Peer Sociometric Status and Personality Development from Middle Childhood to Preadolescence

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Abstract

Sociometric status, the regard that other group members confer to an individual, is one of the most ubiquitous and behaviorally relevant attributes assigned to the person by the social environment. Despite this, its contribution to personality development has received little attention. The present three-wave longitudinal study, spanning the age range 7-13 years (*n* = 1222), sought to fill this gap by examining the transactional pathways between peer sociometric status (measured by peer nominations) and Five-Factor personality traits (measured by self-, parent, and teacher ratings). Sociometric status prospectively predicted the development of extraversion. By contrast, agreeableness and neuroticism prospectively predicted the development of sociometric status. Furthermore, individual-level stability in extraversion was associated with individual-level stability in sociometric status. The results were robust across different sources of personality ratings. We argue that peer sociometric status in the school classroom is the type of environmental effect that has potential to explain personality development. Due to its stability, broadness, and possible impact across a variety of personality processes, sociometric status can both repetitiously and simultaneously influence the network of multiple inter-correlated micro-level personality processes, potentially leading to a new network equilibrium that manifests in changes at the level of the broad personality trait.

Introduction

There is now growing evidence of the contribution of environmental effects on the life course development of personality (Briley & Tucker-Drob, 2014). Previous research, focused mostly on early adulthood (Bleidorn, Kandler, & Caspi, 2014), has shown that especially social environments are crucial (Neyer & Lehnart, 2007). Childhood personality structure; that is, the set of traits that describe behavioral and emotional tendencies that persist across time and situations, and are used to differentiate between individuals, is similar to the trait structure in older populations (Soto & Tackett, 2015). Research on how environmental effects impact these traits can thus be extended into childhood. Within the framework provided by the Five-Factor Model of personality structure (Digman, 1990), we investigated whether, from age 7 to age 13, (i) peer sociometric status in the elementary school classroom influences the development of personality characteristics and (ii) whether continuity in sociometric status influences the continuity of personality. The age period — middle childhood to preadolescence — should be optimal for the investigation of the influence of early social environment. It is from the beginning of this age period, at which children enter school, that they start to function in the presence of their peers for a large proportion of their day, making the peer environment increasingly important for their development (Rubin, Bukowski, & Bowker, 2015; Sroufe, Egeland, Carlson, & Collins, 2005). Although sociometric status, the regard that other group members confer to an individual, is one of the most ubiquitous and behaviorally relevant attributes assigned to the person by the social environment (von Rueden, 2014), research on its contribution to personality development has been scant.

Sociometric Status

Sociometric status can be understood as an indicator of the relationship between the individual and the group. In the social network literature, it is referred to as in-degree

centrality, the number of group members that the individual has direct ties to (Kadushin, 2012). The sociometric method employs peer nominations (or ratings) to assess individuals' sociometric status. As Northway (1946) has described it (italics added) “In its procedure sociometry is based on the ability of the individual to discriminate (or choose) among objects (people) in his environment and to select those for *whom* he has certain preferences.” (p. 234). Who is preferred by peers and who is not are prominent questions that are of key importance especially in childhood and early adolescence (LaFontana & Cillessen, 2010). We argue that peer sociometric status could steer personality development.

Sociometric status is an umbrella term, comprised of various types of statuses obtained from sociometric measurement. The relationships, network ties, or sociometric criteria can be emotional (e.g. liking, acceptance, preference, repulsion, and rejection) or reputational (e.g. perceived popularity, visibility, centrality, social impact, or average peer perceptions of behaviors; Cillessen & Bukowski, 2018). The emotional type directly reflects how liked and accepted the person is, whereas the reputational type reflects how central, important, or visible the person is (Parkhurst & Hopmeyer, 1998). Both types can be conceptually differentiated from social power; status is always given voluntarily, whereas social power can be taken without others’ consent (Anderson, Hildreth, & Howland, 2015).

Most sociometric studies have been conducted in classroom settings (Hawley & Bower, 2018). Emotional and reputational types of status tend to be highly correlated in young age groups. In middle childhood and preadolescence, correlations around .70-.80 are common (Cillessen & Mayeux, 2004; Rodkin, Ryan, Jamison, & Wilson, 2012), a level from which they tend to decrease during later developmental stages (Cillessen & Mayeux, 2004). Reputational and emotional status also overlap conceptually in the eyes of younger children; seven-year olds describe popular peers (reputational status) as well-liked, pro-social, not

aggressive, and preferred as playmates (Xie, Li, Boucher, Hutchins, & Cairns, 2006). By contrast, adolescents' descriptions of popular peers relate to physical appearance, self-presentation, studentship, and peer affiliations (Xie et al., 2006). Based on the overlap between reputational and emotional status in childhood, we will use the term *sociometric status* when referring to our participants peer regard[1].

Peer sociometric status could be a meaningful way in which to conceptualize and measure an aspect of the social environment that could, especially in middle childhood and preadolescence, be expected to influence personality development. Changes in broad and descriptive personality traits, such as the Five-Factor traits (extraversion, agreeableness, openness, conscientiousness, and neuroticism; Digman, 1990), have been argued to require repetitive exposure to environments that influence a set of trait relevant inter-correlated micro-level personality processes. These processes refer to, for instance, action planning and situation selection, behaviors and perceptions, as well as post-action evaluations (Cramer et al., 2012; Geukes et al., 2018). If social relationships are to influence personality development, they should influence micro-level processes repetitiously, simultaneously influence multiple processes, and also influence the contingencies between the micro-level processes (Geukes et al., 2018). Sociometric status, because it encompasses many relationships and is relatively stable over time (Jiang & Cillessen, 2005), could allow for the repetitive experiences required to change personality (Geukes, van Zalk, & Back, 2018). Peer sociometric status is also part of the child's daily environment at least five days a week, giving it constant opportunities to influence, both repetitiously and simultaneously, the multiple micro-level processes that constitute broad personality factors (Geukes et al., 2018). Moreover, relationship effects have been argued to be more likely in the absence of major life transitions (Deventer, Wagner, Lüdtke, & Trautwein, 2019; Mund & Neyer, in press). Middle

childhood and preadolescence are not characterized by normative life transitions, with most children attending the same school throughout the period.

Cross-sectional Associations between Personality and Sociometric Status

A recent review of the associations between personality and peer relations (van Aken & Asendorpf, 2018) showed that, of the five personality traits described by the Five-Factor Model of personality, extraversion is associated with all types of sociometric status, and that agreeableness is associated with the emotional form of sociometric status. A negative association between neuroticism and sociometric status was found in some studies, but associations between status and openness or conscientiousness were very rare (van Aken & Asendorpf, 2018). We below review studies (i) conducted with participants under age 16, although also mentioning some studies conducted with older youth populations, (ii) employed other-ratings to measure sociometric status, and (iii) measured positive forms of peer relationships (not, for instance rejection).

Extraversion is associated with both emotional (Ciarrochi & Heaven, 2009; Hubers et al., 2016; Ilmarinen, Vainikainen, Verkasalo, & Lönnqvist, 2015; Jensen-Campbell et al., 2002; Jensen-Campbell & Malcolm, 2007; Lösch & Rentzsch, 2018; Lubbers, Werf, Kuyper, & Offringa, 2006; Scholte, van Aken, & Lieshout, 1997; van der Linden, Scholte, Cillessen, Nijenhuis, & Segers, 2010; Wolters, Knoors, Cillessen, & Verhoeven, 2014), and reputational sociometric status (Hubers et al., 2016; Massey, Byrd-Craven, Auer, & Swearingen, 2015; van der Linden et al., 2010; Wolters et al., 2014), with very few studies reporting otherwise (Andrei, Mancini, Mazzoni, Russo, & Baldaro, 2015). In older youth populations, similar results have been obtained in work-team settings (Lawless DesJardins, Srivastava, Küfner, & Back, 2015), at zero-acquaintance (Back, Schmukle, & Egloff, 2011;

Stopfer, Egloff, Nestler, & Back, 2013), and in studies on the attainment of both reputational (Anderson, John, Keltner, & Kring, 2001) and emotional status (Feiler & Kleinbaum, 2015; Ilmarinen, Lönnqvist, & Paunonen, 2016; cf. Wortman & Wood, 2011).

Agreeableness is across the literature associated with emotional sociometric status (Andrei et al., 2015; Hubers et al., 2016; Ilmarinen et al., 2015; Jensen-Campbell et al., 2002; Jensen-Campbell & Malcolm, 2007; Lösch & Rentzsch, 2018; Scholte et al., 1997; van der Linden et al., 2010; Wolters et al., 2014; cf. Lubbers et al., 2006). Findings regarding reputational sociometric status have been less consistent, with some studies reporting a positive correlation (Hubers et al., 2016; Wolters et al., 2014) and others a null finding (Massey et al., 2015; van der Linden et al., 2010). Among older youth samples, the findings are more inconsistent for emotional sociometric status (Ilmarinen et al., 2016; Wortman & Wood, 2011) and null for reputational status (Anderson et al., 2001; Lawless DesJardins et al., 2015).

Neuroticism has often been reported to be negatively associated with both emotional (Andrei et al., 2015; Hubers et al., 2016; Ilmarinen et al., 2015; Jensen-Campbell & Malcolm, 2007; van der Linden et al., 2010) and reputational (Hubers et al., 2016; van der Linden et al., 2010) sociometric status, but there are also null findings for both types of status (Jensen-Campbell et al., 2002; Lösch & Rentzsch, 2018; Massey et al., 2015; Scholte et al., 1997). Among older youth, studies on neuroticism are few, but negative associations have been found for both types of status (Anderson et al., 2001; Ilmarinen et al., 2016; Wortman & Wood, 2011). For openness and conscientiousness, most studies report on null findings (van Aken & Asendorpf, 2018; for associations with academic popularity as opposed to sociometric status, see Lösch & Rentzsch, 2018).

In sum, there is robust evidence that sociometric status is associated with at least extraversion. The strength of the evidence is weaker, but on balance remains supportive, for agreeableness and neuroticism. These cross-sectional associations are often interpreted as suggesting that personality influences the attainment and maintenance of sociometric status, probably in part because trait-like individual differences emerge early in life and traits are relatively stable over time (Roberts & DelVecchio, 2000). However, the empirical evidence, being mostly cross-sectional, does not allow for strong causal claims one way or the other (van Aken & Asendorpf, 2018). For instance, most of the above referred to studies have examined these associations after the group has endured for a much longer period than the time it takes for group hierarchies to form (Fournier, 2009).

Longitudinal Transactions Between Personality Traits and Sociometric Status

There are very few studies that would have specifically examined the longitudinal transactions between personality and sociometric status. Furthermore, there is no prior longitudinal research that would have employed independent measures of broad personality traits (such as the Five-Factor traits) and sociometric status. Perhaps most relevant is a three-wave longitudinal study focusing on adolescent self-esteem, in which emotional sociometric status predicted increases in self-esteem (path estimates were of the .07 magnitude) but not vice versa (Reitz, Zimmermann, Hutteman, Specht, & Neyer, 2014). Other studies, such as a four-wave study spanning from age 9 to age 12, in which peer ratings of shyness-sensitivity predicted peer ratings of emotional sociometric status and vice versa (all path estimates between –.07 and –.14; Yang, Chen, & Wang, 2015), or a study in which emotional sociometric status in early childhood predicted pre-adolescent conscientiousness (Lansford, Yu, Pettit, Bates, & Dodge, 2014), suffer from severe methodological limitations, such as

having the same informants provide both personality ratings and sociometer ratings (Yang et al., 2015), or measuring personality only once (Lansford et al., 2014).

Three of the Five-Factor traits, extraversion, agreeableness, and neuroticism, are, based on cross-sectional evidence, associated with sociometric status. For all three traits one can, based on theory, derive expectations regarding personality effects on sociometric status, as well as status effects on personality. Support for the notion that extraversion could influence sociometric status can be found in zero-acquaintance studies, in which extraversion has predicted sociometric status (Back et al., 2011; Stopfer et al., 2013) and in longitudinal studies (Anderson et al., 2001). The proposed core of extraversion — social attention seeking (Ashton, Lee, & Paunonen, 2002) and sensitivity to social rewards (Lucas, Diener, Grob, Suh, & Shao, 2000) — and results connecting extraversion to time spent in social situations (Wrzus, Wagner, & Riediger, 2016) also support the idea that extraversion is important for attaining sociometric status during the initial phases of a newly formed group. Some mechanisms proposed for this association include verbal capability, being generally energetic, and expressiveness (Back et al., 2011; Ilmarinen et al., 2015).

Extraversion is perhaps the most likely of the Five-Factor traits to be influenced by sociometric status. After the initial phases of group-formation, in which a status hierarchy emerges (itself influenced by extraversion; Anderson et al., 2001), group members will strive to maintain status and safeguard group membership. Other group members may expect high-status individuals to behave in ways that maintain their status; i.e., to behave in assertive, sociable, and positive ways, taking initiative and assuming leadership responsibilities. On the other hand, behaving above one's status is punished, for instance by ostracism, motivating low-status individuals not to engage in these types of behaviors (Anderson, Ames, & Gosling, 2008; Anderson, Srivastava, Beer, Spataro, & Chatman, 2006). Previous empirical

results, which found effects of sociometric status on self-esteem and on shyness-sensitivity (Reitz et al., 2014; Yang et al., 2015), both of which are correlated with extraversion (Paulhus & Trapnell, 1998; Robins, Tracy, Trzesniewski, Potter, & Gosling, 2001), also support a line of reasoning in which status influences the development of extraversion.

The literature on agreeableness can be interpreted as suggesting that agreeableness is more relevant for maintenance than attainment of status. In contrast to extraversion, there is no association between agreeableness and sociometric status at zero-acquaintance (Back et al., 2011). However, agreeable people are helpful in solving conflicts (Jensen-Campbell & Graziano, 2001), empathetic (Graziano, Habashi, Sheese, & Tobin, 2007), forgiving, and tolerant (Ashton & Lee, 2007), all of which are characteristics that could be expected to be valued by peers. Supporting this idea, research on romantic relationships shows that people with agreeable partners report higher relationship satisfaction (Leikas, Ilmarinen, Verkasalo, Vartiainen, & Lönnqvist, 2018; Weidmann, Schönbrodt, Ledermann, & Grob, 2017) and agreeableness predicts increases in number of friends among university freshmen (Selfhout et al., 2010). On the other hand, status could also influence development of agreeableness. However, although there is some evidence that possessing status can affect prosocial behaviors (the types of behavior most strongly associated with agreeableness; e.g., Graziano et al., 2007), the results are rather mixed, with high status sometimes increasing and sometimes decreasing prosocial behavior (Kafashan, Sparks, Griskevicius, & Barclay, 2014).

Neuroticism could also be relevant for the maintenance of status. Those scoring high on neuroticism experience general insecurity in relationships (Deventer et al., 2019), their partners are less satisfied (Leikas et al., 2018; Weidmann et al., 2017), and they are aggressive towards peers (Tackett, Kushner, Herzhoff, Smack, & Reardon, 2014), characteristics that point towards potential difficulties in the maintenance of peer

relationships. On the other hand, self-esteem and shyness-sensitivity, which are both influenced by sociometric status (Reitz et al., 2014; Yang et al., 2015), are strongly correlated with neuroticism (Paulhus & Trapnell, 1998; Robins et al., 2001), suggesting that sociometric status may also influence neuroticism. Also consistent with this notion are the findings that self-reports of loneliness are predictive of later neuroticism (Abdellaoui et al., 2019) and that, in studies on older populations, relationship effects on neuroticism are more frequently reported than relationship effects on other Five-Factor traits (Mund & Neyer, in press).

Parallel Continuities

Change and stability both describe the development of personality (Briley & Tucker-Drob, 2014). Identifying properties of the environment that are associated with trait stability could therefore be as important as identifying properties of the environment that are associated with trait change. The moderately high stability of sociometric status means that it could not only influence trait levels, but also contribute to the continuity of traits.

The parallel continuities hypothesis (Branje, van Lieshout, & van Aken, 2004; Sturaro, Denissen, van Aken, & Asendorpf, 2008) suggests that stability in the social environment contributes to the stability of personality. To clarify, this type of individual-level stability should be differentiated from contextual stability, which refers to the absence of normative life transitions and which generally facilitates environmental effects on personality (Mund & Neyer, in press). Although status tends to stabilize in newly formed groups (Fournier, 2009), it is not set in stone, but changes over time (Jiang & Cillessen, 2005). Importantly, there will be individual differences in the extent to which status changes. The parallel continuities hypothesis posits that those individuals who experience the least change in their status will also change the least in terms of their personality. I.e., a highly stable

social position within the group would be expected to constrain behavior, affording little possibility for personality change. Research on correlated change between personality traits and the social environment has partially addressed this notion (Branje et al., 2004; Mund & Neyer, 2014; Scollon & Diener, 2006), but the focus has been on identifying determinants of change, not stability. Because of its relatively high but imperfect stability (Anderson et al., 2001; Jiang & Cillessen, 2005), sociometric status may be better suited to explain stability than change.

Sources of Personality Information

By using self-, parent and teacher ratings of personality, we took a multi-informant approach to personality measurement. This allowed us to avoid method variance between sociometric status and personality (a common limitation in research on person-environment transactions; Denissen, Ulferts, Lüdtke, Muck, & Gerstorf, 2014). There are many general advantages to having multiple viewpoints on personality (Vazire & Carlson, 2011), and some of them are especially pertinent in the present context. First, a multi-informant approach allows us to examine whether personality or relationship effects are specific to a certain perspective on personality or if the effects generalize across perspectives. Different sources of personality information have unique variance and unique predictive validity on outcomes (Lönnqvist, Vainikainen, & Verkasalo, 2012; Luan et al., in press; Vazire & Mehl, 2008), and such patterns may also exist in the associations between personality and sociometric status. Second, self-ratings of children may not be reliable (Soto, John, Gosling, & Potter, 2008). In the present study, parent and teacher ratings are used in all three waves and self-ratings in the two later waves. Third, multiple views can be combined into a common variance measure of personality that encompasses the variance in the personality ratings that is shared across sources (Branje et al., 2004; Kraemer et al., 2003). In the absence of a gold standard for

personality trait measurement, the incorporation of information from multiple perspectives and contexts (home, school), helps guard against the most general problems in personality assessment (e.g., socially desirable responding, rose-tinted glasses, random responding; see Hofstee, 1994; Kraemer et al., 2003). The variance shared across informants could also be interpreted as a compressed measure of personality, as it comprises those aspects of personality that are available to all raters (Bouchard & Loehlin, 2001). In the present study, both common variance measures and single rater measures of personality will be employed to examine the associations between personality and sociometric status, and the results obtained using these different sources will be compared to establish which associations are unique and which generalize across sources. Although different informants may have unique views on the target's personality, and therefore some differences could emerge, there should, given that a moderate proportion of personality rating variance is shared across informants (Connelly & Ones, 2010), also be similarity across the models.

The Present Study

The purpose of the present research, conducted with 1222 participants in three waves and spanning the age range 7-13 years, was to examine the transactional development of children's personality traits and their sociometric status. Besides investigating the directional pathways between personality and sociometric status, we investigated the parallel continuities between the stability of sociometric status and the stability of personality traits. In addition, we investigated to what extent associations between sociometric status and personality are specific to certain sources of personality information or general across informants.

Preregistration statement. We did not preregister any hypotheses. This was not part of routine procedure at the time the research began, and when writing up the research, we were not aware of the possibilities to preregister hypotheses and analysis strategies for partially or fully collected data. However, given the pre-existing literature on the cross-sectional associations between personality and sociometric status, examining and setting hypothesis about bi-directional pathways was rather straightforward. Although the work is thus in some sense not entirely exploratory, the lack of preregistration motivates us to employ a more stringent type-I error-rate and compare the results obtained with different informants and different analysis strategies to help guard against false-positives.

Method

Open Data Statement

In agreement with the Education Department of the city where the study was conducted, the data is stored on a private university network to which researchers can gain access only by application and no part of the data is allowed to be downloaded from that network to another location. Doing so would be a breach of contract. Thus, the data is not available, but summary statistics that can be used for reproducing the results with the analysis scripts are available at OSF: https://osf.io/f47jm/.

Participants and Procedure

The study was conducted in cooperation with the Education Department of a large Finnish city. At the first measurement wave of the study, there were 17 participating schools and 38 classrooms, but at later stages of the study, additional schools and classrooms were included in the study (there were 56 classrooms in total at T3). The participating schools were randomly selected from the schools in the area. An equal probability randomization

procedure was used to ensure representativeness in terms of socio-economic status. In total, there were 1222 participants (51.9 % girls). Data were collected at three different measurement waves (T1 through T3). Personality was measured at all measurement waves, and sociometric status at T1 and T2. Parent- and teacher reports of personality were obtained at all waves, and self-reports were obtained at T2 and T3. The mean age of the participants was M = 7.47 (SD = 0.39), M = 9.89 (SD = 0.40), and M = 12.82 (SD = 0.40), at the time of the personality measurements at waves T1 (first grade), T2 (third grade), and T3 (sixth grade), respectively, and M = 8.47 (SD = 0.39), and M = 11.47 (SD = 0.39), at the time of the sociometric nominations at waves T1 (second grade) and T2 (fifth grade), respectively. Note that personality and sociometric status were not measured simultaneously. Therefore, in one of the modelling approaches that we employ (see below), we separate the waves in which sociometric status was measured from those in which personality was measured and refer to the sociometer measurement waves as T1+ and T2+.

Sampling statement. Sample size was determined by the financial constraints set by the funder.

Measures

Personality. The five personality traits identified by the Five-Factor Model of personality structure (neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness) were measured with self- and other-report versions of the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The items were responded to on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Teachers were instructed by their employer to rate all of their pupils. The Education Department could arrange for another person to look over the class whilst the teacher completed the ratings. Teacher ratings were

not independent of each other because the same teacher (in each wave, we obtained ratings from 39 to 56 teachers) rated all of the children in his or her classroom (mean intra-class correlation, *ICC*, across all items and measurement waves was .10, *SD* = .05, min = .02, max = .21). To remove perceiver effects from the personality ratings provided by the teacher, teacher ratings were centered around the class-mean (if at least six ratings from the same teacher were available) or the grand mean (across all teacher ratings, but only if there were less than six ratings provided by the same teacher) of each item. The grand-mean was used in very small classrooms, in which the effects of one or two outliers on the class-mean, or being only student in a classroom with valid data in a certain measurement wave (but belonging to a larger classroom at other measurement waves), could otherwise have been an issue. Proportion of subjects whose data was grand-mean centered instead of class-mean centering was 0%, 1.58%, and 1.44% at T1, T2, and T3, respectively.

Parents rated their children as part of a regular parents' night, or, if not possible, the questionnaires were sent home with the children. Self-ratings of personality were obtained during a regular class. There were no classroom effects on parent-ratings (across items, mean *ICC* = .01, *SD* = .01, min < .001, max = .04) or self-ratings (mean *ICC* = .02, *SD* = .02, min < .001, max = .05). All analyses were nevertheless run using both a centering approach similar to the one used for teacher ratings and with non-centered raw scores. The means, standard deviations and reliabilities (obtained using the Spearman-Brown formula, recommended for use with two-item scales: Eisinga, Grotenhuis, & Pelzer, 2013) of the trait scores are reported in Table 1. The mean reliabilities across all traits and measurement waves were .57 (*SD* = .08), .72 (*SD* = .07), and .42 (*SD* = .05), for parent, teacher, and self-ratings, respectively.

Factor structure and congruence of personality measures. See Method Supplement text and Supplement Tables S1-S3 (https://osf.io/f47jm/).

Cross-informant agreement in ratings of personality. Estimates of cross-informant agreement are presented in Table S4 (https://osf.io/f47jm/). Cross-informant correlations ranged from r = .19 (parent-self agreement at T2 in neuroticism) to r = .53 (parent-teacher agreement at T3 for conscientiousness). The grand average of the estimates was r = .31.

Sociometric status. The same sociometric nomination procedure was run at T1 and T2: children indicated with whom of their classmates they prefer to spend time with in class, between classes, and outside school. The children were allowed a maximum of five nominations per item and to nominate the same person across items. Sociometric status was operationalized as the number of received nominations. Those who were absent (T1: n = 45, 5.92 %; T2: n = 133, 13.25 %) on the day that the sociometer was administered received fewer nominations at both T1 ($t(758) = 4.88$, $p < .001$, $d = 0.44$) and at T2 ($t(1002) = 14.11$, $p < .001$, $d = 0.69$). This suggests that part of the children did not nominate their absent classmates (the children were not explicitly instructed on whether those absent should be included or excluded). To avoid this issue, subjects who did not respond to the sociometer were also not eligible to receive nominations (the data was coded as missing). The means, standard deviations, and reliabilities of sociometric status variables are presented in Table 2.

Missing values. Data were collected at three distinct time-points and from multiple informants (self-, parent and teacher ratings of personality, peer ratings of sociometric status). The amount of data available for each participant therefore showed some variation (see Tables 1 and 2 for sample sizes for each measure, and Table S5 for coverage statistics: https://osf.io/f47jm/). On average, if one data point was available, any single other data point was available for around half of the cases (M = .52, SD = .12). The lowest co-coverage was observed for teacher ratings of personality at T1 and parent ratings of personality at T3 (.340; that is, a third of all participants had both data points). Of the participants, 50.7 %, 30.4 %,

and 18.9 % had data available for three, two, and one of the measurement waves, respectively.

Attrition. In total 110 participants were present at T1 but not at T2 or T3. The drop-outs did not differ from other participants in ratings provided by their parents (for all comparison, $p > .01$), but teachers rated them as higher in neuroticism ($M = 0.55$, $SD = 1.49$ vs. $M = –0.03$, $SD = 1.45$; $t(93.63) = –3.15$, $p = .002$, $d = –0.40$). All other differences, as well as the difference in sociometric status ($M = –0.28$, $SD = 1.71$ vs. $M = 0.02$, $SD = 1.61$; $t(63.59) = 1.29$, $p = .203$, $d = 0.19$) were non-significant ($p > .01$).

In total 112 of the participants who were present at T2 were not present at T3. Drop-outs were not different in parent ratings of personality (for all comparisons, $p > .05$). Drop-outs were by teachers rated as lower in conscientiousness ($M = –0.40$, $SD = 1.53$ vs. $M = 0.05$, $SD = 1.51$; $t(125.62) = 2.81$, $p = .006$, $d = 0.30$) and higher in neuroticism ($M = 0.57$, $SD = 1.64$ vs. $M = –0.07$, $SD = 1.42$; $t(119.52) = –3.77$, $p < .001$, $d = –0.44$). No statistically significant differences were found in self-rated personality traits (all $p > .03$). The difference in sociometric status of drop-outs ($M = –0.56$, $SD = 1.57$) and other participants ($M = 0.03$, $SD = 1.84$) showed marginal differences between the groups, $t(45.63) = 2.31$, $p = .025$, $d = 0.32$.

Statistical Analyses

Personality and status effects. There were three waves of personality and two waves of sociometric status data. Balanced longitudinal methodologies for examining cross-lagged effects between personality and sociometric status could thus not be employed. The design allowed us to twice control for prior personality when investigating the longitudinal effects of sociometric status on personality (β_2: Sociometric status$_{T1}$ → Personality$_{T2}$ and β_3:

Sociometric status$_{T2}$ → Personality$_{T3}$), but only once to control for prior sociometric status when examining the effects of personality on sociometric status (γ_2: Personality$_{T2}$ → Sociometric status$_{T3}$). A further challenge was that personality and sociometric status were not measured simultaneously; at both T1 and T2, sociometric status was measured after personality measurement. To address the challenges set by the staggered and imbalanced nature of the data we employed two different types of structural equation models.

First, we employed cross-lagged panel models (CLPM) without T3 sociometric status (Figure 1a). Second, we employed longitudinal bivariate path models (PATH) with all measures occurring at different time points (Personality at T1, T2, and T3, Sociometric status at T1+ and T2+, Figure 1b). CLPM is described here, but the description of PATH and the differences between CLPM and PATH are presented only in the Supplemental materials (https://osf.io/f47jm/). In CLPM, two longitudinal personality effects on sociometric status (β_2 and β_3) were estimated as well as a single longitudinal personality effect from personality T1 to sociometric status T2 (γ_{2CLPM}). These cross-lagged paths were adjusted for previous levels of personality and sociometric status via autoregressive paths (α_2 and α_3 for personality and δ_2 for status). Cross-sectional associations were estimated from the correlation between personality and sociometric status at T1 (ψ_1), and from the residual correlation between personality and sociometric status at T2 (ψ_2). We imposed invariance constraints on some of the paths in order to test if they were of similar magnitude across measurement waves. This was possible for the longitudinal autoregressive paths of personality (constraining $\alpha_2 = \alpha_3$) and for sociometric status effects (constraining $\beta_2 = \beta_3$).

The influence of the source of personality information on the personality and sociometric status effects. The longitudinal associations between personality and sociometric status could be investigated from a multi-informant perspective. The various sources of

personality information also allowed us to employ measures of personality that reflected shared variance across informants.

Common variance across informants. Before testing the longitudinal association between personality and sociometric status, a longitudinal univariate model for each personality trait was constructed. In each model, the shared variance between ratings by different informants was modeled as a latent factor onto which mean scale scores from each of the three types of informant loaded (at T1, only parent and teacher ratings were available). Informant specific stable variance was modeled as a residual correlation between ratings by the same informant. We also used these univariate common variance models to examine whether the loadings from teacher ratings and self-ratings were invariant across measurement waves (parent ratings were fixed to 1 in all the waves). To consider the constructs equivalent across time, we required that the factor loadings be invariant (Little, 2013). The longitudinal invariance of the sociometric status model was similarly tested (loadings from nominations within class were fixed to 1 and item specific residuals were allowed to covary). When testing for the invariance of the measurement models, we required that CFI would not decrease by more than .01 and RMSEA (SRMR) would not increase by more than .015 (.03) in the model with invariance constraints (Chen, 2007).

Common variance between parents and teachers. An alternative model, in which self-reports were excluded (because these were not available at T1), was also constructed. In this model, loadings from the parent ratings were fixed to 1 and loadings from the teacher ratings were freely estimated. As above, informant specific residuals were allowed to correlate across measurement waves.

Single-informant models. In the single-informant models, the observed mean scores for each TIPI scale were used. Regarding the self-rating models, because self-ratings were not available at T1, the autoregressive path from personality T1 to T2 was controlled for by using the common factor from parent and teacher ratings as a stand-in for the T1 self-ratings.

Parallel continuities. The parallel continuities hypothesis was tested with polynomial regression analysis and response surface analysis (RSA). This approach is suitable when the focus is on the association between an outcome variable and a combination of two predictors representing the same construct (Barranti, Carlson, & Côté, 2017; Edwards & Parry, 1993). Essentially, it is the ideal statistical method for testing congruence hypotheses (Humberg, Nestler, & Back, 2019), and therefore also for testing whether intra-individual stability over time is associated with an outcome of interest (the outcome may of course also be the intra-individual stability of another variable). Polynomial regression together with RSA allows the response surface to fluctuate with fewer constraints, making the method more informative as compared to commonly used analyses that implicitly make strong assumptions about the shape of the response surface, such as analyses that use difference scores or interaction terms without the squared terms (Edwards, 2001, 2002; Schönbrodt, Humberg, & Nestler, 2018). For example, difference scores are informative only if the main effect coefficients for the variables based on which the differences are computed are of the same sign (Edwards, 2001), and employing interaction terms, without squared terms (i.e. moderated regression), has the consequence that one does not know whether congruence effects are similar across different levels of the predictor variables (Edwards, 2001; Schönbrodt et al., 2018). Because we wanted to test if stability at all levels of sociometric status is associated with the stability of personality, a full second-degree polynomial regression was used.

Individual stability in personality. The regression analyses and RSA were conducted separately for each personality trait. The dependent variable was the individual stability (*I*) in a personality trait from T2 to T3, calculated with Equation 1 (Asendorpf, 1990).

$$I = 1 - \frac{(Z_{Personality\ T2} - Z_{Personality\ T3})^2}{2} \quad (1)$$

where *Z*-variables are individual's standardize trait scores at a specific measurement wave. Individual-level stability in personality traits was calculated for all seven possible combinations of personality ratings (parent-teacher-self, parent-teacher, parent-self, teacher-self, parent, teacher, and self).

Polynomial regression model. The polynomial regression model for trait stability included the observed scores of sociometric status (*S*) from both measurement waves (S_{T1} and S_{T2}) as well as their squared terms (S_{T1}^2 and S_{T2}^2) and interaction ($S_{T1} \times S_{T2}$) as independent variables. The full second-degree polynomial model is presented in Equation 2.

$$I = b_0 + b_1 S_{T1} + b_2 S_{T2} + b_3 S_{T1}^2 + b_4 S_{T1} \times S_{T2} + b_5 S_{T2}^2 + e \quad (2)$$

where *I* is the individual stability of a single personality trait and *e* is a residual term. The regression coefficients from *b1* to *b5* represent the polynomial regression coefficients. More specifically, *b1* is the coefficient for sociometric status T1, *b2* is the coefficient for sociometric status T2, *b3* is the coefficient for the squared term of sociometric status T1, *b4* is the coefficient for the interaction term of sociometric status T1 and sociometric status T2, and *b5* is the coefficient for the squared term of sociometric status T2. Estimates for the *b*-parameters do not directly give answers regarding the parallel continuities hypothesis but are used in the response surface analysis for a more direct test.

Response surface analysis. In response surfaces for individual stability, the regression coefficients obtained from the polynomial regression analysis determine the slopes and curvatures of the lines of congruence (where sociometric status in T1 and T2 match perfectly: $S_{T1} = S_{T2}$) and incongruence (where sociometric status in T1 and T2 have same values but opposite signs: $S_{T1} = -S_{T2}$). These slopes and curvatures are also known as *a*-parameters and are given by the following equations: linear effect along the line of congruence ($a1 = b1 + b2$), quadratic effect along the line of congruence ($a2 = b3 + b4 + b5$), linear effect along the line of incongruence ($a3 = b1 - b2$), and quadratic effect along the line of incongruence ($a4 = b3 - b4 + b5$). The interpretation of the *a*-parameters, however, depends on the overall orientation of the surface, defined by the principal axes on the plane of sociometric status in T1 and T2 (Edwards, 2002).

To establish that individual stability in sociometric status is associated with individual stability in personality, four conditions of congruence must be met (Humberg et al., 2019). The first and second conditions are that the intercept of the first principal axis (*p10*) should not deviate from zero and the slope of the first principal axis (*p11*) should deviate from zero but not from one (i.e., *p11* is statistically significant and the confidence interval does not exclude 1). Meeting these two conditions means that the response surface is oriented along and around the lines of congruence and incongruence, and the fluctuation of the surface can be straightforwardly interpreted in terms of stability in sociometric status, i.e. whether it is associated with stability in personality. The third condition for congruence is that the curvature along the line of incongruence (*a4*) must be negative, indicating that the stability of personality reaches its peak at a point where sociometric status is perfectly stable. Finally, the fourth condition states the linear effect along the line of incongruence (*a3*) should not deviate from zero, indicating that deviations from perfectly stable sociometric status are

associated with an increased instability in personality that is of a similar magnitude, independently of the direction of the instability (increase and decrease in status from T1 to T2 similarly predict decreases in stability of personality). If all these conditions are met, the congruence hypothesis is supported, which in the context of the present study would be a direct indication of parallel continuities between sociometric status and personality. Polynomial regression and RSA were run simultaneously within the framework provided by structural equation modeling.

Statistical inference. In interpreting the statistical significance of the parameter estimates and comparing models with different specifications and constraints, we employed null-hypothesis significance tests in which type I error rate was set at 1 % (p <.01 or 99 % confidence intervals that exclude zero). The estimates produced by different sources of personality information and different longitudinal path modeling techniques (CLPM and PATH) were compared with homogeneity tests (Q-test). Importantly, because the estimated parameters were not independent, the dependence between the parameter estimates was also included in the homogeneity tests. To obtain the correlation between parameter estimates, a bootstrap approach was used wherein the parameter estimates from each model were collected across refitting the selected model with 1000 resamples from the data (10000 for polynomial regression models as has been suggested by Edwards, 2002). The obtained estimates were used to construct the parameter estimate distributions and to calculate the correlations between the estimates of the same parameters across models. For example, when comparing a set of models, such as CLPM models with five different personality measures (common variance, parent-teacher, parent, teacher, and self-rating models) with reference to a specific parameter estimate, such as ψ_1, the mean and sampling variability of the estimate across the bootstraps, as well as the covariances between the estimated parameters across

different models, were entered into multivariate random effect meta-analysis using the *metafor*-package (Viechtbauer, 2010). From this analysis, the estimate of heterogeneity (Q) was obtained. When homogeneity across models was not rejected, the parameters estimated with different type of models were interpreted as originating from the same underlying distributions. Because the parameter estimates are likely to be positively correlated with each other, the test will reject homogeneity more easily than it would if the estimates were independent. Due to the large number of parameter estimates, we tested for the homogeneity of the parameter estimates only if at least one of the initially run models suggested that the estimate was statistically significant. Meta-analytical estimates of the parameter estimates were computed to further examine the generalizability of the associations across sources of personality information.

To examine the effects of the above described class-mean centering, all analyses were also run with raw scores, and differences in parameter estimates were tested with the *Q*-test. All structural equation modeling was conducted with the *lavaan* -package (Rosseel, 2012) in R (R Core Team, 2017) with full information maximum likelihood estimation. Following the recommendations by Edwards (2002), for polynomial regression and RSA, we used bootstrap method with ten thousand resamples from which 99% confidence intervals were constructed for statistical inference.[2] See https://osf.io/f47jm/ for analysis script and a detailed set of results, including unstandardized parameter estimates and parameter estimates from the unconstrained models, as well as homogeneity tests and bootstrap estimates from all models.

Results

Zero-order correlations between personality trait aggregates calculated across all informants and sociometric status aggregates calculated across all nominations are presented in Table 3.

Latent Factor Modelling of Personality and Sociometric Status

Univariate latent factor models all showed good fit to the data, also with invariance constraints. See Results Supplement and Tables S6-S7 for more detailed information (https://osf.io/f47jm/).

Longitudinal Paths and Transactions between Personality Traits and Sociometric Status

For longitudinal analysis, the personality models (one trait at a time) were combined with the sociometric status model to construct CLPM and PATH models. Personality and status effects, as well as autoregressive effects, were examined from these models (Figure 1).

All models supported longitudinal invariance constraints for the autoregressive personality paths and for status effects on personality (*p*s > .063), except for teacher ratings of Openness, for which the autoregressive paths were not invariant (α_2 = .31, α_3 = .51, in both CLPM and PATH, $\chi^2(2) = 9.28$, $p = .010$). The constrained models are interpreted. Comparing models that were run with centered vs. raw scores, only seven of the 1400 comparisons of parameter estimates were heterogeneous (chance alone would be expected to give 14 with alpha set at 1%). Only the results obtained with centered variables are therefore presented, except for results that require different interpretation if raw scores are used.

Across models, there was heterogeneity in the autoregressive personality paths that employed different sources of personality information (see Tables 4-6, and S8-S14, for trait specific estimates). The common variance personality factors showed notably higher levels of temporal stability (standardized path estimates ranging from .77 to .95 across all models) than parent (range from .47 to .58) or teacher ratings (range from .31 to .64), which nevertheless showed higher levels of temporal stability than self-ratings (range from .28 to

.33, estimated only from T2 to T3). Thus, across traits, the variance that is shared across informants also captures the more stable aspects of personality. Next, the associations between personality and status are presented one trait at a time. Because of a very high resemblance of the results obtained with CLPM and PATH, only results for CLPM are presented below, except when results from PATH provide specific additional information. Comprehensive results for PATH and comparisons between CLPM and PATH can be found in the Results Supplement (https://osf.io/f47jm/).

Extraversion. Path estimates from models with extraversion and status are presented in Table 4. In the models, personality effects from extraversion T1 to sociometric status T2 (γ_{2CLPM}) were statistically non-significant (for all models, *p*s > .120) and homogeneous across models with different personality informants, $Q(2) = 3.14$, $p = .208$. The paths from sociometric status to extraversion (β_2 and β_3, constrained to be equal) were statistically significant in all models (*p*s < .003). The standardized parameter estimates (ranging from .09 to .13), were also homogeneous across the models with different sources of personality information, $Q(4) = 1.13$, $p = .890$, indicating that sociometric status predicts increases in extraversion independently of the personality informant (meta-analytical estimate for $\beta = .11$, $p < .001$). Furthermore, the cross-sectional correlation at T1 (ψ_1) was statistically significant in the model employing teacher rated extraversion ($\psi_1 = .12$, $p = .006$), and this correlation was homogeneous with the one obtained using parent rated extraversion ($\psi_1 = .09$, $p = .038$) and the one obtained using parent-teacher common variance ($\psi_1 = .14$, $p = .022$) models ($Q(2) = 0.96$, $p = .618$) indicating that sociometric status and extraversion were initially associated (meta-analytical $\psi_1 = .09$, $p = .002$).

Agreeableness. Path estimates from models with agreeableness and status are presented in Table 5. Personality effects from agreeableness T1 to sociometric status T2

(γ_{2CLPM}) were statistically significant in the common variance, γ_{2CLPM} = .16, p = .005, and parent rating models, γ_{2CLPM} = .12, p = .008. The model with teacher ratings showed a similar trend, γ_{2CLPM} = .10, p = .020. These parameter estimates were homogeneous across informants, $Q(2)$ = 2.42, p = .298 (meta-analytical γ_{2CLPM} = .08, p = .002). The longitudinal paths from sociometric status to agreeableness were non-significant (ps > .026) and homogeneous across models, $Q(4)$ = 9.15, p = .058. Furthermore, the cross-sectional correlations at T1 were statistically significant in the common variance (ψ_1 = .30, p < .001) and teacher-rating (ψ_1 = .25, p < .001) models, but not the parent-rating (ψ_1 = .11, p = .018) model (these estimates were heterogeneous across models, $Q(2)$ = 26.85, p < .001), giving the meta-analytical estimate ψ_1 = .21, p < .001. In sum, CLPM models suggest that agreeableness and sociometric status are cross-sectionally correlated, and that agreeableness predicts increases in sociometric status.

Openness. Parameter estimates for the openness models are presented in Table S10. Longitudinal paths from status to openness were statistically significant in the teacher rating model, β = .08/.09, p = .001. Although the estimates were homogeneous across models, $Q(4)$ = 11.65, p = .020, the estimates of β (ranging from –.03 to .01) from other models were statistically non-significant (ps > .290), as well as was the meta-analytical estimate (β = .02, p = .400) suggesting that the effect is specific to teacher ratings. In the common variance (ψ_1 = .18, p = .007) and teacher rating (ψ_1 = .13, p = .007) models openness correlated at T1 with status, but not in the parent rating model (ψ_1 = .04, p = .389; heterogeneity across correlations was significant, $Q(2)$ = 9.75, p = .008). The meta-analytical estimate was also non-significant, ψ_1 = .09, p = .067. However, challenging the robustness of a possible T1 cross-sectional correlation between teacher ratings of openness and status, the estimates obtained with raw scores differed from those obtained with centered scores (in the PATH model, γ_1

differed , $Q(1) = 6.87$, $p = .009$, and in CLPM, ψ_1 differed, $Q(1) = 6.06$, $p = .014$) and suggested that the estimates were non-significant.

Conscientiousness. Parameter estimates for conscientiousness models are presented in Table S12. In the CLPMs, none of the cross-lagged paths were statistically significant (for γ_{2CLPM}, ps > .141, for β, ps > .085). Cross-sectional correlations at T1 between conscientiousness and sociometric status were significant in the common variance ($\psi_1 = .25$, $p < .001$) and teacher rating ($\psi_1 = .22$, $p < .001$) models, but not in the parent rating model ($\psi_1 = .08$, $p = .068$), and these differences were significant, $Q(2) = 21.76$, $p < .001$. The meta-analytical estimate of ψ_1 was statistically significant, $\psi_1 = .17$, $p = .004$.

Neuroticism. Parameter estimates for neuroticism are presented in Table 6. The cross-lagged path from neuroticism T1 to sociometric status T2 was statistically significant in the common variance model ($\gamma_{2CLPM} = –.20$, $p = .005$). Although there was no heterogeneity in parameter estimates ($Q(2) = 3.89$, $p = .143$) the estimates in parent ($\gamma_{2CLPM} = –.09$, $p = .038$) and teacher ($\gamma_{2CLPM} = –.12$, $p = .011$) rating models were non-significant. The meta-analytical estimate was also non-significant, $\gamma_{2CLPM} = –.08$, $p = .015$. Paths from sociometric status to neuroticism were all non-significant (ps > .010). The common variance ($\psi_1 = –.27$, $p = .001$), parent ($\psi_1 = –.12$, $p = .007$) and teacher rating models ($\psi_1 = –.18$, $p < .001$) all showed an association between neuroticism and status at T1 (the strength of the association varied across models, ψ_1, $Q(2) = 9.53$, $p = .009$). The meta-analytical estimate was $\psi_1 = –.17$, $p = .002$. The effect from T2 neuroticism to T2+ status, included only in the PATH models, was statistically significant in the parent-teacher model ($\gamma_{2PATH} = –.13$, $p = .004$) and teacher model ($\gamma_{2PATH} = –.10$, $p = .004$), but not in the common variance ($\gamma_{2PATH} = –.13$, $p = .011$), parent ($\gamma_{2PATH} = –.04$, $p = .236$), or self-rating ($\gamma_{2PATH} = –.05$, $p = .188$) models. Differences between estimates were not significant, $Q(4) = 5.73$, $p = .220$, but yielded only a non-

significant meta-analytical estimate, $\gamma_{2PATH} = -.04$, $p = .089$. Together these results from the PATH model suggest a weak effect of neuroticism on sociometric status, lending support to the CLPM model, in which a clearer, but marginal, effect was found.

Parallel Continuities between Personality Traits and Sociometric Status

The associations between the stability of sociometric status and the stability of each personality trait was examined from polynomial regression analysis followed by response surface analysis. As above, all possible combinations of personality information were first examined separately, after which we tested for heterogeneity. The types of personality information employed in the different models were common variance, parent-teacher, parent-self, teacher-self, parent, teacher and self-ratings. Comparison of analyses run with centered and with raw scores showed that the *a*-parameters did not vary as a function of centering (only two out of the 140 estimates that were compared were heterogeneous, *a1* for parent-self models for openness and conscientiousness). Below parallel continuities between personality and status are presented one trait at a time based on estimates obtained with centered variables.

Extraversion. Results for extraversion are presented in Table 7. Examining the congruence criteria from the first principal axis of the response surface showed that in the common variance, parent-teacher, parent-self, and parent rating models, the first principal axis did not deviate from the line of congruence (*p10* = 0 and *p11* = 1, the parameter CIs are in Table 7). Congruence was also supported by the statistically significant negative curvatures along the line of incongruence (*a4* < 0) and the non-significant slopes along the line of incongruence (*a3* = 0). The teacher-self, teacher, and self-rating models did not fulfill the criteria regarding the slope of the first principal axis, nor were their curvatures along the

line of incongruence statistically significant. Nevertheless, the latter estimates were all negative, and *Q*-test indicated that the *a4* parameter estimates were homogeneous across models employing different personality information ($Q(6) = 5.25$, $p = .512$) and the meta-analytical estimate was statistically significant, $a4 = -0.25$, $p < .001$. In addition, the *a3* parameter estimates were all non-significant and homogeneous across different informants, $Q(6) = 2.43$, $p = .876$ (meta-analytical $a3 = 0.11$, $p = .014$). Thus, the results are interpreted as showing that stability in sociometric status is associated with individual-level stability in extraversion. The variance explained in the individual-level stability of extraversion ranged from 0.7 % (teacher ratings) to 6.0 % (parent ratings). Response surfaces for all models are presented in Figure 2.

In addition to parallel continuities between sociometric status and extraversion, the slope along the line of congruence was statistically significant in the common variance model ($a1 = 0.07$, 99% CI [0.01, 0.14], and homogeneous across combinations of informants, $Q(6) = 2.99$, $p = .810$; meta-analytical $a1 = 0.06$, $p = .005$). Underlying this effect ($a1 = b1 + b2$) was the linear effect of status T1 on the stability of extraversion (meta-analytical $b1 = 0.08$, $p = .003$, $Q(6) = 2.10$, $p = .910$), not the effect of status T2 (meta-analytical $b2 = -0.03$, $p = .119$, $Q(6) = 4.06$, $p = .668$). Thus, high sociometric status at T1 contributed to the stability of extraversion in preadolescence.

Agreeableness. None of the agreeableness models supported the congruence hypothesis (non-significant *p11* and *a4* parameter estimates; see Table S15). Sociometric status T1 predicted stability in Agreeableness, but only in the self-rating model, $b1 = 0.14$, 99 % *CI* [0.00, 0.28]. The non-significance of *b1* estimates in the other models, their heterogeneity across models ($Q(6) = 17.03$, $p = .009$), and the non-significant meta-analytical estimate ($b1 = 0.03$, $p = .365$) suggest that T1 status is associated with later stability in

agreeableness only in self-ratings. Response surfaces for agreeableness are presented in Figure S1.

Openness. Parameter estimates for Openness are in presented Table S16. In the common variance model, the first principal axis did not deviate from the line of congruence ($p10$ = 0.23, 99% *CI* [–0.66, 1.76], $p11$ = 0.89, 99% *CI* [0.08, 2.11]). Congruence in this model was also supported by statistically significant negative curvatures along the line of incongruence (*a4* = –0.25, 99% *CI* [–0.48, –0.01]) and non-significant slopes along the line of incongruence (*a3* = –0.05, 99% *CI* [–0.20, 0.10]). However, in all other models, the first principal axis did not deviate from the line of congruence and there was heterogeneity across the models in *a4*, $Q(6) = 20.07$, $p = .003$. This, together with a non-significant meta-analytical estimate, *a4* = –0.20, $p = .043$, suggest that stability in sociometric status was associated with individual stability in openness only in the common variance model. Response surfaces for openness are presented in Figure S2.

Conscientiousness. All conscientiousness models failed to support the congruence hypothesis (zero *p11* and *a4* parameter estimates, see Table S17).

Neuroticism. All neuroticism models failed to support the congruence hypothesis (zero *p11* and *a4* parameter estimates, see Table S18).

Discussion

The present longitudinal multi-informant examination of the transactional pathways between personality and sociometric status revealed that personality and sociometric status predict each other in the developmental period spanning from middle childhood to preadolescence. The results for extraversion were the most pervasive, as sociometric status linearly predicted

the development of extraversion both in middle childhood and in preadolescence. Furthermore, the individual-level stability of extraversion in preadolescence was associated with both the initial level of sociometric status as well as with the individual-level stability of sociometric status. The early attainment and preservation of high sociometric status is thus predictive of the development of high extraversion. We also found that agreeableness predicted later sociometric status, and a similar but more marginal personality effect for neuroticism. Our results can thus help explain the previously observed cross-sectional associations between sociometric status and extraversion, agreeableness, and neuroticism (van Aken & Asendorpf, 2018).

Developmental Transactions between Extraversion and Sociometric Status

Previous longitudinal research on extraversion shows that it is associated with attainment of status (Anderson et al., 2001). Extraversion is also associated with liking at zero-acquaintance (Back et al., 2011), indicating that it can predict status in newly formed groups. In the present study, extraversion and sociometric status were correlated at the first measurement, possibly reflecting personality effects in a newly formed class. Moving beyond these cross-sectional associations, rank-order increases in extraversion were predicted by previous levels of sociometric status. Status effects have previously been found on the self-rated self-esteem of adolescents (Reitz et al., 2014) and on the peer-rated shyness-sensitivity of preadolescents (Yang et al., 2015). Extending upon this literature, we rule out shared method variance as a cause of status effects, and show that the effects are robust across different sources of personality information.

Consistent with the parallel continuities hypothesis, the stability of sociometric status was positively associated with the stability of extraversion. This result supports the view that

a more stable environment demands less change in personality (Branje et al., 2004; Sturaro et al., 2008). Similar results have been reported on in older samples in which changes in the social environment have been correlated with changes in personality traits (Mund & Neyer, 2014; Scollon & Diener, 2006). However, the present research is the first to investigate such parallel continuities from the perspective of stability rather than that of change. Focusing on concomitant stability may be more informative (Wood & Denissen, 2015), especially given the relatively high stability of personality traits and sociometric status (Anderson et al., 2001; Jiang & Cillessen, 2005). Extraversion was also more stable among those with high initial levels of social status. Together with the result suggesting that status influences the development of extraversion, the results pertaining to stability further support the notion that early status attainment allows for increasing and more stable levels of extraversion.

The here described pattern of results for extraversion and peer status can be characterized as a Matthew effect in personality development (DiPrete & Eirich, 2006; Merton, 1968). The Matthew effect, in which social advantages lead to further advantages, or disadvantages to further disadvantages, creates widening gaps between those initially advantaged and those less so. In the present case, those who are initially afforded higher sociometric status will become more extraverted and more stable in their extraversion. That stability in extraversion is higher among those whose sociometric status is not only stable but also high further contributes to this widening gap and accentuates the consequences of early status attainment for the development of extraversion.

How could Sociometric Status Influence Extraversion?

Broad trait domains have been argued to emerge from a network of inter-connected constituents and processes that influence each other directly, indirectly, and reciprocally

(Baumert et al., 2017; Mõttus & Allerhand, 2018). If this network of processes changes sufficiently to establish a new equilibrium, change at the level of broad traits can be observed (Cramer et al., 2012; Geukes et al., 2018). Previous research shows that different status positions allow for very different types of behaviors in a wide array of behavioral domains. For example, social power and status are known to increase approach tendencies (e.g., positive affect, disinhibited behavior) whereas lack of status causes avoidance tendencies (e.g., attention to punishment, negative affect; Keltner, Gruenfeld, & Anderson, 2003). Behaving above one's status is punished by the group (Anderson et al., 2008, 2006), and those with low rank avoid risky social initiatives and leadership (Spark, Stansmore, & O'Connor, 2018). Thus, it could be that high and low sociometric status allow and constrain various behaviors, emotions, and cognitions to the extent that new network equilibria emerge and can be observed as increases and decreases in extraversion. Additionally, it could also be that sociometric status, due to its pervasive and stable influence on the processes thought to constitute extraversion, could have some role in explaining why these processes come together in the first place (Mõttus & Allerhand, 2018).

Individual differences in all Five-Factor traits except extraversion tend to increase from age 3 to age 17 (Mõttus, Soto, & Slobodskaya, 2017). Together with our results, this suggests that sociometric status could set constraints on youth's extraverted behaviors in a zero-sum fashion. Research on leadership suggests leadership is a finite resource that is divided among group members (Livi, Kenny, Albright, & Pierro, 2008). In a similar way it seems plausible that not everyone can have high (or low) sociometric status, but that one person's increase or decrease in sociometric status is balanced by a corresponding but opposite pattern in the sociometric status of others. The diversity of positions within the social network could remain constant over time, keeping also variance in levels of

extraversion constant over time. That is, the social hierarchies that regularly emerge in groups of humans (von Rueden, 2014) could systematically allow (constrain) high (low) status individuals to behave more (less) extraverted, leading to constant within-group variance in introversion-extraversion. Status could, of course, be reallocated within the group, indicated by its non-perfect rank-order stability (Jiang & Cillessen, 2005). Future studies should examine the socioecological features of the classroom (e.g. size) and look into whether these are associated with classroom variance in extraversion. It could also be that more hierarchically structured peer networks have more variance in extraversion.

Timing Matters for Personality Effects

Agreeableness predicted increases and neuroticism decreases in sociometric status. Although extraversion was cross-sectionally associated with status at the first measurement wave, it did not predict later increases in sociometric status. This pattern could be interpreted as indicating that extraversion is most important in initial group formation. By contrast, agreeableness and neuroticism could come into play at a later stage, an idea consistent with the lack of associations between these traits and status in newly-formed groups (Anderson et al., 2001). Processes associated with conflict solving (Graziano et al., 2007), benevolent values (Roccas, Sagiv, Schwartz, & Knafo, 2002), and forgiveness (Ashton & Lee, 2007) could explain why childhood agreeableness predicts increases in preadolescence sociometric status. Among university freshmen, increases in number of friends during the first year is also predicted by agreeableness (Selfhout et al., 2010).

Neuroticism does not predict number of friendships during the freshman year (Selfhout et al., 2010), but it does predict increases in self-reported loneliness (and vice versa: Abdellaoui et al., 2019) and negative life-events (Lüdtke, Roberts, Trautwein, & Nagy,

2011; Magnus, Diener, Fujita, & Pavot, 1993). Neuroticism is also associated with the type of behaviors, such as strong reactions to cues of social inclusion (Denissen & Penke, 2008) and inter-moment mood spillovers and general susceptibility to stress (Suls & Martin, 2005), that could explain why neuroticism would predict decreased peer regard, as our results suggest it does. Future studies on personality effects should take into account that these effects can depend on the phase of group development.

Common Variance Operationalizations of Traits and their Implications

The multi-informant approach that we employed allowed us to use indices of personality traits that reflected the variance of personality ratings that was shared across different informants (Branje et al., 2004; Kraemer et al., 2003). This gave us a more reliable and bias-free indices, but it also narrowed them down, as they comprised only those aspects of the traits that were perceived across informants, likely giving more visible aspects more weight.

The compressed common variance measure that we employed did, with one exception, not reveal associations to sociometric status that would have been unique to the compressed measure. Sociometric status predicted extraversion also as rated by each of the informants separately, and the predictive power of both agreeableness and neuroticism was homogeneous across sources of personality information. The only instance in which the source seemed to matter was the parallel continuities hypothesis for openness, which was supported only when the common variance measure was employed. This implies that some aspects of openness, such as openness to actions, are more easily observable than other aspects, and that it is these aspects of openness that develop in parallel with sociometric status.

The common variance measures had higher temporal stability than single informant ratings. Thus, those aspects of personality that are observable to different informants are also more stable. Behavior genetic studies have shown that compressed personality measures are also more heritable than single rater measures (Bouchard & Loehlin, 2001; Riemann, Angleitner, & Strelau, 1997). These results imply that personality traits, as measured by common variance measures, are somewhat different than personality traits measured by other means. Future studies on personality-relationship transactions will of course benefit from employing multi-method assessment of personality. Although common variance measures may be more reliable, they may also capture the sought-after trait domains more narrowly, and comparisons between common variance and single-rater measures are therefore essential.

Limitations

The personality measure that we employed was only ten items, lowering the reliability and narrowing the content of our personality assessment. Future studies should, of course, try to include broader measures. This could be especially important given that some cross-sectional results indicate that the narrower facets of extraversion have opposite sign associations with sociometric status (Wortman & Wood, 2011). Sampling more broadly from the domain of extraversion could be informative about the mechanisms that tie sociometric status to extraversion and help determine whether sociometric status can, in part, help explain why a broad trait such as extraversion, with all its intercorrelated micro-level processes, emerges (Baumert et al., 2017; Mõttus & Allerhand, 2018). Broader sampling from the domain of openness would also be important. The parallel continuities hypothesis for openness was supported only for the compressed measure, suggesting that those aspects of openness that are easily observable develop in parallel with sociometric status.

Another important limitation of this study is the lack of genetic analysis. If, for instance, there were common genetic influences on extraversion and sociometric status, the transactions between these constructs that we report on would be strong evidence of active gene-environment correlations (Bleidorn et al., 2014). Although we cannot determine the extent to which such a correlation underlies the developmental process that we report on, this limitation should not detract from the usefulness of our results. Describing the phenotypical pathways between extraversion and sociometric status is theoretically important regardless of whether they have common genetic influences. Our results can serve as a starting point for future behavioral genetic studies, which should, based on our results, include measures of sociometric status (preferably measures that do not share method variance with other phenotypes of interest), allowing for more precise partitioning of genetic and environmental contributions and their interactions.

We did not differentiate between the more emotional vs. reputational forms of sociometric status (Cillessen & Bukowski, 2018). Our measure resembled more the emotional form, but given that children cannot differentiate between the two, we believe that our results would had been virtually identical had we used a reputational measure (Cillessen & Mayeux, 2004; Xie et al., 2006). However, an emotional measure of the type we used could, as it focuses on the personal relationship between the target and the rater, be preferable to a reputational measure that taps more into consensual perceptions of the target. Future research may, besides disentangling emotional and reputational status, also seek to distinguish between other possible types of status, such as communal and agentic status.

The results that we report on may not be generalizable to adulthood. The elementary school years are unlike other life stages, in that people are embedded in an age stratified group for such a large portion of their time (Hawley & Bower, 2018). The peer environment

in adulthood may not be pervasive in a similar way but may instead better allow for self-selection into niches. Culture could also play a role in the extent to which peer relations matter, implying that generalizations to other populations may not be warranted (Henrich, Heine, & Norenzayan, 2010).

We also acknowledge that the effect sizes that we report on are not very large. They do not, for instance, suggest that sociometric status in any way exhaustively predicts the development of extraversion: the meta-analytic standardized path estimate of this particular effect was .11, a typical effect size in research on relationship and status effects (Deventer et al., 2019; Mund & Neyer, 2014; Reitz et al., 2014; Yang et al., 2015), and the average variance in the stability of extraversion that could be explained by the stability of status was 3.3 %. These and the other effects that we report on could be classified as small to moderate. However, even effects of this magnitude can be highly consequential, especially in the long run (Funder & Ozer, 2019).

A further limitation was that the measurement of sociometric status and personality did not take place simultaneously, at T1 and T2. Rather, personality was measured one year earlier than status. Also, the number of measurements waves was not equal, which meant that we could not employ balanced statistical modeling, such as random intercept cross-lagged panel modeling (Hamaker, Kuiper, & Grasman, 2015).

Despite these limitations, our results suggest that: (1) Sociometric status in middle childhood and preadolescence predicts the development of extraversion. (2) Agreeableness and (3) neuroticism in childhood predict sociometric status in preadolescence. Besides these direct effects, (4) the individual-level stability of sociometric status was associated with the individual-level stability of extraversion and (5) with the individual-level stability of the

common variance measure of openness. On the most general level, our results support the idea that children's standing on personality traits is not predetermined, but that personality traits and social relationships influence each other and develop over time.

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Table 1
Means, Standard Deviations and Reliabilities for Composites of Observed Personality Measures

		Parent ratings			Teacher ratings			Self-ratings		
Time	Personality Trait	*M*	*SD*	α	*M*	*SD*	α	*M*	*SD*	α
T1		(*n* = 618–625)			(*n* = 586–589)					
	Extraversion	5.60	1.27	.62	4.82	1.63	.77			
	Agreeableness	5.26	1.20	.46	4.91	1.51	.68			
	Openness	5.72	1.14	.43	4.83	1.13	.56			
	Conscientiousness	5.11	1.26	.52	5.06	1.47	.64			
	Neuroticism	4.34	1.46	.67	4.81	1.55	.76			
T2		(*n* = 848–856)			(*n* = 957–959)			(*n* = 926–939)		
	Extraversion	5.49	1.25	.59	4.87	1.61	.80	5.49	1.26	.33
	Agreeableness	5.19	1.22	.51	4.91	1.48	.65	5.56	1.21	.43
	Openness	5.49	1.24	.57	4.96	1.30	.76	5.29	1.38	.37
	Conscientiousness	4.76	1.35	.60	4.94	1.60	.77	5.44	1.27	.47
	Neuroticism	4.33	1.40	.61	4.92	1.58	.76	4.80	1.46	.37
T3		(*n* = 822–830)			(*n* = 890–896)			(*n* = 921–931)		
	Extraversion	5.41	1.28	.64	4.90	1.59	.78	5.27	1.24	.45
	Agreeableness	5.35	1.16	.47	5.00	1.47	.65	5.06	1.19	.42
	Openness	5.31	1.26	.52	4.92	1.34	.75	5.03	1.30	.43
	Conscientiousness	4.95	1.35	.64	4.97	1.63	.79	4.89	1.19	.46
	Neuroticism	4.57	1.37	.65	4.95	1.47	.67	4.37	1.32	.48

Note: M = Mean, *SD* = Standard Deviation, α = reliability (Spearman-Brown for two-item scales). Descriptive statistics were calculated with non-centered variables. Reliabilities were calculate with centered variables.

Table 2
Means, Standard Deviations and Reliabilities for Observed Sociometric Status Variables

Time	Variable	*M*	*SD*
T1+ (*n* = 715; α = .86)	In classroom	3.68	1.93
	Between classes	3.61	1.91
	Outside school	3.05	1.83
T2+ (*n* = 871; α = .90)	In classroom	3.86	2.15
	Between classes	3.79	2.04
	Outside school	3.42	2.01

Note: M = Mean, *SD* = Standard Deviation, α = Cronbach's alpha. Descriptive statistics calculated for raw scores of received nominations. Reliabilities were calculated with centered variables.

Table 3
Zero-order correlations between personality trait aggregates across informants and sociometric status

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Extraversion T1	-															
2. Extraversion T2	**.51**	-														
3. Extraversion T3	**.43**	**.60**	-													
4. Agreeableness T1	**–.15**	**–.13**	–.03	-												
5. Agreeableness T2	**–.13**	–.02	–.03	**.54**	-											
6. Agreeableness T3	**–.14**	**–.10**	–.02	**.43**	**.56**	-										
7. Openness T1	**.29**	**.21**	**.13**	**.12**	.05	.01	-									
8. Openness T2	**.11**	**.27**	**.17**	.02	**.22**	*.08*	**.40**	-								
9. Openness T3	.03	**.12**	**.24**	**.13**	**.17**	**.20**	**.36**	**.55**	-							
10. Conscientiousness T1	**–.10**	**–.10**	–.05	**.41**	**.28**	**.27**	.06	.00	.07	-						
11. Conscientiousness T2	*–.08*	.02	–.04	**.30**	**.52**	**.33**	.04	**.18**	**.12**	**.47**	-					
12. Conscientiousness T3	*–.10*	–.03	–.03	**.23**	**.37**	**.51**	.02	**.15**	**.25**	**.42**	**.59**	-				
13. Neuroticism T1	**.18**	**.14**	.06	**–.65**	**–.45**	**–.34**	–.04	–.04	*–.10*	**–.41**	**–.30**	**–.24**	-			
14. Neuroticism T2	**.18**	.05	.03	**–.42**	**–.62**	**–.37**	.05	**–.11**	–.06	**–.23**	**–.46**	**–.29**	**.50**	-		
15. Neuroticism T3	**.14**	*.08*	.03	**–.30**	**–.38**	**–.56**	**.11**	.02	**–.09**	**–.23**	**–.31**	**–.45**	**.35**	**.52**	-	
16. Sociometric status T1	*.10*	**.15**	**.18**	**.16**	**.22**	**.14**	.06	**.10**	.06	**.14**	**.14**	**.12**	**–.16**	**–.15**	**–.14**	-
17. Sociometric status T2	.04	**.16**	**.20**	**.18**	**.15**	*.08*	.01	.05	.03	**.11**	*.08*	.02	**–.18**	**–.15**	–.04	**.41**

Note: T1 Personality aggregates calculated from parent and teacher ratings. T2 and T3 personality aggregates calculated from parent, teacher, and self-ratings. Boldface correlations statistically significant $p < .01$. Italicized correlations statistically significant $p < .05$

Table 4
Standardized parameter estimates from cross-lagged panel models for extraversion and sociometric status

		Common variance		Parent-teacher		Parent		Teacher		Self	
		Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*
Cross-lagged paths											
Personality T1 → Status T2	γ_{2CLPM}	.02 [–.14, .17]	.869	–.01 [–.16, .13]	.812	.07 [–.05, .18]	.126	–.03 [–.14, .08]	.451	*.04 [–.13, .21]*	*.570*
Status T1 → Personality T2	β_2	.10 [.03, .18]	***	.10 [.03, .17]	.002	.09 [.03, .16]	***	.11 [.05, .17]	***	.08 [.02, .15]	***
Status T2 → Personality T3	β_3	.11 [.03, .19]	***	.11 [.03, .20]	.002	.10 [.03, .17]	***	.13 [.06, .19]	***	.10 [.02, .17]	***
Autoregressive paths											
Personality T1 → Personality T2	α_2	.82 [.72, .92]	***	.82 [.71, .93]	***	.49 [.43, .55]	***	.55 [.50, .61]	***	.27 [.13, .41]	***
Personality T2 → Personality T3	α_3	.82 [.74, .91]	***	.87 [.77, .97]	***	.47 [.40, .53]	***	.58 [.53, .64]	***	.33 [.25, .41]	***
Status T1 → Status T2	δ_2	.48 [.38, .58]	***	.48 [.38, .59]	***	.48 [.37, .58]	***	.49 [.38, .59]	***	.48 [.37, .58]	***
Cross-sectional correlations											
Status T1 ↔ Personality T1	ψ_1	.15 [.01, .30]	.007	.14 [.00, .28]	.022	.09 [–.02, .21]	.038	.12 [.01, .24]	.006	*.16 [.01, .32]*	*.006*
Status T2 ↔ Personality T2 (Residuals)	ψ_2	.16 [–.09, .42]	.099	.18 [–.06, .42]	.046	–.01 [–.13, .10]	.769	.09 [–.02, .21]	.038	.05 [–.06, .17]	.211

Note: Est = Standardized path estimate. *CI* = confidence interval. Italicized estimates were calculated with parent-teacher common variance latent factors (no self-ratings at T1).

*** $p < .001$

Table 5
Standardized parameter estimates from cross-lagged panel models for agreeableness and sociometric status

		Common variance		Parent-teacher		Parent		Teacher		Self	
		Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*
Cross-lagged paths											
Personality T1 → Status T2	γ_{2CLPM}	.19 [.03, .35]	.003	.16 [.01, .31]	.005	.12 [.00, .23]	.008	.10 [–.01, .22]	.020	*.21 [.05, .38]*	*.002*
Status T1 → Personality T2	β_2	.00 [–.07, .07]	.982	.00 [–.07, .07]	.957	.05 [–.01, .11]	.048	.05 [–.01, .11]	.027	.04 [–.03, .11]	.130
Status T2 → Personality T3	β_3	.00 [–.09, .09]	.982	.00 [–.09, .08]	.957	.05 [–.02, .12]	.048	.06 [–.01, .13]	.027	.05 [–.03, .12]	.130
Autoregressive paths											
Personality T1 → Personality T2	α_2	.82 [.71, .93]	***	.85 [.73, .96]	***	.47 [.40, .53]	***	.57 [.51, .62]	***	.31 [.17, .45]	***
Personality T2 → Personality T3	α_3	.85 [.76, .94]	***	.90 [.79, 1.02]	***	.49 [.42, .55]	***	.57 [.51, .63]	***	.29 [.21, .38]	***
Status T1 → Status T2	δ_2	.42 [.31, .54]	***	.44 [.32, .56]	***	.47 [.37, .57]	***	.46 [.35, .57]	***	.42 [.31, .54]	***
Cross-sectional correlations											
Status T1 ↔ Personality T1	ψ_1	.33 [.20, .47]	***	.30 [.17, .44]	***	.11 [–.01, .22]	.018	.25 [.14, .35]	***	*.31 [.16, .45]*	***
Status T2 ↔ Personality T2 (Residuals)	ψ_2	–.16 [–.41, .09]	.085	–.14 [–.39, .11]	.157	–.02 [–.13, .10]	.679	.01 [–.11, .12]	.896	–.06 [–.18, .06]	.209

Note: Est = Standardized path estimate. *CI* = confidence interval. Italicized estimates were calculated with parent-teacher common variance latent factors (no self-ratings at T1).

*** $p < .001$

Table 6
Standardized parameter estimates from cross-lagged panel models for neuroticism and sociometric status

		Common variance		Parent-teacher		Parent		Teacher		Self	
		Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*	Est [*99% CI*]	*p*
Cross-lagged paths											
Personality T1 → Status T2	γ_{2CLPM}	–.20 [–.37, –.03]	.005	–.18 [–.37, –.02]	.005	–.09 [–.21, .02]	.038	–.12 [–.23, .00]	.011	*–.19 [–.37, –.01]*	*.010*
Status T1 → Personality T2	β_2	.04 [–.04, .12]	.227	.02 [–.05, .10]	.443	–.01 [–.07, .05]	.565	–.06 [–.12, .00]	.011	.03 [–.04, .09]	.257
Status T2 → Personality T3	β_3	.05 [–.05, .14]	.227	.03 [–.06, .12]	.443	–.02 [–.09, .05]	.565	–.07 [–.14, .00]	.011	.04 [–.04, .12]	.257
Autoregressive paths											
Personality T1 → Personality T2	α_2	.85 [.73, .98]	***	.86 [.73, 1.00]	***	.49 [.43, .56]	***	.48 [.42, .55]	***	.32 [.17, .47]	***
Personality T2 → Personality T3	α_3	.90 [.79, 1.01]	***	.95 [.82, 1.08]	***	.47 [.41, .54]	***	.51 [.45, .57]	***	.28 [.20, .37]	***
Status T1 → Status T2	δ_2	.42 [.30, .54]	***	.43 [.31, .55]	***	.47 [.37, .57]	***	.46 [.36, .57]	***	.43 [.31, .55]	***
Cross-sectional correlations											
Status T1 ↔ Personality T1	ψ_1	–.30 [–.45, –.16]	***	–.27 [–.43, –.12]	.001	–.12 [–.23, –.01]	.007	–.18 [–.30, –.07]	***	*–.28 [–.44, –.13]*	***
Status T2 ↔ Personality T2 (Residuals)	ψ_2	.10 [–.19, .40]	.361	.08 [–.21, .37]	.466	.01 [–.15, .12]	.893	–.06 [–.17, .06]	.896	.01 [–.11, .13]	.830

Note: Est = Standardized path estimate. *CI* = confidence interval. Italicized estimates were calculated with parent-teacher common variance latent factors (no self-ratings at T1).

*** $p < .001$

Table 7
Parameter Estimates from Polynomial Regression and Response Surface Analysis for Individual Stability in Extraversion

		Common		Parent+Teacher		Parent+Self		Teacher+Self		Parent		Teacher		Self	
		Est	99 % CI	Est	99 % CI	Est	99 % CI	Est	99 % CI	Est	99 % CI	Est	99 % CI	Est	99 % CI
Intercept	*b0*	0.65	[0.57, 0.73]	0.67	[0.58, 0.76]	0.54	[0.44, 0.65]	0.59	[0.48, 0.70]	0.55	[0.42, 0.67]	0.63	[0.50, 0.77]	0.37	[0.23, 0.50]
Status T1	*b1*	0.08	[–0.02, 0.18]	0.08	[–0.01, 0.19]	0.12	[–0.04, 0.29]	0.08	[–0.04, 0.19]	0.14	[–0.02, 0.30]	0.06	[–0.05, 0.18]	0.07	[–0.12, 0.25]
Status T2	*b2*	–0.01	[–0.08, 0.07]	–0.03	[–0.11, 0.05]	–0.04	[–0.14, 0.05]	0.01	[–0.09, 0.11]	–0.08	[–0.18, 0.02]	–0.03	[–0.12, 0.06]	0.00	[–0.13, 0.13]
Status $T1^2$	*b3*	–0.07	[–0.16, 0.01]	–0.08	[–0.18, 0.00]	–0.10	[–0.28, 0.01]	–0.06	[–0.19, 0.04]	–0.15	[–0.30, –0.03]	–0.02	[–0.21, 0.13]	–0.04	[–0.19, 0.11]
Status T1 × Status T2	*b4*	0.16	[0.03, 0.31]	0.14	[0.01, 0.31]	0.18	[0.02, 0.40]	0.13	[–0.06, 0.38]	0.23	[0.04, 0.43]	0.04	[–0.18, 0.36]	0.08	[–0.16, 0.32]
Status $T2^2$	*b5*	–0.06	[–0.13, 0.00]	–0.04	[–0.12, 0.02]	–0.05	[–0.13, 0.03]	–0.06	[–0.18, 0.02]	–0.04	[–0.13, 0.04]	–0.02	[–0.16, 0.07]	–0.03	[–0.15, 0.08]
LOC slope	*a1*	0.07	[0.01, 0.14]	0.06	[–0.01, 0.12]	0.08	[–0.03, 0.20]	0.09	[0.00, 0.19]	0.06	[–0.05, 0.18]	0.04	[–0.05, 0.13]	0.07	[–0.07, 0.21]
LOC curvature	*a2*	0.03	[–0.03, 0.10]	0.03	[–0.03, 0.09]	0.03	[–0.07, 0.13]	0.01	[–0.08, 0.10]	0.04	[–0.06, 0.13]	0.00	[–0.08, 0.08]	0.01	[–0.11, 0.14]
LOIC slope	*a3*	0.09	[–0.07, 0.25]	0.11	[–0.04, 0.28]	0.15	[–0.07, 0.42]	0.06	[–0.12, 0.26]	0.22	[–0.02, 0.47]	0.09	[–0.08, 0.28]	0.06	[–0.22, 0.36]
LOIC curvature	*a4*	–0.28	[–0.57, –0.04]	–0.26	[–0.59, –0.02]	–0.32	[–0.73, –0.04]	–0.26	[–0.71, 0.09]	–0.41	[–0.81, –0.07]	–0.08	[–0.69, 0.35]	–0.15	[–0.60, 0.28]
Δ(b3–b5)	*a5*	–0.01	[–0.10, 0.07]	–0.03	[–0.13, 0.04]	–0.05	[–0.23, 0.08]	0.00	[–0.12, 0.11]	–0.11	[–0.25, 0.00]	0.00	[–0.14, 0.12]	0.00	[–0.17, 0.15]
PA1 intercept	*p10*	–0.30	[–2.28, 0.43]	–0.63	[–4.75, 0.31]	–1.20	[–5.51, 0.31]	0.59	[–7.07, 6.43]	–0.88	[–5.35, 0.05]	25.25	[–96.7, 117]	–2.19	[–57.4, 43.2]
PA1 slope	*p11*	1.09	[0.49, 2.95]	1.37	[0.57, 4.53]	1.42	[0.53, 4.94]	0.46	[–2.76, 5.53]	1.74	[0.98, 5.36]	–0.51	[–31.7, 27.2]	1.44	[–19.5, 32.3]
PA2 intercept	*p20*	–0.24	[–72.5, 63.3]	0.09	[–51.1, 56.2]	–2.15	[–52.8, 54.8]	3.51	[–251, 250]	0.24	[–6.62, 1.69]	23.97	[–177, 220]	55.27	[–184, 155]
PA2 slope	*p21*	–0.98	[–1.93, –0.31]	–0.80	[–1.60, –0.19]	–0.83	[–1.74, –0.18]	–1.07	[–8.15, 6.00]	–0.62	[–1.01, –0.17]	–1.03	[–34.6, 35.9]	–1.15	[–45.7, 34.4]

Note: Est = parameter estimate. 99 % CI = Percentile confidence interval for the parameter estimate. LOC = line of congruence. LOIC = line of incongruence. PA1 = first principal axis. PA2 = second principal axis.

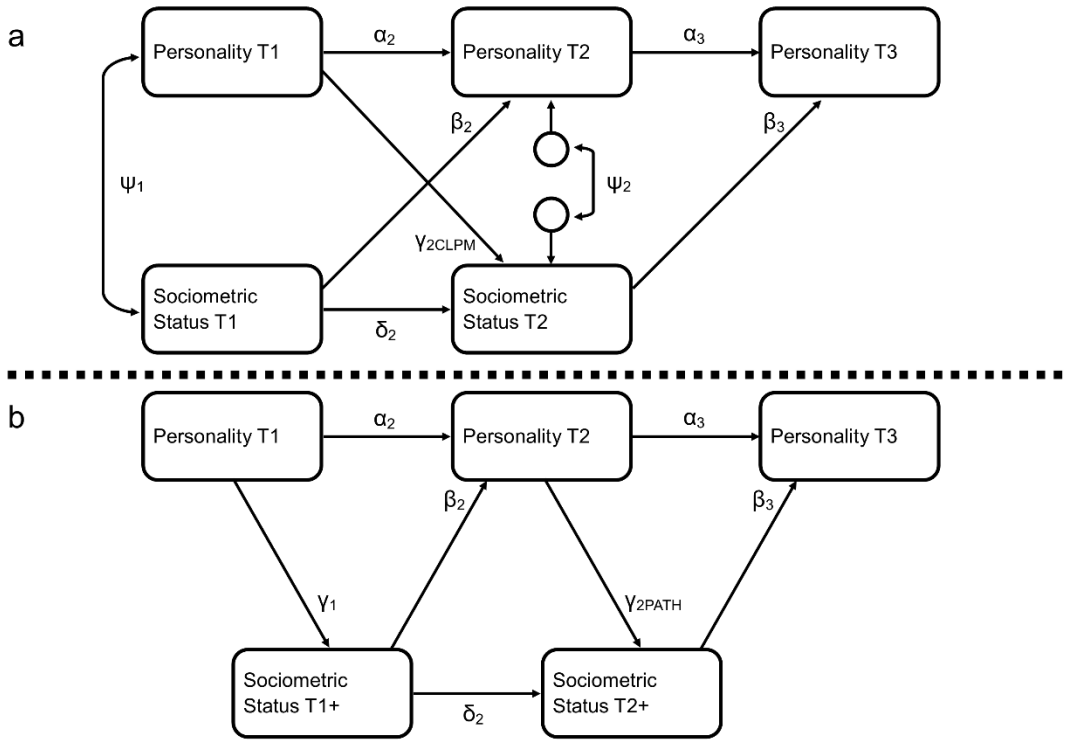

Figure 1. Cross-lagged panel model (CLPM, Top), and Bivariate longitudinal path model (PATH, Bottom)

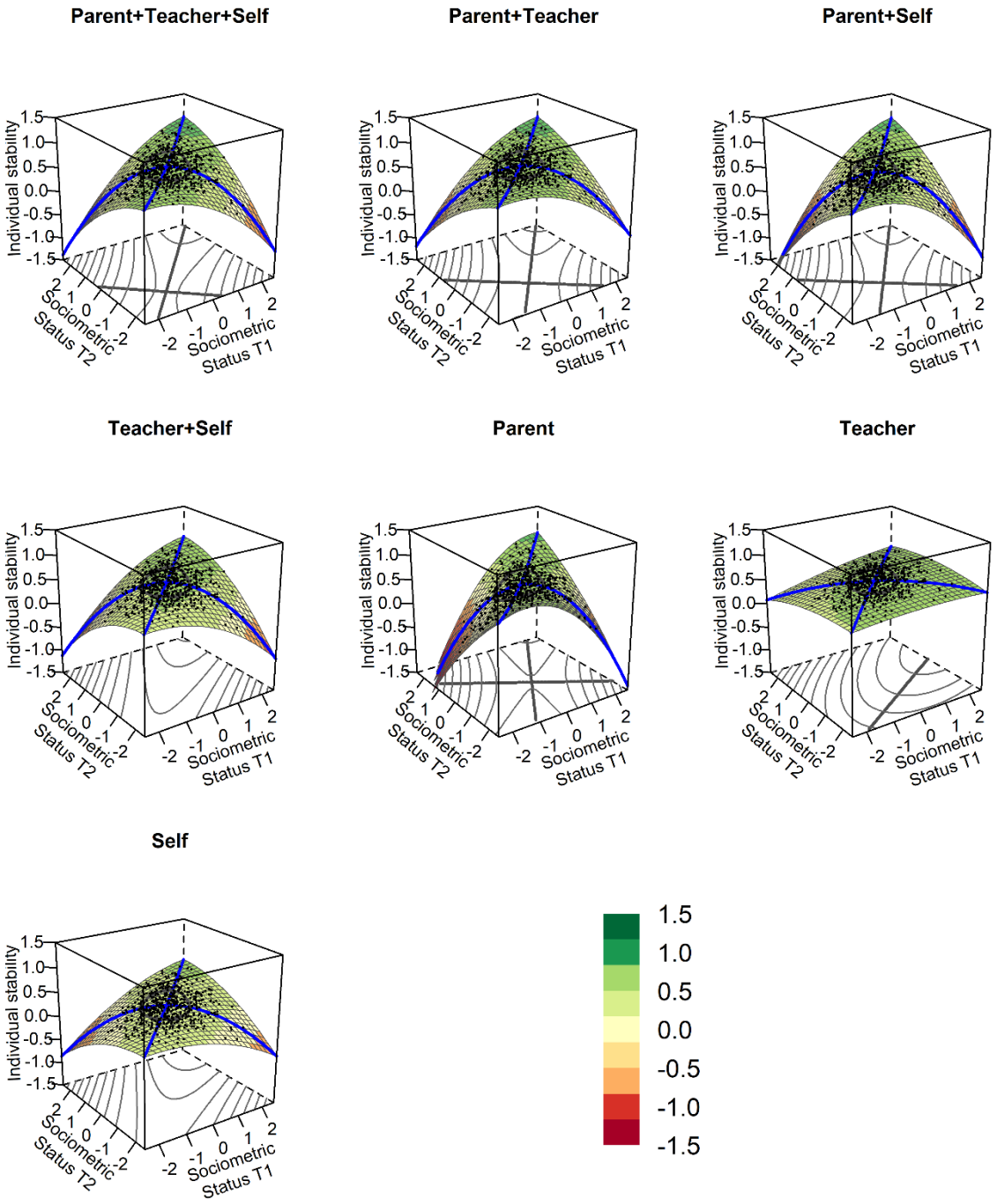

Figure 2. Response surfaces of individual stability in extraversion by all informant variants as a function of sociometric status at T1 and T2.

Footnote 1: The differentiation between emotional and reputational sociometric status becomes even more complicated when their most likely mutually re-inforcing development is considered — these characteristics are very likely to influence each other and the nature of that influence may change over developmental stages. Sociometer ratings will be influenced not only by actual dyadic relationship but also by other relationships in the same social network. To take an example, sociometric reputation predicts sociometric liking among youth (Cillessen & Mayeux, 2004). This means that the target's reputation may influence the emotions of an average peer towards the target, and it also seems likely that whether others like the target in terms of interpersonal emotions will influence the target's average reputation.

Footnote 2: The sampling variability of *p11* and *p10* are very large in bootstrap sampling as compared to the sampling variability that is estimated by maximum likelihood estimation of *p11* and *p10* (this is likely because the equation for *p11*, $p11 = \frac{(b_5 - b_3) + \sqrt{(b_3 - b_5)^2 + b_4^2}}{b_4}$, may occasionally produce some very large values if *b4* is small and *b3* and *b5* differ from each other). We therefore considered only *a4* and *a3* when testing for congruence. For these estimates, the sampling variability in bootstrap estimates is less likely to produce extreme outliers (because of more straightforward equations: *a4* = *b3* – *b4* + *b5* and *a3* = *b1* – *b2*).