

Original Research Report

Social Contact and Cognitive Functioning: The Role of Personality

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Abstract

Objectives: Social contact has been shown to be positively associated with cognitive functioning. It is unclear, however, whether all individuals can equally benefit from social contact with regard to their cognitive functioning. The goal of this study was to examine whether the beneficial effects of social contact are affected by individual differences in personality.

Method: We examined the Big Five personality traits as moderators of the associations between social contact and episodic memory and executive functioning using the second wave of the Midlife in the U.S. study ($N = 3,524$, $M(\text{age}) = 55.8$).

Results: High levels of Extraversion and low levels of Openness to Experience strengthened the association between social contact and memory and executive functioning. High levels of Neuroticism and Agreeableness weakened the association of social contact with memory but not with executive functioning. The results are consistent across adulthood.

Discussion: Personality modifies the social contact–cognition association. Whereas extraverts may need social contact for cognitive stimulation, those who are high on Openness gain their stimulations elsewhere. The highly neurotic might experience contact as stressful and hence as less beneficial. Emotional rather than cognitive motivation might be the reason that the highly agreeable benefit less from social contact with regard to their cognitive functioning.

Keywords: Cognitive functioning—Personality—Social contact—The Big Five

Cognitive impairment is a leading risk factor for disability in old age (Coe, von Gaudecker, Lindeboom, & Maurer, 2012) and bears major personal and societal costs. Studies indicate that cognitive functioning in old age is affected by a list of factors, among them social contact and social support (Seeman et al., 2011). However, individuals' ability to benefit from social contact may depend on their personality traits (Segel-Karpas, Bamberger, & Bacharach, 2013a).

According to the conceptual model of person–situation interaction, individuals' affective and behavioral reactions to an encountered situation depend on the situational factors, personality traits, and the interaction between the two (Mischel, 1996; Mischel & Shoda, 1995). Employing

this theoretical perspective and treating adult attachment orientation as a trait, Segel-Karpas and colleagues (2013a, 2013b) found that attachment anxiety hinders individuals' ability to benefit from increased engagement in social activities. Only when the attachment is relatively secure, increased social participation corresponds with increased well-being. Moreover, the reaction to unfavorable situations (e.g., decrease in income) also depends on attachment orientation, such that only those characterized by high levels of attachment avoidance experience decreased well-being in response to income decline. Thus, the authors argued that favorable or unfavorable situations do not automatically produce the anticipated favorable or unfavorable response. Rather, the response depends on the

interaction between the situation and the personality. Similarly, examining the role of personality in the association between interpersonal stressors and coping strategy, Lee-Baggeley, Preece, & DeLongis (2005) found that coping responses depend on the interaction between Extraversion and Agreeableness and the type of stressor.

Personality traits can shape the perception and interpretation of a given situation and thus affect the reaction to the situation (Mischel, 1996; Mischel & Shoda, 1995). In this study, we examine whether personality traits moderate the relationship between social contact and cognitive functioning, such that the beneficial effects of social contact depend on personality traits. We investigate the interactions between social contact and the Big Five personality traits in relation to cognitive outcomes.

Cognitive Aging

Research suggests that decline in many cognitive abilities is an inevitable part of the aging process. Decline in episodic memory and speed of cognitive processing starts in early adulthood and is accelerated in old age (Christensen, 2001). However, there is wide between-person variability in cognitive functioning and cognitive decline, and while some manage to maintain high level of cognitive functioning through very old age, others experience significant decline as part of the normal aging process or as a result of dementia (Fillit et al., 2002). Much attention has been directed toward “malleable” lifestyle factors (in contrast to genetic or medical conditions) that are associated with the rate and outcomes of cognitive aging. One such lifestyle factor that has been shown to relate to cognitive functioning is social contact (Seeman et al., 2011).

Social contact and cognition

An ample body of research has documented the contribution of social contact to cognitive functioning. This effect is attributed to the cognitive demands that social interactions pose (Zunzunegui, Alvarado, Del Ser, & Otero, 2003), to a mediated effect through physiological mechanisms (Seeman, Lusignolo, Albert, & Berkman, 2001), and to psychological mechanisms, such as self-efficacy and depression (e.g., Seeman et al., 2001).

Using the same data set as the current study, Seeman and colleagues (2011) found that social contact, that is, the frequency of interactions with family and friends, was positively related to cognitive functioning and that decline in social contact negatively affected cognitive functioning. Zunzunegui and colleagues (2003) examined the effects of social contact with friends and relatives, social integration (that was defined as engagement in communal activities) and social engagement (that was defined as the perceived usefulness of the self to close others), on cognitive functioning and found that low levels of these were a risk factor for cognitive decline among elderly people. In a longitudinal study, high social integration was related to a slower rate

of memory decline over a period of 6 years (Ertel, Glymour, & Berkman, 2008).

Despite the findings supporting the association between various forms of social engagement and cognitive functioning, it remains unclear whether all individuals can equally benefit from social engagement. We expect that individual differences in personality will moderate the associations between social contact and cognitive functioning. As far as we know, the moderating role of personality in this regard has not been studied.

Social contact and personality

Personality traits affect the interpretations given to social situations, the perceptions of others' behaviors, and the typical patterns of thoughts and feeling that arise in social situations (Barrett & Pietromonaco, 1997). Thus, while for some, social contact may be perceived as enjoyable, stimulating, and necessary for well-being, for others, the contact may be burdensome, distressing, or simply not meaningful or beneficial (Segel-Karpas et al., 2013a).

Social contact and cognitive functioning: The role of personality

The Big Five personality traits (Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness) are related to the perceptions of the self and others and to expectations and behaviors in social situations (Nezlek, Schütz, Schröder-Abé, & Smith, 2011). Of the five factors, Extraversion and Agreeableness are considered the traits with the most immediate implications for social situations (Nezlek et al., 2011).

Extraversion. It was suggested that extraverts suffer from low levels of cortical arousal and that their sociable nature is an attempt to increase their level of arousal (Eysenck, 1967; Matthews & Gilliland, 1999). Extraverts were found to have greater number of social interactions and activities (Nezlek et al., 2011) and larger and more diverse social networks (Swickert, Rosentreter, Hittner, & Mushrush, 2002) in comparison with introverts. Extraverts ascribe greater importance to social relationships (White, Hendrick, & Hendrick, 2004) and manage to benefit more from social interactions with regard to their self-esteem (Barrett & Pietromonaco, 1997). Findings regarding the relationships between Extraversion and cognitive abilities are mixed: although Extraversion is beneficial to cognitive tasks that require speed of processing, it is harmful to tasks that require reasoning and verbal abilities (Graham & Lachman, 2014). It was argued that highly extraverted individuals are not particularly interested in intellectual activities and derive their stimulation from the social environment (Chamorro-Premuzic, Furnham, & Ackerman, 2006).

The extraverts' utilization of the social environment to gain stimulation, and their greater involvement in social interactions, could indicate that they are more likely than introverts to cognitively benefit from social contact.

Agreeableness. The relationships between Agreeableness and social engagement are similar to those described for Extraversion (including positive associations with quality of and satisfaction with relationships and greater perceived importance of social interactions, Neyer & Asendorpf, 2001; White et al., 2004).

Despite the similarities between Extraversion and Agreeableness, the *motivation* for social contact may differ. Although it was suggested that in Extraversion, the motivation is cognitive stimulation (Eysenck, 1967; Matthews & Gilliland, 1999), theory suggests that in Agreeableness, the motivation is the preservation of social cohesion and positive relationships (Graziano & Eisenberg, 1997). Several studies found a negative association between Agreeableness and cognitive performance (e.g., Graham & Lachman, 2012), suggesting that the highly agreeable rely on their social skills, rather than on cognitive performance as a main venue for achievements, or that better cognitive abilities decrease the need for pleasing others and thus are related to lower levels of Agreeableness (Baker & Bichsel, 2006). Because it is hypothesized that for the highly agreeable, the motivation for social contact is not cognitive stimulation, but rather positive relationships, they may choose to engage in less stimulating interactions that have less potential for conflict. Thus, they may not cognitively benefit from social contact as we expect the extraverts to benefit from it. The emphasis on cohesion and positive relationships could reduce the cognitive stimulation and the consequent cognitive benefits gained from social contact.

Neuroticism. Although Neuroticism is not defined as a “social trait,” it has major implications for social relationships. The highly neurotic experience heightened reactivity to social stressors (Mroczek & Almeida, 2004) and greater harm to their self-esteem resulting from threats of social exclusion (Denissen & Penke, 2008). Distress experienced by highly neurotic individuals in social situations may be the reason for the negative association between Neuroticism and cognitive functioning, as it distracts them and hinders their performance in different tasks (Graham & Lachman, 2012, 2014).

The possible stressfulness of social situations, and the threat they pose to self-esteem, could limit the highly neurotic’s ability to engage in meaningful, stimulating social contact and thus result in reduced benefit to cognitive functioning.

Openness to Experience. Openness to Experience was traditionally examined more so in relation to intellectual activities than in relation to social activities (Nezlek et al., 2011) and was consistently positively associated with cognitive functioning (Graham & Lachman, 2012, 2014). However, recent studies emphasized its effects on social behaviors and social perceptions, arguing that the “characteristics of mind have profound consequences for social behavior ...” (McCrae & Sutin, 2009, p. 257). In a recent

review, McCrae and Sutin (2009) thoroughly examined the contribution of Openness to different aspects of social behaviors and social perceptions such as conflict management and satisfaction in married couples. Examining dyads of friends, Openness was related to lower number of conflicts but was unrelated to closeness in friendships (Berry, Willingham, & Thayer, 2000). Nezlek et al. (2011) found that Openness was related to better quality of daily social interactions in an American sample, but not in a German one. Studying the relationships between Openness and social support, Swickert, Hittner, and Foster (2010) and Cukrowicz, Franzese, Thorp, Cheavens, and Lynch (2008) found no or only weak associations.

Focusing on the contribution of social contact to *cognitive functioning*, we argue that the effect will be weaker for those who are high in Openness, as those individuals would demonstrate high levels of cognitive functioning regardless of social contact due to their profound interest in varied cognitively stimulating activities. Thus, those who are lower in Openness, and hence, probably, are less engaged in varied cognitively stimulating activities, will be those who rely more heavily on the social realm and benefit most from social contact.

Conscientiousness. Conscientiousness is considered a “task-related” construct, and it is not associated with social engagement (Nezlek et al., 2011). Studies suggest that the effects of Conscientiousness on cognition depend on the cognitive aspect examined. Conscientiousness was shown to be positively related to academic performance (Poropat, 2009) but negatively associated with intelligence (Moutafi, Furnham, & Paltiel, 2004). However, results have not been consistent, and several studies found no association between Conscientiousness and cognitive abilities (Graham & Lachman, 2012, 2014). Given that Conscientiousness is not a social trait, and was not consistently demonstrated to relate to cognitive performance, we did not specify a hypothesis regarding its role.

In summary, our hypotheses are that (H1) Extraversion amplifies the association between social contact and cognitive functioning and (H2) Agreeableness, (H3) Neuroticism, and (H4) Openness to Experience weaken the association.

Method

Participants

Data were derived from the second wave of the Midlife in the U.S. (MIDUS) study. The sample, collected between 2004–2006, initially included 4,963 respondents from the noninstitutionalized population of the 48 contiguous states. Data were obtained by a telephone interview, using random digit dialing (RDD; response rate of 71%). After completion of the telephone interview, participants were invited to respond to another questionnaire sent by mail, where psychological data (the five traits) were collected (response rate of 81% of the telephone interview).

The cognitive battery was collected in a second telephone interview (response rate of 86% of those in the initial telephone interview). Mean age was 55.8 (SD 12.31) and ranged from 32 to 84. Fifty-five percent were female, 69% were married, and 62% were employed. Analyses were performed on 3,524 respondents who provided full data on all the relevant variables. Testing for selection bias, our comparison revealed that those with complete data tended to be slightly older ($M = 56.17$, $SD = 12.20$ vs. $M = 55.03$, $SD = 12.92$, $t(4204) = -2.21$, $p < .05$), and more educated ($M = 14.41$, $SD = 2.62$ vs. $M = 14.04$, $SD = 2.59$, $t(4198) = -3.35$, $p < .01$) than those with missing data. Similarly, those who provided full data had fewer functional limitations ($M = 1.54$, $SD = .76$ vs. $M = 1.81$, $SD = .83$, $t(3692) = 4.45$, $p < .001$) and were more likely to be female (55% female, $\chi^2 = 10.82$, $p < .001$).

Measures

Cognitive functioning

Cognitive functioning was assessed after performing a short hearing test, using the Brief Test of Adult Cognition by Telephone (BTACT; Lachman, Agrigoroaei, Tun, & Weaver, 2013).

The BTACT includes measurements of immediate recall and delayed recall of a list of 15 words; working memory span (reversed order repetition of a series of numbers); verbal fluency (spontaneous recollection of maximal number of animals in 60 seconds); inductive reasoning (completion of next number in a series); processing speed (number of digits completed in 30s by counting backwards from 100); attention-switching task (derives accuracy and latency in two conditions: a normal condition in which participants are asked to respond with “go” to the stimulus “green” and “stop” to the stimulus “red” and a reverse condition where they are asked to respond with “stop” to the stimulus “green” and “go” to “red”).

The subsets of variables tap into two cognitive functioning indicators: episodic memory (immediate and delayed recall) and executive functioning (all the remaining tests). Scores on these scales are the standardized scores (z scores) of the mean index of scores obtained in the different subscales. This structure was validated using exploratory and confirmatory factor analysis (Lachman, Agrigoroaei, Murphy, & Tun, 2010).

Social contact

We defined social contact as the frequency of contact, including visits, phone calls, letters, or e-mails with (1) family and (2) friends. Scale ranged from 1 to 8 (1 = *never or hardly ever*, 2 = *less than once a month*, 3 = *about once a month*, 4 = *2–3 times a month*, 5 = *about once a week*, 6 = *several times a week*, 7 = *about once a day*, and 8 = *several times a day*). Overall social contact score was computed as the sum of contact with family and friends, only when answers were provided for both questions ($n = 4,041$, 81%).

The Big Five

The Big Five personality traits were assessed using 25 adjectives (Prenda & Lachman, 2001). Respondents rated the extent to which each adjective described them on a scale of 1 (*not at all*) to 4 (*a lot*). The adjectives were divided accordingly: *Extraversion*: outgoing, friendly, lively, active, and talkative ($\alpha = .73$); *Agreeableness*: helpful, warm, caring, softhearted, and sympathetic ($\alpha = .74$); *Neuroticism*: moody, worrying, nervous, and calm (reverse coded) ($\alpha = .70$); *Openness to Experience*: creative, imaginative, intelligent, curious, broad-minded, sophisticated, and adventurous ($\alpha = .74$); and *Conscientiousness*: organized, responsible, hardworking, careless (reverse coded), and thorough ($\alpha = .64$). Scales were computed as the mean across all adjectives, when a response was provided for at least half of the items. The Extraversion, Neuroticism, Agreeableness and Conscientiousness scores were computed for 81% of the overall sample of 4,963, and Openness was computed for 80% of the overall sample. The adjectives were taken from existing traits inventories (Goldberg, 1992; John, 1990; Trapnell & Wiggins, 1990) and validated in a pilot study before inclusion in the MIDUS survey. The scales were shown to have good reliability and validity in the full sample (Lachman & Bertrand, 2001).

Control variables

We controlled for age, gender, number of school years, race (a binary variable contrasting Whites and Blacks and/or African Americans; Native Americans or Aleutian Islanders/Eskimo; Asian or Pacific Islander; Others; Multiracial), marital status (a binary status contrasting those with and without a spouse), and employment status (contrasting the employed with the unemployed). We also controlled for the number of functional limitations, as these were found to be associated with cognitive functioning. The functional limitations scale included ratings of the difficulty (1 = *not at all*, 4 = *a lot*) in lifting/carrying groceries; bathing/dressing; climbing several flights of stairs; climbing one flight of stairs; bending/kneeling/stooping; walking more than one mile; and walking several blocks and walking one block.

As a potential benefit of social contact may be the social support gained from the interactions, and the latter could potentially benefit cognitive functioning, we controlled in our models for perceived social support. Social support was defined as a composite score of the support provided from the spouse/partner, other family members and friends, and the strain caused by each of these relationships (rated on a scale of 1 (*a lot*) to 4 (*not at all*)). Each scale included four items for support/strain from friends and family and two additional items for support/strain from the spouse. Example for support question: “how much your spouse/family/friends really care(s) about you.” Example for strain question: “how much your spouse/family/friends make(s) too many demands.” The social strain items were recoded,

such that higher scores in the overall scale indicated low strain and high support ($\alpha = 0.85$).

Analysis

To test the models, we used a series of regression analyses. In the first step, we included the control variables. In the second and third steps, we added social contact and the personality traits, respectively, and in the fourth step, we included the interaction terms between the predictor and the traits. The predictor and the moderators were centered around the mean prior to analysis. We complemented the analyses with simple slopes analysis, testing the slope between social contact and cognitive functioning for low (1 *SD* below mean), mean, and high (1 *SD* above the mean) levels of the moderators.

The regression analyses revealed that Conscientiousness was not significantly associated with the outcomes (as a main effect or as a moderator), and hence it was not included in the final analyses (Tables 2 and 3).

Results

Descriptive statistics and correlations between study variables are presented in Table 1. Social contact was positively correlated with episodic memory ($r = .08, p < .001$), but not with executive functioning.

Tables 2 and 3 present the results of the regression analyses for episodic memory (Table 2) and executive functioning (Table 3). Similarly to previous studies, social contact was positively and significantly associated with episodic memory ($b = .02, p < .01$). Neuroticism was negatively associated with episodic memory ($b = -.06, p < .05$), and Openness was positively associated with episodic memory ($b = .09, p < .01$). The association between social contact and episodic memory was moderated by Extraversion ($b = .05, p < .001$), such that Extraversion strengthened the association, $b = .05, p < .001$ when Extraversion was high; $b = .02, p < .01$ (mean); $b = -.008, p = n.s$ (low), in support of our first hypothesis (Figure 1A). In support of the second hypothesis, Agreeableness moderated the association between social contact and episodic memory ($b = -.03, p < .05$), such that it was stronger for lower levels of Agreeableness, $b = .03, p < .001$ (low); $b = .02, p < .01$ (mean); $b = .006, p = n.s$ (high; Figure 1B). In support of the third hypothesis, Neuroticism was also a significant moderator ($b = -.02, p < .05$), such that it weakened the association between social contact and episodic memory, $b = .03, p < .001$ (low); $b = .02, p < .001$ (mean); $b = .007, p = n.s$ (high; Figure 1C). Finally, supporting the fourth hypothesis, Openness was also a significant moderator ($b = -.03, p < .05$), weakening the association between social contact and memory, $b = .04, p < .001$ (low); $b = .02, p < .01$ (mean) $b = .004, p = n.s$ (high; Figure 1D).

The results for the model testing executive functioning (Table 3) showed that social contact was a positive covariate

($b = .03, p < .01$). Neuroticism and Extraversion were negatively associated with executive functioning, $b = -.05, p < .05, b = -.08, p < .05$, respectively, and Openness was positively associated with executive functioning ($b = .09, p < .01$). The association between social contact and executive functioning was moderated by Extraversion ($b = .03, p < .01$) and by Openness ($b = -.03, p < .05$), such that Extraversion strengthened the association, $b = .03, p < .01$ (high); $b = .02, p < .01$ (mean), and $b = .001, p = n.s$ (low; Figure 2A), and Openness weakened it, $b = .03, p < .001$ (low); $b = .02, p < .001$ (mean); $b = .002, p = n.s$ (high; Figure 2B), in support of hypotheses H1 and H4.

Finally, because cognitive performance is related to age and gender, we tested the moderating role of these in three-way interactions. Neither the interaction with age nor with gender was significant, indicating that the moderating role of personality is consistent across adulthood and between men and women. Similarly, as marital status could guarantee daily social interactions, we tested its moderating role in three-way interactions and found a significant interaction term between marital status, Extraversion, and social contact for episodic memory ($b = -.15, p < .05$). This suggests that Extraversion amplifies the contribution of social contact to episodic memory among unmarried people more than among married people ($b = .20, p < .001; b = .06, p < .10$, respectively). In other words, Extraversion is most cognitively beneficial to those unmarried individuals who enjoy social contact.

Discussion

The results lend partial support to our hypotheses, implying that the beneficial effects of social contact are not universal, but rather are limited to individuals with certain personality traits. Although the effects are small, in line with the person-situation interaction theory (Mischel, 1996; Mischel & Shoda, 1995), the results suggest it could be interesting to take into account personality differences when examining the associations between social contact and cognitive outcomes or in designing interventions.

More specifically, four of the five personality traits (Conscientiousness being the exception) moderated the relationship between social contact and episodic memory, and two personality traits (Extraversion and Openness) also moderated the relationship between social contact and executive functioning.

Previous studies did not provide consistent results regarding the association between Extraversion and cognitive functioning, and it seems the associations depend on the measure used to assess cognitive functioning: whereas Extraversion contributes to tasks that require speed, it harms the performance in tasks that require more thorough processing (Graham & Lachman, 2014). In a similar manner, in our study, higher levels of Extraversion were associated with lower levels of executive functioning but were not associated with memory. In accordance with our hypothesis, higher levels of Extraversion amplified the

Table 1. Descriptive Statistics and Correlations Between Study Variables

| | M | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---------------------------|-------|-------|---------|---------|---------|---------|---------|---------|---------|---------|--------|---------|--------|--------|---------|--------|--------|
| 1. Age | 56.17 | 12.21 | | | | | | | | | | | | | | | |
| 2. Gender ^a | .44 | .50 | .03 | | | | | | | | | | | | | | |
| 3. Race ^b | .92 | .25 | .03 | .005 | | | | | | | | | | | | | |
| 4. Married ^c | .73 | .45 | -.09*** | .15*** | .09*** | | | | | | | | | | | | |
| 5. Employed ^d | .63 | .48 | -.50*** | .11*** | -.01 | .05*** | | | | | | | | | | | |
| 6. Education | 14.40 | 2.62 | -.14*** | .11*** | .03 | .04* | .18*** | | | | | | | | | | |
| 7. Functional limitations | 1.54 | .76 | .31*** | -.12*** | -.02 | -.13*** | -.34*** | -.24*** | | | | | | | | | |
| 8. Support | 3.23 | .37 | .19*** | -.02 | .04** | .09*** | -.07*** | .02 | -.09*** | | | | | | | | |
| 9. Contact | 11.59 | 2.51 | .05** | -.15*** | .005 | -.03* | -.09*** | .01 | .01 | .22*** | | | | | | | |
| 10. Neuroticism | 2.04 | .61 | -.18*** | -.11*** | -.01 | -.04* | .03* | -.08*** | .12*** | -.32*** | -.05** | | | | | | |
| 11. Extraversion | 3.10 | .56 | .05** | -.08*** | -.08*** | -.008 | .009 | -.02 | -.09*** | .25*** | .24*** | -.20*** | | | | | |
| 12. Openness | 2.91 | .53 | -.01 | .05** | -.08*** | -.06*** | .06*** | .21*** | -.11*** | .16*** | .09*** | -.22*** | .51*** | | | | |
| 13. Agreeableness | 3.45 | .49 | .11*** | -.29*** | -.03 | -.05** | -.10*** | -.10*** | .07*** | .24*** | .20*** | -.11*** | .49*** | .32*** | | | |
| 14. Conscientiousness | 3.39 | .48 | -.02 | -.08*** | .01 | .06*** | .07*** | .07*** | -.16*** | .22* | .04* | -.19*** | .27*** | .33*** | .27*** | | |
| 15. Episodic memory | .05 | .99 | -.33*** | -.23*** | .07*** | .005 | .18*** | .20*** | -.18*** | -.008 | .08*** | .005 | .05** | .09*** | .05** | .10*** | |
| 16. Executive functioning | .09 | .94 | -.42*** | .10*** | .11*** | .10*** | .31*** | .41*** | -.31*** | -.01 | .02 | -.02* | -.02 | .12*** | -.09*** | .08*** | .42*** |

^aGender (1 = male).

^bRace (1 = White).

^cMarried (1 = yes).

^dEmployed (1 = yes).

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2. Main Effects and Interaction Terms for Social Contact, and Personality Traits on Episodic Memory

| | Estimate | | Estimate | | Estimate | | Estimate | |
|-------------------------|----------|------|----------|------|----------|------|----------|------|
| | B | SE | B | SE | B | SE | B | SE |
| Intercept | .33** | .19 | .35** | .19 | .44*** | .20 | .42** | .19 |
| Age | -.02*** | .001 | -.02*** | .001 | -.02*** | .002 | -.02*** | .002 |
| Gender (1 = male) | -.51*** | .03 | -.49*** | .03 | -.50*** | .03 | -.50*** | .03 |
| Race (1 = White) | .27*** | .05 | .27*** | .06 | .29*** | .04 | .28*** | .05 |
| Married (1 = yes) | -.02 | .03 | -.02 | .03 | -.006 | .03 | -.004 | .03 |
| Employed (1 = yes) | .05 | .04 | .06 | .04 | .05 | .04 | .05 | .04 |
| Education | .06*** | .006 | .06*** | .006 | .06*** | .006 | .06*** | .005 |
| Functional limitations | -.09*** | .02 | -.09*** | .02 | -.08*** | .02 | -.08*** | .02 |
| Support | .08* | .04 | .05 | .04 | -.001 | .04 | .01 | .04 |
| Contact | | | .02** | .01 | .02** | .01 | .02** | .01 |
| Neuroticism | | | | | -.06* | .03 | -.06* | .02 |
| Extraversion | | | | | .006 | .04 | .01 | .03 |
| Openness | | | | | .09** | .03 | .09** | .03 |
| Agreeableness | | | | | .007 | .04 | .002 | .04 |
| Contact × Neuroticism | | | | | | | -.02* | .01 |
| Contact × Extraversion | | | | | | | .05*** | .02 |
| Contact × Openness | | | | | | | -.03* | .01 |
| Contact × Agreeableness | | | | | | | -.03* | .01 |
| R ² | .202 | | .205 | | .211 | | .215 | |
| ΔR ² | | | .003** | | .006*** | | .004** | |

p* < .05. *p* < .01. ****p* < .001.**Table 3.** Main Effects and Interaction Terms for Social Contact and Personality Traits on Executive Functioning

| | Estimate | | Estimate | | Estimate | | Estimate | |
|-------------------------|----------|------|----------|------|----------|------|----------|------|
| | B | SE | B | SE | B | SE | B | SE |
| Intercept | .20 | .11 | .21 | .16 | .29** | .11 | .28* | .11 |
| Age | -.03*** | .001 | -.03*** | .001 | -.03*** | .001 | -.03*** | .001 |
| Gender (1 = male) | .10*** | .03 | .11*** | .03 | .09** | .03 | .09** | .03 |
| Race (1 = White) | .40*** | .04 | .40*** | .05 | .40*** | .05 | .39*** | .05 |
| Married (1 = yes) | .06* | .03 | .06* | .03 | -.07* | .03 | .07* | .03 |
| Employed (1 = yes) | .09** | .03 | .09** | .03 | .09** | .03 | .09** | .03 |
| Education | .11*** | .005 | .11*** | .005 | .11*** | .005 | .11*** | .005 |
| Functional limitations | -.12*** | .02 | -.12*** | .02 | -.12*** | .02 | -.12*** | .02 |
| Support | .08* | .03 | .06 | .04 | .04 | .04 | .04 | .01 |
| Contact | | | .03** | .01 | .02** | .01 | .02** | .01 |
| Neuroticism | | | | | -.05* | .02 | -.05* | .02 |
| Extraversion | | | | | -.08* | .01 | -.07* | .03 |
| Openness | | | | | .09** | .03 | .09** | .03 |
| Agreeableness | | | | | -.005 | .03 | -.007 | .03 |
| Contact × Neuroticism | | | | | | | -.004 | .01 |
| Contact × Extraversion | | | | | | | .03** | .02 |
| Contact × Openness | | | | | | | -.03* | .02 |
| Contact × Agreeableness | | | | | | | -.01 | .02 |
| Adjusted R ² | .338 | | .339 | | .343 | | .345 | |
| ΔR ² | | | .001** | | .004** | | .002* | |

p* < .05. *p* < .01. ****p* < .001.

positive association between social contact and cognitive functioning—both for episodic memory and for executive functioning. Only those with relatively high levels of Extraversion managed to cognitively benefit from social

contact. As those who are low on Extraversion performed better on executive functioning regardless of social contact, it is noteworthy that for them the positive effect of social contact was least evident. The effect was most evident for

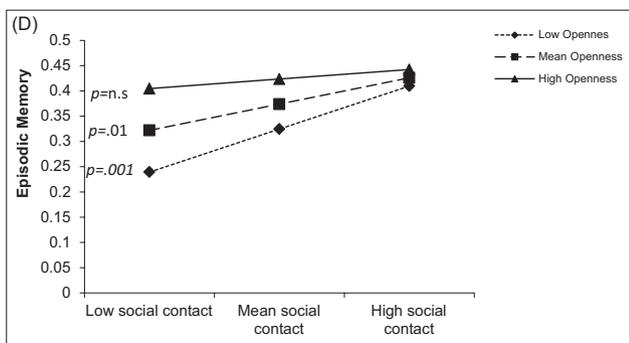
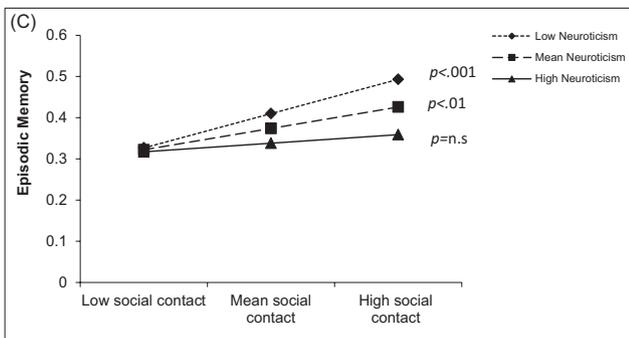
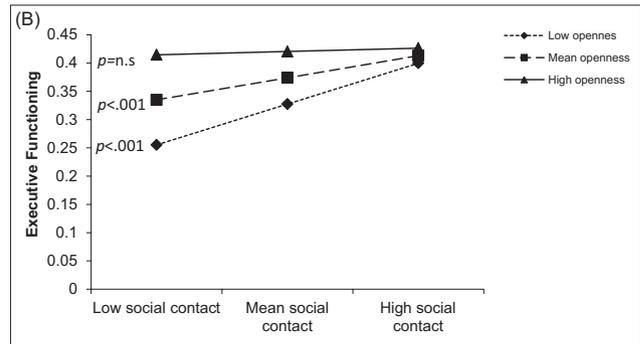
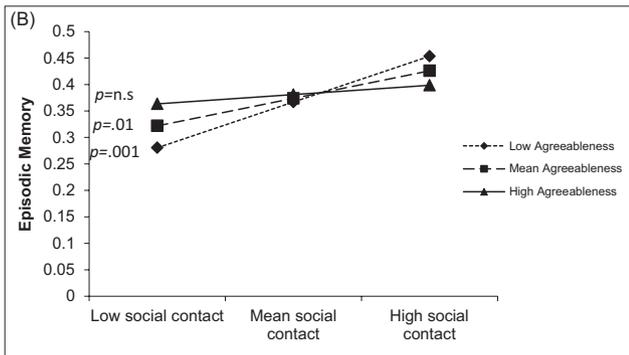
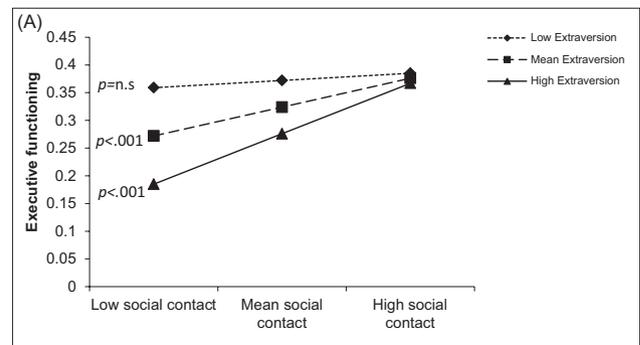
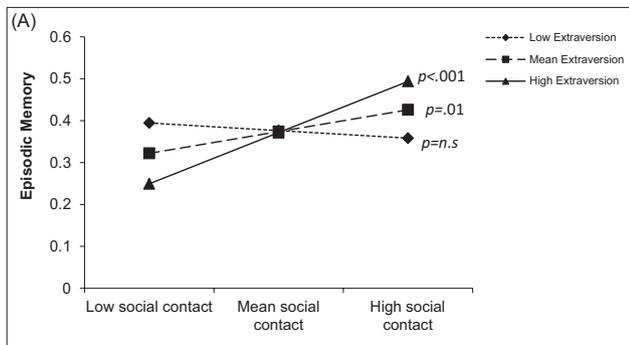


Figure 1. (A) The moderating role of Extraversion in the association between social contact and episodic memory. (B) The moderating role of Agreeableness in the association between social contact and episodic memory. (C) The moderating role of Neuroticism in the association between social contact and episodic memory. (D) The moderating role of Openness in the association between social contact and episodic memory. The indicated *p* levels refer to the significance of the slope. n.s = not significant.

Figure 2. (A) The moderating role of Extraversion in the association between social contact and executive functioning. (B) The moderating role of Openness in the association between social contact and executive functioning. The indicated *p* levels refer to the significance of the slope. n.s = not significant.

Extraversion on episodic memory, those who were high in Extraversion, also managed to benefit most from contact, whereas social contact had no effect for those who were low on Extraversion. Theory suggests that extraverts use their social environment to gain cognitive stimulation (Chamorro-Premuzic et al., 2006; Eysenck, 1967). Social contact provides extraverts the needed cognitive stimulation, and the results of this study suggest that indeed they manage to use it to benefit their cognitive functioning. In an environment that is rich with social contact, Extraversion is positively associated with cognitive functioning.

For those high on Agreeableness, it is suggested that the motivation to engage in social contact is relational, rather than intellectual (Graziano & Eisenberg, 1997). The results suggest that those who are low on Agreeableness manage to benefit more from social contact with regard to episodic memory. When Agreeableness is high, social contact no longer contributes to episodic memory. It is possible that highly agreeable individuals place great emphasis on the pleasantness of the social interaction and avoid the type of interactions that are more stimulating and possibly argumentative in nature. Hence, although the highly agreeable may practice other skills in their interactions, like expressing empathy or perspective taking, these may come at the expense of engagement in the kind of interactions that allow practicing skills that contribute more to cognitive stimulation and memory such as debating with others. The interaction effect was not significant for

those with high levels of Extraversion (see Figure 2A). In a similar manner, despite the lack of main effect of

executive functioning, indicating that the positive relationship between social contact and executive functioning does not depend on Agreeableness. As argued, whether or not one is agreeable may influence the nature of social relationships but does not seem to be important for executive functioning. That is, social contact may be helpful for executive functioning regardless of the nature of the interactions that are tied to Agreeableness.

Neuroticism was negatively associated with both episodic memory and executive functioning but only moderated the association between social contact and episodic memory. Those who were high on Neuroticism had lower levels of episodic memory regardless of levels of social contact (as a main effect), such that the effects of social contact were most evident for those with low levels of Neuroticism. As expected, Neuroticism reduced individuals' ability to cognitively benefit from social contact with regard to episodic memory, such that high levels of Neuroticism counteracted the positive effects of social contact. We believe that distress felt in social interactions hinders the ability of the highly neurotic to benefit from the situation. Possibly, their stress reaction to the social situation causes them to allocate resources to stress management and veers them away from cultivating the kind of interactions that are cognitively beneficial. Hence, social contact does not seem to be cognitively beneficial to highly neurotic individuals, whereas it is beneficial for those low in Neuroticism, with regard to episodic memory.

It should be noted that the beneficial effect of low levels of Agreeableness and of Neuroticism for the association between social contact and cognitive functioning were limited in this study to episodic memory. Social contact contributed to executive functioning regardless of the levels of Neuroticism and Agreeableness. It is possible that engaging in social interactions with close contacts involves memory processes, and memories play an integral part in social relationships. Thus, frequent contact may lead to enhanced memory, whereas executive functioning is less of a socially driven set of abilities. Indeed, [Seeman and colleagues \(2011\)](#) found that the association of social contact with episodic memory is stronger than that with executive functioning. It is also possible that decreased memory leads to social withdrawal as it does not allow the carrying of social relationships over time. This corroborates with the recent findings of [Ayalon, Shiovitz-Ezra, and Roziner \(2016\)](#), according to which lower levels of memory precedes loneliness, and not vice versa. However, further research is needed to assert these findings and suggestions.

In line with previous studies, linking Openness with cognitive functioning (e.g., [Graham & Lachman, 2012, 2014](#)), we found positive associations between Openness and both episodic memory and executive functioning. Looking at the moderating role of Openness, we found that it weakened the association between social contact and cognitive functioning. Those who are high in Openness must derive their cognitive stimulation from a variety of intellectual activities, and thus the effects of social contact are less pronounced for them. They perform well regardless of the level of their

social contact. The social contact is more meaningful for those low on Openness, that perhaps are less prone to search for cognitively stimulating activities, and rely more heavily on the stimulation gained from social interactions.

Although both social activities and personality traits were previously shown to be associated with cognitive functioning, to our knowledge, this is the first examination of their interactive effect. Whereas some may perceive the interactions as a source of intellectual stimulation, others may focus on their emotional and relational aspect or feel that the interactions are a source of stress, rather than of stimulation. These perceptions and reactions shape the implications that social contact holds for cognition.

Limitations and Future Research

Some limitations should be noted. First, this is a cross-sectional study. Hence, it is not possible to determine causality. It is possible that cognitive performance affects social contacts or personality dispositions ([Graham & Lachman, 2012](#)). Future research should examine whether the long-term effects of social contact on cognition are moderated by personality. The MIDUS data set only has one wave of cognitive data at this time.

Although we expected personality to have similar moderating effects on social contact for episodic memory and executive functioning, the results were more consistent for memory, supporting all four hypotheses, with only two predicted interaction effects supported for executive functioning. Although social engagement has beneficial effects for both memory and other cognitive functions captured in the domain of executive functioning (such as verbal fluency and attention), the contribution of social contact to memory was more often dependent on personality traits. The value of social contact for executive functioning was not influenced as much by individual differences in personality. Future research could benefit from addressing these differences and testing for other cognitive outcomes.

It should also be noted that social contact was self-reported and hence influenced by individuals' perceptions. Although we controlled for social support, future research could benefit from testing other forms of social engagement (such as community activities), or from trying to account for the kind of interactions that individuals participate in, addressing such questions as the reciprocity of the contact and the activities performed. Future research could also benefit from testing the moderating role of other traits. For example, attachment orientation was previously shown to shape the effect of social engagement on well-being ([Segel-Karpas et al., 2013a](#)), and it is possible that it also plays a role with regard to the cognitive benefits derived from social contact.

Finally, it should also be noted that the interaction effects found in this study were small in terms of explained variance. Despite the small effects, we believe the results are meaningful both theoretically and practically and warrant further investigation.

Theoretically, this study joins the growing body of research aimed at deciphering the roles that social variables play in cognitive functioning. Basing our theoretical model on the person–situation interaction perspective (Mischel, 1996; Mischel & Shoda, 1995), we add to this field by suggesting that social and personality variables should be considered simultaneously when predicting cognitive functioning.

Practically, our results suggest that attention should be directed toward both social activities and personality as potential vulnerability or resilience factors. Practitioners might benefit from taking into account one's personality and social environment when evaluating their risks for cognitive decline and in designing interventions aimed at the preservation of cognitive functioning. Furthermore, it is possible that the interactive effects will be more pronounced in populations suffering from cognitive impairments, a possibility worthy of consideration in future research.

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Conflict of interest

The authors have no conflict of interests to disclose.

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