The Six Dimensions of Personality (HEXACO) and their Associations with Network Layer Size and Emotional Closeness to Network Members

Catherine Molho[a*]

Sam G. B. Roberts[b]

Reinout E. de Vries[a,c]

Thomas V. Pollet[a]

[a] VU Amsterdam

Department of Experimental and Applied Psychology

Van der Boechorststraat 1

1081 BT Amsterdam, Netherlands

[b] University of Chester

Department of Psychology

Parkgate Road

Chester, CH1 4BJ, UK

[c] University of Twente

Department of Educational Science

Postbus 217, 7500 AE Enschede, Netherlands

*Corresponding Author

c.molho@vu.nl

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Abstract

Previous work has examined how specific personality dimensions are associated with social network characteristics. However, it is unclear how the full range of personality traits relates to the quantity and quality of relationships at different network layers. This study (N = 525) investigates how the six HEXACO personality dimensions relate to the size of support and sympathy groups, and to the level of emotional closeness to network members. Extraversion was positively related to support group size, but did not significantly relate to sympathy group size or emotional closeness. Openness to Experience and Emotionality were positively related to support group size, but not to the size of the sympathy group. Honesty-Humility, but not Agreeableness, was positively related to emotional closeness to members of the sympathy group. Findings suggest that personality effects vary across network layers and highlight the importance of considering both emotional closeness and network size.

Keywords: individual differences, HEXACO, social networks, emotional closeness

1. Introduction

Personality is important for our understanding of individual patterns of cognition, motivation, emotion, and behavior—what has been described as *"a kind of thematic recurrence within the events of a life"* (Nettle, 2007, p. 12). Here, we focus on the effects of personality on characteristics of individuals' innermost network layers, that is, on the number and emotional intimacy of close social relationships.

Individuals' social networks are hierarchically structured in successive layers of increasing size and decreasing emotional intimacy (Dunbar, 1998; Hill & Dunbar, 2003; Sutcliffe et al., 2012). Recent work has examined the effects of personality on different network layers' size and intimacy, but has been limited to specific dimensions, such as Extraversion and Neuroticism (Pollet et al., 2011; Roberts et al., 2008). Other studies, which examined a more exhaustive set of personality dimensions, did not differentiate between network layers, such as support and sympathy groups (Asendorpf & Wilpers, 1998; Selfhout et al., 2010). In this study, we attempt to address these limitations by investigating how the six HEXACO personality dimensions (Ashton & Lee, 2007; Lee & Ashton, 2004) relate both to the size and relationship intensity of individuals' innermost network layers.

1.1. Social network characteristics

It is widely recognized that not all social relationships are of equal strength or emotional intensity (Bernard et al., 1990; Granovetter, 1973; Milardo, 1992; Wellman & Wortley, 1990). Focusing on emotionally close ties, many studies have identified two distinct groupings: a small number of emotionally close ties offering intense emotional support and a larger number of less emotionally close, but still significant, ties that provide more general support (Bernard et al. 1990; Binder et al., 2012; Boase et al., 2006; Milardo, 1992; Wellman & Wortley, 1990).

Consistently, research suggests that social networks are organized in a series of hierarchically inclusive layers (Hill & Dunbar, 2003; Sutcliffe et al., 2012; Zhou et al., 2005). The innermost layers, corresponding to the two groupings identified above, have been termed ‘support groups’ and ‘sympathy groups’. Support groups consist of individuals from whom one would seek support in times of severe emotional or financial distress: they have an average size of 5 members (Binder et al., 2012; Dunbar & Spoors, 1995). Sympathy groups consist of individuals whose sudden death would be greatly upsetting (Buys & Larson, 1979): they have an average size of 12-15 members, including support group members (Binder et al., 2012; Dunbar & Spoors, 1995; Stiller & Dunbar, 2007).

Previous work has noted the importance of examining both the quantity and quality of relationships within different network layers (Pollet et al., 2011), as there is evidence of a trade-off between relationship quantity and quality (Roberts et al., 2009; Binder et al., 2011). As the size of each network layer increases, relationship intensity tends to decrease (Dunbar, 1998; Hill & Dunbar, 2003). Arguably, this is due to constraints—related to time and cognitive effort—on the number of relationships one can maintain at a certain level of emotional intensity (Roberts & Dunbar, 2011a; Stiller & Dunbar, 2007; Sutcliffe et al., 2012; Zhou et al., 2005).

While upper bounds seem to exist in different network layers’ size, previous work has also documented substantial inter-individual variation in both their size and composition. Such variation can be partly explained by demographic characteristics such as sex, socioeconomic status, age, and relationship status (McPherson et al., 2006; Roberts et al., 2009), but another important factor is personality (Nettle, 2007).

1.2. Personality and social networks

Research has examined how the Big Five or Five-Factor model personality traits (McCrae & Costa, 1999) relate to network characteristics. Among adolescents and young adults, Extraversion relates to larger networks and faster network growth, whereas Agreeableness is associated with higher peer acceptance and less conflict (Asendorpf & Wilpers, 1998; Jensen-Campbell et al., 2002; Selfhout et al., 2010). Although some studies have found no relation between Neuroticism and network size (Asendorpf & Wilpers, 1998; Roberts et al., 2008), higher Neuroticism is linked to less perceived social support and more loneliness (Russell et al., 1997; Stokes, 1985). Finally, Openness to Experience is linked to a larger number of new network contacts (Zhu et al., 2013; cf. Jensen-Campbell et al., 2002).

Research explicitly differentiating the hierarchical structure within social networks has focused on Extraversion. However, evidence on its relation with network characteristics is mixed. Specifically, Roberts and colleagues (2008) showed that Extraversion positively correlates with support group, but not sympathy group, size. However, this relation was no longer significant after controlling for participant age. Another study by Pollet and colleagues (2011) examined the relation of Extraversion with both network quantity and quality: extraverts reported having larger network layers (support group, sympathy group, outer layer), but did not feel emotionally closer to members of any layer.

1.3. HEXACO personality and network characteristics

Recent theoretical and empirical work in personality psychology has supported a six-dimensional framework of personality structure—the HEXACO—as a viable alternative to the Big Five and Five-Factor models. Lexical studies of personality structure in diverse languages consistently demonstrate the emergence of six (rather than five) personality factors (Ashton & Lee, 2007): Honesty-Humility (H),

Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O).

An important difference between the HEXACO model and five-factor models is the addition of Honesty-Humility, which is defined by honesty, fairness, sincerity, modesty, and lack of greed. Further, in the HEXACO framework, the Emotionality and Agreeableness factors result from a re-rotation of the Big Five factors of Emotional Stability and Agreeableness. As a result, HEXACO Emotionality excludes the anger facet that defines low Emotional Stability but includes the sentimentality facet that defines Agreeableness. Conversely, HEXACO Agreeableness excludes sentimentality and includes lack of anger[1].

For our research, the use of the HEXACO has two important advantages. First, it allows us to examine the relations of both Agreeableness—i.e., the tendency to be flexible, forgiving, and tolerant—and Honesty-Humility—i.e., the tendency to approach others with sincerity and fairness—with emotional closeness toward support and sympathy group members. While we start from the explorative hypothesis that both Honesty-Humility and Agreeableness positively relate to emotional closeness, we also consider the possibility that one characteristic is more important than the other for building and maintaining close social relationships. Second, using the HEXACO could clarify if Emotionality—including sentimentality, but excluding anger content—relates to network layer size (Asendorpf & Wilpers, 1998; Roberts et al., 2008) and, in particular, whether it is indeed associated with less social support (Russell et al., 1997; Stokes, 1985).

The HEXACO Extraversion, Conscientiousness, and Openness to Experience dimensions are largely equivalent to the corresponding traits in the Big Five. However, HEXACO Openness excludes intellect content—i.e., intelligence and

mental ability—that is part of some Big Five measures (e.g., Goldberg's IPIP scale, 1999).

Based on previous examinations of the relation between Extraversion and network characteristics (Asendorpf & Wilpers, 1998; Pollet et al., 2011), we expect Extraversion to positively relate to the size of both support and sympathy groups, but not to emotional closeness. Given previous inconsistencies regarding the relation between Openness and network size (Jensen-Campbell et al., 2002; Selfhout et al., 2010), and the lack of evidence for a relation between Conscientiousness and network characteristics, we do not make specific predictions for these dimensions.

2. Methods

2.1. Participants

525 participants (63.4% women, M_{age} = 27, SD_{age} = 10.09, range 18 to 83 years) completed an online survey in English or Dutch. Respondents were recruited via the personal networks of more than 20 international and Dutch students. The majority of respondents had a university degree (68.6%). Among participants, 29.3% reported Dutch as their native language, 20.4% reported English, and 50.3% another language. Finally, 52.8% of participants reported having a partner (*married* or *in a relationship*; 47.2% were *single, divorced,* or *widowed*; see also Supplementary Materials 1-2).

2.2. Procedure and measures

Participants were first asked to list all people with whom losing contact forever would be upsetting (*"We would like you to think of the people who are most important to you, and to imagine not being able to speak or to see these people ever again"*). Next, they indicated which of these people they would turn to *"in times of severe emotional or financial distress"*. We defined the support group as individuals

to whom participants would turn in times of severe distress, and the sympathy group as individuals with whom losing contact forever would be upsetting. These measures are commonly used to elicit individuals' inner network layers (e.g., Binder et al., 2012; Buys & Larson, 1979). Participants then reported how emotionally close they felt to each network member on a 0 to 100 scale. Emotional closeness is considered the most reliable indicator of tie strength (Marsden & Campbell, 1984) and is related to the frequency of both mobile phone and face-to-face contact (Roberts & Dunbar, 2011b; Saramäki et al., 2014).

Subsequently, participants completed the 60-item version of the HEXACO personality inventory (Ashton & Lee, 2009), using 5-point Likert scales (1 = *strongly disagree*, 5 = *strongly agree*). The HEXACO-60 consists of items representing a broad range of content from all facets of the six HEXACO dimensions (Ashton & Lee, 2009). Scales for all HEXACO dimensions showed adequate reliability: Honesty-Humility, a = .70; Emotionality, a = .76; Extraversion, a = .80; Agreeableness, a = .73; Conscientiousness, a = .77; Openness to Experience, a = .76.

2.3. Analytical Techniques

Here, our interest was in examining support and sympathy group properties. Following previous research (Roberts et al., 2008; Pollet et al., 2011), our sympathy group measure excluded support group members to avoid including the same individuals in two sets of analyses. Similarly, we calculated average emotional closeness to individuals belonging only to the support group, and individuals belonging only to the sympathy group, separately.

We report results from OLS regressions for support and sympathy group size, and for emotional closeness to support and sympathy group. For all regressions, we followed a hierarchical procedure. We first included all six HEXACO dimensions as

predictors in our model. We then kept only significant personality predictors and added control variables as follows: sex (0 = *male*, 1 = *female*), age, university degree (0 = *no*, 1 = *yes*), native language (two dummy coded variables; 0 = *Dutch* and *English*, 1 = *other*; 0 = *Dutch* and *other*, 1 = *English*), and relationship status (0 = *no committed partner*, 1 = *with committed partner*). For analyses on emotional closeness variables, we controlled for the corresponding layer size variables—given previous evidence of a trade-off between layer size and emotional closeness (Roberts et al., 2009). Finally, to test for the robustness of our results, we used a bootstrap procedure (Bias-Corrected and Accelerated (BcA); 1,000 samples). We report results based on parameter estimates and 95% confidence intervals from bootstrapped analyses.

3. Results

3.1. Descriptives and bivariate correlations

Descriptive statistics for the HEXACO dimensions, network layer size, and emotional closeness can be found in Supplementary Materials 3. On average, the support group consisted of 5 individuals (*SD* = 3) and the sympathy group, including support group members, consisted of 11 individuals (*SD* = 6). The mean size of both layers is consistent with prior research (Binder et al., 2012; Dunbar & Spoors, 1995; Stiller & Dunbar, 2007). Results from bivariate Pearson's correlations, after performing BcA bootstrapping with 1,000 samples, between demographics, HEXACO dimensions, and all network layer size and emotional closeness variables are presented in Supplementary Materials 4.

3.2. Personality and network layer size

Table 1 shows results from bootstrapped hierarchical regressions for network layers' size. Consistent with predictions, higher Extraversion scores were associated with larger support group size. Openness was also positively and significantly related

to support group size. In contrast to the claim that Emotionality relates negatively to social support (Russell et al., 1997; Stokes, 1985), there was a marginally significant, positive relation between Emotionality and support group size. This model explained 4% of variance in support group size (adjusted R^2 = .04, F(3, 513) = 7.60, p < .001).

Contrary to predictions and previous evidence indicating a positive relation between Extraversion and sympathy group size (Pollet et al., 2011; cf. Roberts et al., 2008), none of the HEXACO dimensions significantly related to sympathy group size. Of the control variables, only native language was significantly associated with sympathy group size (adjusted R^2 = .03, F(2, 514) = 10.19, p < .001). Participants who reported Dutch or English as their language indicated having larger sympathy groups, compared to participants who reported another language.

3.3. Personality and emotional closeness

Table 2 shows results from bootstrapped hierarchical regressions for emotional closeness variables. Emotionality positively and significantly related to emotional closeness to support group members. However, this effect was no longer significant after controlling for participant sex: women felt emotionally closer to support group members, compared to men. Further, native language had a significant relation with emotional closeness to support group. Participants who indicated Dutch or English as their native language reported more closeness, compared to participants who indicated another language. Consistent with previous work (e.g., Roberts et al., 2009), there was a negative relation between support group size and emotional closeness to this layer's members, such that participants with larger support groups reported less closeness. This model accounted for 7% of variance in emotional closeness to support group (adjusted R^2 = .07, F(5, 511) = 8.30, p < .001).

In line with our prediction that Honesty-Humility is associated with higher emotional closeness, we found that this personality characteristic significantly and positively related to emotional closeness to sympathy group. Unexpectedly, there was also a marginally significant relation between Extraversion and emotional closeness to sympathy group members. Further, education level significantly related to emotional closeness to sympathy group: participants with a university degree reported less closeness than those without. Finally, native language also had a significant relation with emotional closeness to sympathy group. Respondents who indicated Dutch or another native language reported more closeness, compared to participants who indicated English as their language. This model accounted for 4% of the variance in emotional closeness to sympathy group (adjusted $R^2 = .04$, $F(5, 470) = 5.24$, $p < .001$).

4. Discussion

4.1. Summary of findings

This study examined the associations between the six HEXACO personality dimensions and the size and emotional closeness of individuals' innermost network layers. Regarding layer size, our findings suggest that extraverts have larger support groups, but not larger sympathy groups. Although previous studies have repeatedly demonstrated a relation between Extraversion and network size (Asendorpf & Wilpers, 1998; Pollet et al., 2011), further research is needed to clarify whether this relation can be observed at *all* network layers. For now, there is good evidence that Extraversion positively relates to support group size. With respect to emotional closeness to network members, our findings are in line with previous research (Pollet et al., 2011), suggesting that there is no significant relation between Extraversion and emotional closeness to either support or sympathy group members.

This result may seem counterintuitive given that Extraversion is linked to behaviors that attract social attention (Ashton et al., 2002), and that extraverts are more outgoing, energetic, and cheerful than introverts (Kalish & Robbins, 2006). Thus, if extraverts have more frequent social interactions that introverts—and frequency of contact between individuals is linked to emotional closeness (Roberts & Dunbar, 2011b; Saramäki et al., 2014)—it may be expected that extraverts would build relationships with higher emotional closeness. However, we found a negative relation between support group size and emotional closeness, suggesting a trade-off between maintaining a large network and having emotionally close relationships (Roberts et al., 2009; Binder et al., 2012). Together, results suggest that extraverts may focus on maintaining a larger number of ties, rather than developing the emotional closeness of those ties.

Interestingly, our results suggest that Openness to Experience positively relates to support group size, but not necessarily sympathy group size. This result is consistent with previous theoretical interpretations of Openness as reflecting inquisitiveness and creativity, thus potentially yielding social benefits and social attention (Ashton & Lee, 2007; Nettle, 2007). Future research could more closely examine whether Openness to Experience is indeed related to a larger number of relationships in the innermost network layers, or a larger number of new contacts, in particular (Zhu et al., 2013).

In line with predictions, Honesty-Humility, which reflects a tendency to approach others with sincerity and fairness (Lee & Ashton, 2004), positively related to emotional closeness, albeit only for sympathy groups. Our results suggest that there is no direct, significant, relationship between Honesty-Humility and emotional closeness to support group members. Further, contrary to hypotheses, Agreeableness

291 does not seem to relate to emotional intimacy at any layer. Combined, these results
292 suggest that the HEXACO is a useful alternative to Big-Five models, especially due to
293 the inclusion of Honesty-Humility and, in particular, for examinations of emotional
294 closeness in social network research.

295 Finally, our results are only partially consistent with previous work suggesting
296 that Neuroticism does not relate to network size or other network characteristics
297 (Asendorpf & Wilpers, 1998; Roberts et al., 2008). Using HEXACO Emotionality,
298 which includes sentimentality but excludes anger content, we found that Emotionality
299 is marginally but positively related with support group size. This finding points to the
300 possibility that Emotionality is associated with increased, rather than decreased
301 (Russell et al., 1997; Stokes, 1985), social support. Although Emotionality also
302 correlates with emotional closeness to support group members, this relationship seems
303 entirely attributable to gender differences in Emotionality (Lee & Ashton, 2004).

304 *4.2. Strengths, limitations, and future directions*

305 Our research contributes to the literature on individual differences and social
306 networks in three ways. First, whereas previous work has focused on specific traits,
307 such as Extraversion and Neuroticism (Pollet et al., 2011; Roberts et al., 2008), our
308 study examined how all six HEXACO personality dimensions are related to network
309 size and emotional closeness. Second, in investigating the effects of HEXACO traits
310 on network characteristics, we differentiated between support and sympathy groups
311 (Dunbar & Spoors, 1995; Stiller & Dunbar, 2007), rather than treating social networks
312 as homogeneous (e.g., Asendorpf & Wilpers, 1998; Selfhout et al., 2010). Finally, we
313 investigated both the quantity and quality of relationships within network layers,
314 examining both the number and emotional closeness of participants' ties.

However, our study was cross-sectional and therefore cannot address questions of causality—does personality influence the size and emotional closeness of social networks, or do social network characteristics influence personality? Although the former seems more likely—given that personality traits show a high degree of stability over time—longitudinal work is needed to address this question directly.

Moreover, our findings point to rather weak associations between personality and the number and emotional strength of close ties, in terms of proportion of explained variance. One possibility is that the questionnaires we used are not valid measures of the intended constructs. While this is unlikely for the HEXACO-60—which has good levels of reliability and self-observer agreement (Ashton & Lee, 2009), less is known about the reliability of network size measures. Previous work suggests that interviews as a method of eliciting personal networks have relatively high levels of test-retest reliability (for a review, see Brewer et al., 2000). In terms of questionnaire approaches, various research groups have used measures of group size and emotional closeness that are similar to the ones used here and they have found networks of similar size (Binder et al., 2012; Buys & Larson, 1979; Cummings et al., 2006; Dunbar & Spoors, 1995; Jeon & Buss, 2007; Roberts et al. 2009).

However, these measures have two potential drawbacks. First, our measure of support and sympathy groups allows participants to include all reported network members in either one or the other group—and participants can be more or less 'inclusive' in naming network members, irrespective of the objective size of these groups. Second, our emotional closeness measure could be influenced by response styles, whereby some respondents generally report more closeness, irrespective of the actual closeness of their ties. However, an 18-month longitudinal study demonstrated that self-reported emotional closeness is significantly related to the number of mobile

phone calls participants make to network members (Saramäki et al., 2014). This suggests that self-reported emotional closeness meaningfully relates to objective communication patterns. Further research could use the 'digital trace' left by electronic communication (Lazer et al., 1999) to examine in more detail how personality characteristics relate to individuals' interaction patterns.

4.3 Conclusion

In summary, this study suggests that the personality traits of Extraversion, Openness to Experience, and Honesty-Humility, meaningfully relate to network layer size and emotional closeness to network members. However, current findings also indicate that a large proportion of variability in network characteristics is not accounted for by either personality or basic demographics. As such, future social network research could complement and extend this work by using more objective measures of interaction with network members and examining how other factors—for example, one's childhood environment or current social setting (e.g., neighborhood, workplace)—influence the quantity and quality of close relationships.

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To be included.

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Appendix

Table 1. Hierarchical regressions for network layer size (BcA bootstrapping; 1,000 samples).

Dependent variable	Model	Predictors	B	*b* (bootstrap)	*p* (bootstrap)	Lower	Upper
Support group size	*Model 1* (R^2 = 0.04)	Emotionality	0.101	0.552	.060	-0.077	1.072
		Extraversion	0.131	0.751	.004	0.267	1.260
		Openness to Experience	0.131	0.737	.002	0.292	1.170
Sympathy group size	*Model 1* (R^2 = 0.03)	Language (Dutch/English vs. Other)	-0.204	-1.870	.001	-2.780	-0.972
		Language (Dutch/Other vs. English)	-0.018	-0.203	.756	-1.426	1.050

Notes. Sympathy group size is excluding support group members. Lower and upper represent lower and upper 95% CI for bootstrapped estimates.

Table 2. Hierarchical regressions for emotional closeness (EC) (BcA bootstrapping; 1,000 samples).

Dependent variable	Model	Predictors	β	*b* (bootstrap)	*p* (bootstrap)	Lower	Upper
EC support group	*Model 1* (R^2 = 0.01)	Emotionality	0.091	1.811	.039	0.077	3.760
	Model 2 (R^2 = 0.04)	Emotionality	0.012	0.229	.806	-1.695	2.190
		Gender	0.182	4.816	.002	2.292	7.765
	Model 3 (R^2 = 0.05)	Emotionality	0.028	0.557	.571	-1.448	2.624
		Gender	0.163	4.311	.003	1.746	7.125
		Language	-0.141	-3.591	.003	-5.637	-1.409
		(Dutch/English vs. Other)					
		Language	-0.125	-3.959	.006	-6.523	-1.344
		(Dutch/Other vs. English)					
	Model 4 (R^2 = 0.07)	Emotionality	0.037	0.738	.430	-1.215	2.864
		Gender	0.164	4.325	.002	1.851	7.001
		Language	-0.134	-3.399	.004	-5.439	-1.267
		(Dutch/English vs. Other)					
		Language	-0.111	-3.533	.011	-6.157	-0.982
		(Dutch/Other vs. English)					
		Support group size	-0.151	-0.551	.002	-0.897	-0.222

Table 2 continued.

EC sympathy group	*Model 1* (R^2 = 0.02)	Honesty-Humility	0.124	3.751	.008	0.960	6.237
		Extraversion	0.083	2.406	.068	-0.241	5.148
	Model 2 (R^2 = 0.03)	Honesty-Humility	0.134	4.050	.004	1.297	6.434
		Extraversion	0.085	2.472	.057	-0.142	5.165
		Degree	-0.139	-5.419	.003	-8.896	-1.922
	Model 3 (R^2 = 0.04)	Honesty-Humility	0.128	3.858	.006	1.073	6.373
		Extraversion	0.077	2.241	.089	-0.349	4.865
		Degree	-0.118	-4.585	.009	-7.996	-1.060
		Language (Dutch/English vs. Other)	-0.088	-3.156	.068	-6.393	0.467
		Language (Dutch/Other vs. English)	-0.128	-5.700	.011	-9.879	-1.517

Notes. EC sympathy group is excluding support group members. Lower and upper represent lower and upper 95% CI for bootstrapped estimates.

480 Footnotes

481 [1] Empirically, Honesty-Humility and Emotionality are less well covered by the five factors of the NEO-FFI than the other HEXACO

482 factors, suggesting that these two traits—and somewhat Agreeableness—include content that is not well-represented in the Big Five

483 (Lee & Ashton, 2013).