same behavior is potentially more tolerable in women (Broverman et al., 1972). Although we do not have data on participants' emotion expression and their social partners'

response, future research should study these potential mechanisms linking high neuroticism to greater interpersonal problems among men.

Whether biased perceptions or evocation or another mechanism are driving the sex difference in the negative interaction rate, men exhibiting higher neuroticism in our sample had relatively fewer positive or neutral interactions to offset the consequences of negative ones. Positive emotion-eliciting events have been shown to buffer individuals from the effects of stress (Frederickson, Mancuso, Branigan, & Tugade, 2000). Without as many positive interactions proportional to total social activity, neurotic men might be more vulnerable to continued negative affect.

In terms of limitations, the sample size for men in the present study is lower than we would prefer when making inferences about sex-based differences. Future research on social functioning and neuroticism should use larger samples of men. Second, not recording group interactions potentially excluded a large number of daily interactions for participants that might impact the negative interaction rate. That said, Berry and Hansen (1996) had participants record both dyadic and group interactions and found that as negative affectivity-neuroticism increased, dyadic same-sex interactions comprised a larger proportion of participants' total interactions. As a result, measuring only dyadic interactions in this study probably captured the most important part of high-Ns' social experience. Lastly, as we did not measure interpersonal behaviors, we cannot state whether the effects of neuroticism are related to evocation, biased perceptions of interactions, or both.

Conclusion

The person-environment mechanism of selection did not play a role in the relationship between neuroticism and the rate of negative interaction occurrence, highlighting the potential importance of biased perceptions and/or evocation. In addition, the stronger relationship between neuroticism and the negative interaction rate for men suggests that the interpersonal effects of neuroticism might be sex-dependent.

Footnote

1. While we conceptualize selection as seeking out interpersonal interactions regardless of valence, one could be more specific and examine selection into negative interactions. That said, selection into negative interactions is potentially confounded with evocation because it is unlikely that an individual nonrandomly enters conflictual environments and exhibits no negative or evocative behavior, whether intentional or not. Maintaining the separation between selection and evocation in predicting negative interpersonal interactions is better accomplished by examining selection into interpersonal interactions in general.

References

- Aiken, L.S. & West, S.G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Sage Publications: Newbury Park, CA.

- Berry, D.S. & Hansen, J.S. (1996). Positive affect, negative affect, and social interaction. *Journal of Personality and Social Psychology*, 71, 796-809.
- Bolger, N. & Eckenrode, J. (1991). Social relationships, personality, and anxiety during a major stressful event. *Journal of Personality and Social Psychology*, 61, 440-449.
- Bolger, N. & Schilling, E.A. (1991). Personality and the problems of everyday life: The role of neuroticism in exposure and reactivity to daily stressors. *Journal of Personality*, 59, 355-386.
- Broverman, I.K., Vogel, S.R., Broverman, D.M., Clarkson, F.E., & Rosenkrantz, P.S. (1972). Sex-role stereotypes: A current reappraisal. *Journal of Social Issues*, 28, 59-78.
- Buss, D.M. (1987). Selection, evocation, and manipulation. *Journal of Personality and Social Psychology*, 53, 1214-1221.
- Cassano, M., Perry-Parrish, C., & Zeman, J. (2007). Influence of gender on parental socialization of children's sadness regulation. *Social Development*, 16, 210-231.
- Chaplin, T.M., Cole, P.M., & Zahn-Waxler, C. (2005) Parental socialization of emotional expression: Gender differences and relation to child adjustment. *Emotion*, 5, 80-88.
- Costa, P., Terracciano, A., & McCrae, R.R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology*, 81, 322-331.
- Costa, P. T., & McCrae, R. R. (1992). Revised NEO personality inventory and NEO-five-factor inventory: Professional manual. Odessa FL, USA: Psychological Assessment Resources.
- Côte, S. & Moskowitz, D.S. (1998). On the dynamic covariation between interpersonal behavior and affect: Prediction from neuroticism, extraversion, and agreeableness. *Journal of Personality and Social Psychology*, 75, 1032-1046.
- Dunteman, G.H. & Ho, M-H. R. (2006). *An Introduction to Generalized Linear Models*. Sage.
- Flett, G.L., Hewitt, P.L., Garshowitz, M., & Martin, T.R. (1997). Personality, negative social interactions, and depressive symptoms. *Canadian Journal of Behavioural Science*, 29, 28-37.
- Forand, N.R., Gunthert, K.C., German, R.E., & Wenzel, S.J. (2010). Appearance investment and everyday interpersonal functioning: An experience sampling study. *Psychology of Women Quarterly*, 34, 380-393.
- Frederickson, B.L., Mancuso, R.A., Branigan, C. & Tugade, M.M. (2000). The undoing effect of positive emotions. *Motivation and Emotion*, 24, 237-258.
- Gardner, W., Mulvey, E. P., & Shaw, E. C. (1995). Regression analyses of counts and rates: Poisson, overdispersed Poisson, and negative binomial models. *Psychological Bulletin*, 118, 392-404.
- Gunthert, K.C., Cohen, L.H., & Armeli, S. (1999). The role of neuroticism in daily stress and coping. *Journal of Personality and Social Psychology*, 77, 1087-1100.
- Joiner, Jr., T.E. & Metalsky, G.I. (1995). A prospective test of an integrated interpersonal theory of depression: A naturalistic study of college roommates. *Journal of Personality and Social Psychology*, 69, 778-788.

- Karney, B.R. & Bradbury, T.N. (1995). The longitudinal course of marital quality and stability: A review of theory, method, and research. *Psychological Bulletin*, 118, 3-34.
- Lopes, P.N., Brackett, M.A., Nezlek, J.B., Schutz, A., Sellin, I., & Salovey, P. (2004). Emotion intelligence and social interaction. *Personality and Social Psychology Bulletin*, 30, 1012-1034.
- McCrae, R.R. (1990). Controlling neuroticism in the measurement of stress. *Stress Medicine*, 6, 237-241.
- McNulty, J.K. (2008). Neuroticism and interpersonal negativity: The independent contributions of perceptions and behaviors. *Personality and Social Psychology Bulletin*, 34, 1439 – 1450.
- Pennebaker, J. W. (1989). Confession, inhibition, and disease. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 211–244). New York: Academic Press.
- Steiger, H., Gauvin, L., Jabalpurwala, S., Seguin, J. R., & Stotland, S. (1999). Hypersensitivity to social interactions in bulimic syndromes: Relationship to binge eating. *Journal of Consulting and Clinical Psychology*, 67, 765–775.
- Wang, S., Repetti, R.L., & Campos, B. (2011). Job stress and family social behavior: The moderating role of neuroticism. *Journal of Occupational Health Psychology*, 16, 441-456.
- Watson, D. (1988). Intraindividual and interindividual analyses of positive and negative affect: Their relation to health complaints, perceived stress, and daily activities. *Journal of Personality and Social Psychology*, 54, 1020-1030.
- Watson, D., Clark, L.A., McIntyre, C.W., & Hamaker, S. (1992). Affect, personality, and social activity. *Journal of Personality and Social Psychology*, 63, 1011-1025.