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Longitudinal Pathways From Shyness in Early Childhood to Personality in
Adolescence: Do Peers Matter?

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Abstract

Temperamental shyness in childhood is theorized to be an important contributor for adolescent personality. However, empirical evidence for such pathways is scarce. Using longitudinal data (N = 939 children, 51% boys) across 17 years, the aim of this study was to examine how shyness development throughout childhood predicted personality traits in adolescence, and the role of peers in these associations. Results from piecewise latent growth curve modeling showed early shyness levels to predict lower emotional stability and openness in adolescence, whereas early shyness levels and growth across childhood predicted lower extraversion. Peer problems in early adolescence accounted for these associations. This study is the first to demonstrate the role of childhood shyness and peer relations for adolescents' personality development.

Longitudinal Pathways from Shyness in Early Childhood to Personality in Adolescence: Do Peers Matter?

Adolescence is a dynamic period of substantial maturation and change in several developmental domains, including personality (Klimstra, Hale Iii, Raaijmakers, Branje, & Meeus, 2009), interpersonal relationships (Reitz, Zimmermann, Hutteman, Specht, & Neyer, 2014), and identity formation (Klimstra, 2013). At the core of these developmental processes lies individual dispositions that emerge during the first years of life (McAdams & Olson, 2010). These dispositions, traditionally referred to as *temperament*, are primarily thought to be influenced by biological factors and represent the affective, attentional, and activation core from which the broader personality dimensions arise in conjunction with environmental influences (Ahadi & Rothbart, 1994; Caspi & Shiner, 2006; De Pauw & Mervielde, 2010). From early childhood onward, individual differences in temperamental dispositions serve to guide youth's motives, goals, and behaviors, and thereby largely influence how individuals come to perceive and interpret their social surroundings as well as how social agents respond to them. Thus, through a continuous cycle of day-to-day interactions between youth's temperament characteristics and their social environment, adolescent's personality gradually arises, represented as consistent patterns of thinking, feeling, and behaving (McCrae & Costa, 1994; Rothbart & Bates, 2006).

There has been a longstanding debate concerning at what age personality may be considered to be fully developed, and thus validly measured (see, Caspi & Roberts, 2001). However, there is emerging consensus that although it remains subject to development and change across the lifespan, the basic structure of personality is highly consistent and relatively "set" in adolescence (Borghuis et al., 2017; Roberts & DelVecchio, 2000). As a result, there has

been an increasing interest in how childhood temperament is associated with personality traits in adolescence. For example, the temperamental trait of *shyness* is suggested to be an important contributor to youth's personality development (Asendorpf, 1990; De Pauw & Mervielde, 2010). Yet, no previous studies have specifically explored how shyness development in childhood prospectively predicts personality traits in adolescence. Further, little is known about whether there are gender differences in these relations. Moreover, we know little about mechanisms that could explain such potential links. In this regard, the domain of peer relationships may be of particular importance because shyness is proposed to have substantive implications for adolescent's peer relations (Coplan & Bullock, 2012), and because peer relationships are likely to affect adolescent's personality development (Reitz et al., 2014).

Accordingly, the primary goals of this study were to: (1) explore how shyness in infancy and its development through early and late childhood prospectively predict Big Five personality traits in adolescence; (2) delineate the role of peer experiences in early adolescence for these prospective relations; and (3) examine potential gender differences in these associations. To accomplish these goals, we drew upon data from a population-based study that followed 939 Norwegian children and their families across 17 years.

Shyness in Early and Late Childhood

Shyness is a temperamental trait that is characterized by heightened wariness, anxiety, and discomfort in the face of social novelty and/or in situations of perceived social evaluation (Buss & Plomin, 1984; Coplan, Prakash, O'Neil, & Armer, 2004; Rubin, Coplan, & Bowker, 2009). This discomfort derives specifically from the interpersonal nature of the situation and often elicit awkward and inhibited behaviors as well as a desire to withdraw from social interaction (Coplan, Prakash, et al., 2004; Schmidt & Buss, 2010). Behavioral expressions of

shyness in childhood are most visible in the presence of strangers, and many shy children are less inhibited with family and good friends (Buss & Plomin, 1984; Rubin, Coplan, et al., 2009).

It has been argued that shyness may have different expressions and elicitors at different developmental phases across childhood. For instance, shyness that emerges during early childhood (i.e., the last half of the first year) is primarily characterized by fearful responses and general distress, whereas shyness expressions later in childhood are more socially contingent and influenced by the emergence of self-awareness, self-conscious emotions, and perspective-taking abilities, all of which develop from the age of two-three years and onwards (Buss, 1986; Eggum-Wilkens, Lemery-Chalfant, Aksan, & Goldsmith, 2015; Lagattuta & Thompson, 2007).

Shyness early in childhood is thought to be primarily driven by biological factors involving greater sympathetic autonomic nervous system responses that result in a lower threshold for emotional arousal as well as a generalized hypervigilance to social cues (Buss, 1986; Kagan, Reznick, & Snidman, 1988). The emotional and behavioral manifestations of early shyness are often elicited by social novelty and intrusiveness and may include distress, somatic anxiety, and inhibited, wary, and fearful responses to strangers (i.e., fast approach, close physical or psychological proximity; Buss, 1986). However, it has also been suggested that some of the manifestations of early shyness (including fear of strangers) are developmentally normative, representing natural and age-conditioned elements of development (Buss, 1986; Sroufe, 1977). Thus, early-developing shyness is typically thought to wane over time for most children, although, for some children, it may also persist beyond infancy. For instance, Buss (1986) suggested that early, fearful shyness may gradually evolve into a form of social anxiety throughout the childhood years that increasingly manifests as anticipatory worry, as well as inhibition of speech and distress of being evaluated in the presence of others. As such, early-

developing shyness may change expression from primarily reflecting fear of novelty and general distress in early childhood to becoming more reflective of social anxiety and inhibited tendencies towards the later childhood and adolescent years.

As children mature, shyness also becomes increasingly influenced by social contexts. After the first year of life and onwards, children gradually attain a more advanced, cognitive sense of self (Buss, 1986; Lagattuta & Thompson, 2007). With this increased awareness of one's self as a social object during the preschool years, shyness may progressively come to also encompass self-conscious emotions and cognitions such as embarrassment, shame, self-doubt, and a heightened sensitivity to criticism (Eggum-Wilkens et al., 2015). These affective, cognitive, and behavioral manifestations of shyness are typically elicited by a sense of being socially exposed, at the center of attention, and available to scrutiny, and is suggested to involve activation of parasympathetic autonomic nervous system responses (Buss, 1986; Eggum-Wilkens et al., 2015). In response to these developmental changes, average levels of child shyness might significantly increase during the preschool years.

Shyness development is further suggested to move into a new developmental phase at the end of the preschool years and when children enter formal educational settings. During the school years, children are increasingly exposed to a more diverse set of peers, social situations, and demands. As a result, they may gradually develop reaction "blueprints" to (novel) social situations that in turn may serve to stabilize their socio-behavioral patterns, thereby leading to stable levels of shyness from the late preschool years and throughout middle and late childhood (Karevold, Ystrøm, Coplan, Sanson, & Mathiesen, 2012; Rubin, Bukowski, & Parker, 2006).

To sum up, shyness and shyness development are hypothesized to show distinct age-sensitive phases. First, shyness in the first and second year of life has a strong biological base.

Second, in early childhood shyness evolves to become increasingly influenced by social context and by the normative emergence of self-relevant cognitions, which may lead to increasing shyness levels across the preschool years. Third, average childhood levels are thought to remain rather stable during middle and late childhood as children develop reaction blueprints to novel social situations. As such, one may further expect that the different developmental phases of shyness might relate differently to personality factors.

Associations of Childhood Shyness with Adolescent Personality

One reason why childhood shyness may be associated with personality in adolescence is that the neurobiological basis of childhood shyness and adolescent personality may be similar. More specifically, neurobiological models such as reinforcement sensitivity theory (Gray & McNaughton, 2000) suggest that individual differences in behavioral and affective responses are largely determined by activity in neurophysiological systems that are sensitive to different types of stimuli, including reward (behavioral activation system; BAS) and punishment (behavioral inhibition system; BIS).

Building upon this perspective, fearfulness, a core feature of early shyness, has been placed at the base of Ahadi and Rothbart's (1994) anxiety/behavioral inhibition temperament system (similar to the BIS). This system is suggested to be behaviorally manifested by both shyness and negative emotionality in childhood, as well as to underlie the anxious and fearful aspects of neuroticism (Ahadi & Rothbart, 1994; Gray & McNaughton, 2000; Shiner & DeYoung, 2013). Accordingly, the anxiety/behavioral inhibition temperament system is thought to be sensitive to cues of punishment and novel stimuli, as well as to trigger emotions and behaviors that are common to both early shyness and later neuroticism (e.g., fear, distress,

inhibition of ongoing behavior, hypervigilance to environmental stimuli, avoidance, sensitivity to stress, and anxiety) (Costa & McCrae, 1992; Gray & McNaughton, 2000).

Thus, in light of this conceptual overlap between the characteristics of early shyness and neuroticism, there are reasons to expect early shyness to be more strongly associated with neuroticism in adolescence compared to later phases of shyness. More specifically, considering that early-emerging shyness is seen to be mostly biologically-conditioned and related to expressions and responses that are largely determined by sympathetic autonomic nervous system responses (Buss, 1986), early shyness may to a larger extent tap into the anxious and fearful nature of neuroticism than the more socially-conditioned later phases of shyness.

These conceptual frameworks also imply that a neurological system characteristic of behavioral approach (similar to BAS) may underlie shyness and the personality dimensions of extraversion and openness to experience (Ahadi & Rothbart, 1994; Shiner & DeYoung, 2013). The BAS involves a sensitivity to signals of reward in the environment, and triggers approach behaviors, a tendency to seek out and explore novelty, as well as positive emotions (e.g., joy, happiness) in response to the anticipation or acquisition of reward (Gray & McNaughton, 2000). In this respect, the inhibitory and withdrawn aspects of childhood shyness are suggested to reflect the absence of approach behavior that is relevant for the extraversion factor, and may also reflect an inherent inhibition to explorations of novelty, which is relevant for the openness dimension (Hagekull & Bohlin, 1998; Shiner & DeYoung, 2013).

Thus, given that inhibited social behaviors and low approach are salient features of both early and later phases of shyness development (Eggum-Wilkens et al., 2015), there are reasons to expect shyness at all developmental stages in childhood to be prospectively associated with both extraversion and openness to experience in adolescence. However, the prospective linkages with

extraversion may be somewhat stronger for later phases of shyness development than for earlier phases of shyness. More specifically, considering that later shyness is seen to be more strongly determined by social experience and more related to the development of children's cognitive self-representations than earlier phases of shyness (Buss, 1986), later shyness may to a larger extent tap into the socially-oriented nature of extraversion than the fearful and more biologically-contingent early shyness.

Despite the continuing theoretical and empirical interest in shyness (Caspi & Shiner, 2009; De Pauw & Mervielde, 2010), few empirical studies have attempted to directly examine the link between temperamental shyness in childhood and later personality traits. More importantly, no previous studies have specifically explored whether early versus later-phases of shyness development may be differently related to adolescent personality. Accordingly, there is little knowledge about the implications of shyness for personality in adolescence (Bowker, Rubin, & Coplan, 2016). Among the existing cross-sectional studies to date in samples of adolescents and young adults, results typically indicate that shyness is positively correlated with neuroticism and negatively associated with extraversion (Bratko, Vukosav, Zarevski, & Vranić, 2003; Briggs, 1988).

Only a few longitudinal studies have assessed personality outcomes of childhood shyness and conceptually related constructs. For instance, in the Dunedin Longitudinal Study ($N = 1,037$), children who were classified as inhibited (defined similarly as early, fearful shyness) at age three years ($n = 80$) reported lower social potency and positive emotionality at both ages 18 and 26, and were also described by informants as lower in extraversion (but not higher in neuroticism at age 26) as compared to a comparison group of more well-adjusted children (Caspi et al., 2003). In the Munich Longitudinal Study ($N = 230$), children rated as inhibited ($n = 19$) by

their preschool teachers across ages four to six (a period during which shyness is increasingly influenced by social context) were judged as inhibited by their parents at age 23, but in contrast to the Dunedin study findings, no links from early inhibition to later personality reached significance (Asendorpf, Denissen, & van Aken, 2008).

Finally, a Swedish community study ($N = 93$) assessed longitudinal relations from parent-rated temperament of children collected between 28 and 51 months to mother-rated child personality at age nine (Hagekull & Bohlin, 1998). Results showed that preschool shyness (averaged into one measure across ages) predicted lower levels of extraversion and openness to experience, as well as higher levels of agreeableness and conscientiousness in middle childhood. However, given the small sample size in this study, that shyness was conceptualized as a derivative of the sociability and emotionality/fearfulness traits, and that several measurements of shyness across ages were averaged into a single measure, these findings should be considered with some caution.

Furthermore, of note, none of these longitudinal studies reported that childhood shyness (Hagekull & Bohlin, 1998) or inhibition (Asendorpf et al., 2008; Caspi et al., 2003) were significantly predictive of later neuroticism. The lack of evidence for such links in these previous studies could be due to differences in measures (i.e., shyness versus inhibition, sociability or fearful emotionality), their reliance on single rather than multiple measurements of childhood shyness, and relatively small samples in some studies. Most importantly, although studies provide some information about how childhood shyness may relate to personality on a general basis, none of these studies sought to assess whether different developmental periods of shyness could be differently related to personality in adolescence. Hence, by examining how shyness and its development in different periods in childhood predicts adolescent personality, this study not

only fills a gap in the literature, but also serves to provide a more detailed picture concerning the nature of such prospective associations above and beyond approaches where personality is predicted from only single measurements of childhood shyness.

The Role of Peer Experiences for Shy Adolescents' Personality Development

Researchers have long noted that it is essential to account for the role of interpersonal relations and the social context that youth are embedded in to understand personality development in adolescence (Rubin, Bukowski, & Bowker, 2015). Group socialization theory (Harris, 1995) posits that socialization through peer groups outside the home context becomes an increasingly important determinant of youth's personality development with age. For instance, throughout adolescence, the quality of youth's peer relationships becomes critical for the acquisition and development of interpersonal skills, which in turn are important prerequisites for adjustment outcomes as well as successful social functioning later in life (Connolly, Furman, & Konarski, 2000). Particularly, having close friends and experiencing being accepted and liked by peers are important aspects of high quality peer relationships (Rubin, Bowker, & Kennedy, 2009). As friendships and positive peer relations may provide important sources of emotional and social support (Hodges, Boivin, Vitaro, & Bukowski, 1999), the importance of peer relationships increases dramatically as adolescents come to spend proportionally less time with family and more time with friends (Buhrmester & Furman, 1987).

Shyness appears to have important implications for adolescents' interpersonal relationships and particularly for the quality of their peer relations (Coplan & Bullock, 2012; Rubin, Coplan, et al., 2009). For instance, compared to non-shy children and adolescents, shy youth are more inclined to keep themselves on the periphery of the

social scene when among peers, usually observing others than directly interacting with them (Coplan, Rubin, Fox, Calkins, & Stewart, 1994). They tend to have fewer friends than their non-shy counterparts (Pedersen, Vitaro, Barker, & Borge, 2007), and although they are as likely as non-shy children to form and maintain at least one close friendship, the quality of these friendships appears to be less than optimal (i.e., less helpful, supportive, and intimate; Burgess, Wojslawowicz, Rubin, Rose-Krasnor, & Booth-LaForce, 2006).

It has been argued that since shy youth often withdraw from social settings as well as show less socially competent and assertive behaviors compared to non-shy youth (Beier, Terrizzi, Woodward, & Larson, 2016; Coplan, Findlay, & Nelson, 2004), they may evoke less positive response from peers (Coplan & Bullock, 2012). Perhaps for this reason, shy youth are at greater risk of experiencing exclusion, dislike, and rejection from peers than non-shy youth (Chen, DeSouza, Chen, & Wang, 2006; Gazelle & Ladd, 2003), and these negative peer experiences may further serve to reinforce their tendency to withdraw from the peer group. Moreover, by spending less time with their peers, shy youth may miss out on opportunities to learn and practice socially relevant skills (Jones, Schulkin, & Schmidt, 2014; McElhaney, Antonishak, & Allen, 2008).

Thus, over time, shy and withdrawn children may become increasingly less assertive and less successful in their attempts to meet their social goals (Stewart & Rubin, 1995), and this developmental path may ultimately manifest as low extraversion and low openness to experience. Further, social withdrawal is often accompanied with experiencing anxiety in both unfamiliar and familiar social situations (Asendorpf, 1990), and repeated exposure to negative peer interactions might also serve to confirm the social

fears of shy adolescents (Gazelle & Rudolph, 2004; Sterry et al., 2010). In this sense, the combination of withdrawal and negative peer responses may elicit negative thoughts and feelings about the self and own social competence (Boivin & Hymel, 1997), which in turn may reinforce shy youth's socially anxious tendencies that over time may manifest as low emotional stability (i.e., high neuroticism). Accordingly, there are reasons to expect a dynamic relationship between shyness and peer relations, whereby shyness initially affects the quality of peer relations that, in turn, serves to intensify shy youth's characteristic tendencies (i.e., corresponive principle; Caspi, Roberts, & Shiner, 2005). Consequently, this mutually reinforcing process could eventually result in lower extraversion, openness, and emotional stability in adolescence.

We are not aware of any previous studies that have assessed the role of negative peer experiences in the links between shyness development and subsequent personality outcomes. Yet, there is some evidence to suggest that individuals and their social environment participate in reciprocal-influence processes that contribute to continuity in youth's personal characteristics and in their social experiences. For instance, Caldwell, Rudolph, Troop-Gordon, and Kim (2004) reported that young adolescents ($N = 605$) with poor relational self-views tended to be prone to socially disengage from peers. This disengagement further contributed to heightened stress in their peer relationships, which in turn lead to subsequent social disengagement and more negative self-views.

Similarly, McElhaney et al. (2008) found that adolescents ($N = 167$) who reported feeling poorly accepted at age 13 were rated by their peers as becoming relatively more withdrawn one year later. Thus, given that shy youth tend to rate themselves as less socially competent and as less accepted among their peers than non-shy children (DiBiase

& Miller, 2015; Laceulle, Jeronimus, van Aken, & Ormel, 2015), there are reasons to expect shy adolescents to experience low peer acceptance which in turn could result in low extraversion, emotional stability, and openness to experience.

The Present Study

The primary goals of this study were to examine prospective associations between shyness development from infancy to late childhood and Big Five personality traits at age 16.5 years, as well as to explore the role of both peer experiences and child gender on these associations. Using data from the longitudinal and population-based Norwegian TOPP study, the present study built upon findings from Karevold et al. (2012), who employed manifest shyness variables as indicators of growth factors from early to late childhood. In the current study, we applied a second-order latent growth curve framework in order to ensure that the same shyness construct was measured over time. Thus, additional tests of the factorial invariance of shyness at each measurement point and across time points were conducted.

Drawing upon the previously described bio-behavioral mechanisms thought to underlie links between shyness at different age periods and personality traits, we expected that higher initial levels of shyness in early childhood would predict lower levels of emotional stability. We further expected that higher initial levels and increases in shyness during all phases of development would predict lower levels of extraversion and openness to experience. However, linkages with extraversion were expected to be somewhat stronger for later phases of shyness development than for earlier phases of shyness.

We further hypothesized that perceived peer difficulties would help to account for these prospective associations. Specifically, we postulated that peer difficulties would mediate paths

from growth in shyness in early childhood to lower emotional stability, extraversion, and openness to experience in adolescence, and from growth in shyness at later ages to lower extraversion in adolescence.

Finally, on a more exploratory basis, we expected some gender differences in these prospective associations. For example, there is evidence to suggest that shyness among boys is less adaptive and viewed more negatively than shyness among girls (Doey, Coplan, & Kingsbury, 2014). This may be because of socialization processes that emphasize different behavioral expectations for boys and girls (Eagly, 2013; Eisenberg et al., 1993), or because shyness violates stereotypical gender norms that males should be more socially dominant and assertive than girls (De Bolle et al., 2015; Doey et al., 2014; Rubin & Coplan, 2004). Thus, given that assertiveness is a salient feature of the personality dimension extraversion, we tentatively expected that the direct association from shyness development to low extraversion would be more evident for boys than for girls. Relatedly, we also expected the indirect association from shyness development to low extraversion through peer problems to be stronger for boys than for girls.

Method

Participants and Procedure

The present study used data from the *Tracking Opportunities and Problems* (TOPP) study at the Norwegian Institute of Public Health. The TOPP study encompasses eight waves of data collection, from when children were aged 1.5 years to 18.5 years. All families from 19 health care areas in eastern Norway that visited a public health clinic in 1993 for the scheduled 18-month vaccination visits were invited to complete a questionnaire about the child's emotional and social development and their social and

local environment. The families who responded at baseline received a similar questionnaire when the children were 2.5 years, 4.5 years, 8.5 years, 12.5 years, 14.5 years, 16.5 years, and 18.5 years old. Health care workers administered the questionnaires at the first three waves, whereas questionnaires for parents and children were sent by mail at subsequent waves. Mothers reported on their children on all waves and children provided self-reports from age 12.5 and onward.

Of the 1,081 eligible families, $N = 939$ (87%) participated at baseline. The participation numbers for mothers at subsequent time points were as follows: age 2.5: $n = 804$ (86% of baseline); age 4.5: $n = 760$ (81%); age 8.5: $n = 535$ (57%); age 12.5: $n = 611$ (65%); age 14.5: $n = 481$ (51%); age 16.5: $n = 425$ (46%); and age 18.5: $n = 524$ (57%). For the adolescents, the participation rates were as follows: age 12.5: $n = 566$ (60% of parental reports at baseline); age 14.5: $n = 458$ (49%); age 16.5: $n = 375$ (40%); and age 18.5: $n = 441$ (47%). Data from age 1.5 to 16.5 will be used in this study as the variables under study were only measured up to age 16.5. More detailed descriptions of the TOPP study, sample characteristics, and attrition rates are described in Nilsen et al. (2017).

Measures

Shyness. Mothers assessed child shyness at ages 1.5 to 12.5 years via the shyness subscale of the *Emotionality, Activity and Sociability Temperament Survey* (EAS; Buss & Plomin, 1984). The shyness subscale originally includes five items (e.g., “Tends to be shy”, “Takes a long time to warm up to strangers”) rated on a 5-point scale (from 1 = *not typical* to 5 = *very typical*). The EAS approach to the assessment of temperament is considered to be “age-independent” as it relies upon general temperament expressions that may apply to all age groups (Buss & Plomin, 1984). The EAS provides as such a

measurement of shyness that is valid throughout the whole childhood period, even though specific behavioral aspects of shyness may change across age. Further, the validity and reliability of the EAS subscales at different ages has been shown to be good both in this dataset as well as in a recent review (Mathiesen & Tambs, 1999; Walker, Ammaturo, & Wright, 2017).

We tested factorial invariance in the shyness measure by conducting confirmatory factor analyses at each time point with the five shyness items set as indicators for latent shyness factors. Results showed four items to entail better model fit than five items across all time points (see Table 2). Thus, we excluded the one item responsible for the poor model fit (“Makes friends easily”) from each measurement model. Cronbach’s alpha for the 4-item shyness scales was .71 at age 1.5, .74 at age 2.5, .79 at age 4.5, .75 at age 8.5, and .74 at age 12.5.

Peer problems. Adolescents self-reported peer problems at age 14.5 were assessed by combining two items (“I find it hard to make friends”, “Other adolescents tend not to like me”) from the revised version of the original 5-item Social Acceptance subscale of the *Self Perception Profile for Adolescents* (SPPA; Harter, 1988; Wichstrøm, 1995) with two items (e.g., “I feel closely attached to my friends”, “I feel that my friends put reasonable weight on my opinion”, both reversed) from the *Social Support Scale* (Dalgård, Bjørk, & Tambs, 1995). Both scales tap into self-evaluations of acceptance, belonging, and inclusion in the peer and friendship domain. Adolescents rated how much they agreed with each statement on a 5-point scale ranging from 1 (*not characteristic*) to 5 (*very characteristic*). Previous studies have reported both scales to have good psychometric properties (Thomson & Zand, 2002; Wichstrøm, 1995; Ystgaard, Tambs, &

Dalgård, 1999). Mean scores were computed with higher scores indicating lower levels of accept and support (i.e., higher levels of peer problems). As only two items from the full SPPA and two items from the Social Support scales were available at the age 14.5 assessment, mean scores are solely based on these four items. Cronbach's α for the combined scale was .67.

Big Five personality traits. The Big Five personality traits of extraversion, emotional stability, agreeableness, conscientiousness, and openness to experience at age 16.5 years were measured by using the 44-item *Big Five Inventory* (BFI; John & Srivastava, 1999). Each factor is assessed by eight to ten items rated on a 7-point scale (from 1 = *not characteristic* to 7 = *very characteristic*). Previous research has shown these factors to have good psychometric qualities (John, Naumann, & Soto, 2008; Soto, John, Gosling, & Potter, 2008). Personality outcomes were assessed at child age 16.5 as this is the only time point where measurements of Big Five traits were included in the TOPP study. Mean scores were computed with higher scores indicating higher levels of each factor. Cronbach's α for the Big Five domains was .83 (extraversion), .81 (emotional stability), .75 (agreeableness), .82 (conscientiousness), and .66 (openness to experience).

Statistical Analyses

Analyses in the framework of structural equation modeling were conducted, using the statistical program Mplus version 7.3 (Muthén & Muthén, 2012). Full information maximum likelihood (FIML) estimation was used to handle missing data. Before hypotheses were tested, we first tested factorial invariance of temperamental shyness across time points by comparing a baseline model (i.e., configural invariance) with a series of increasingly restricted models (i.e., weak and strong invariance models) (Ferrer,

Balluerka, & Widaman, 2008; Widaman, Ferrer, & Conger, 2010). Goodness of fit comparisons between the three invariance models were evaluated by using the χ^2 statistic, the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI).

We then modeled developmental trajectories of shyness throughout the childhood years by constructing a piecewise second-order latent growth curve model (PLGCM). For this purpose, latent shyness factors at each time point were constructed by using raw scores of the four manifest indicators of shyness. Growth curves were then estimated, based on the latent shyness factors. PLGCM are used to capture non-linear change, wherein the intercept factor represents information about the estimated level of shyness at the first time point and where each growth factor (i.e., slope) provides information about change in shyness per year.

Following Karevold et al. (2012), the PLGCM was set to produce three latent second order factors; one intercept factor and two growth (slope) factors representing linear growth during toddlerhood (slope 1; from age 1.5 to age 4.5) and later childhood (slope 2; from age 4.5 to age 12.5), respectively. The point representing the end of slope 1 and the start of slope 2 was thereby set at age 4.5 (t3). Further, following Ferrer et al.'s (2008) scaling approach, we established an approximate standard metric by constraining the first factor loading of the shyness measurement to the specific value that resulted in setting the variance of the latent shyness factor at t1 to 1 and the mean of the factor to 0. Under this specification, means and variances of the latent shyness variables at t2 to t5 were not bound to specific values, but scaled relative to the mean of 0 and standard deviation of 1 at t1. The intercept and slope values can thus be interpreted in terms of a

standardized metric with a mean of 0 and a standard deviation of 1 relative to shyness at age 1.5 years.

The intercept and slopes of shyness were then used to predict the personality variables at age 16.5. Multi-group analyses were applied to examine whether the prospective patterns differed for boys and girls. As a final step, we tested the mediating effects of peer problems by estimating the indirect paths between each of the childhood shyness growth factors and the outcomes at age 16.5 via peer problems at age 14.5 using bootstrapping based on 5,000 bootstrap samples with bias-corrected confidence intervals (Hayes, 2009). We used another set of multi-group analyses to test gender differences in these indirect paths by constraining all regression paths to be equal for boys and girls and then opening one path at a time in a stepwise manner.

Results

Measurement Invariance of Shyness

To assess measurement invariance in shyness across time, we first tested for configural invariance following Widaman, Ferrer, and Conger (2010) and Ferrer et al. (2008). Latent factors based on the four shyness indicators were simultaneously estimated at age 1.5, 2.5, 4.5, 8.5, and 12.5. Latent factors as well as residuals of the same items at different time points were allowed to correlate. The fit for this model was good (see Table 1). The configural invariant model was then compared with a model in which factor loadings for the same items were constrained to be equal across time points (i.e., weak invariance). Results showed acceptable model fit for the weak invariant model and that there was no statistically significant difference in fit between this and the configural invariant model. As a final step, we tested strong invariance by additionally constraining

the intercepts of the same indicators to be equal across time. The fit for this model was poor, and a significantly worsened fit was obtained when comparing this model with the configural and weak invariant models. For this reason, following Widaman et al. (2010), we relaxed invariance constraints on those intercepts necessary (one at a time) to obtain acceptable model fit based on modification indices.

The fit improved substantially after we relaxed constraints on three shyness indicator intercepts. These were one indicator at age 8.5 (“Child is very friendly with strangers -reversed”) and two indicators at age 12.5 (“Takes a long time for child to warm up to strangers”, “Child is very friendly with strangers – reversed”). This partially strong invariance model then worked as the baseline model for subsequent testing of growth trajectories and predictive associations between shyness development and the outcome variables. In order to assure that associations with the outcome variables would not vary due to differences in constraints at the indicator intercept level across the partially strong and strong invariance models (Ferrer et al., 2008), we repeated the analyses for the strong invariance measurement model. Results were found to be similar across models.

Descriptive Statistics

Mean scores, standard deviations, and reliability estimates of the study variables are presented in Table 2. Mother-reported shyness mean scores for each measurement wave were below the mid-point of the scale (range: 1-5) and increased moderately over time. Adolescent self-reported mean scores of peer problems (range: 1-5) were also below the mid-points.

Inter-correlations between the study variables are shown in Table 3. Correlations of the mean scores for the four-item shyness scale across time points indicated substantial

stability, even over longer time intervals. Shyness at age 1.5, 8.5, and 12.5 was positively correlated with peer problems at age 14.5. The extraversion and openness to experience factors were negatively correlated with shyness across all time points. The emotional stability factor was negatively correlated with shyness at age 1.5 and 12.5. The agreeableness factor correlated negatively with shyness at age 12.5, whereas the conscientiousness factor was uncorrelated with shyness across time points. Peer problems at age 14.5 was significantly correlated with all outcome variables at age 16.5.

Piecewise Growth Curve Model of Temperamental Shyness.

Building upon the final measurement model of shyness, we constructed a second order PLGCM. The piecewise model demonstrated better model fit: $\chi^2(147) = 353.06$, RMSEA = .038, CFI = .96, TLI = .95 than a more parsimonious linear model; $\chi^2(151) = 464.71$, RMSEA = .047, CFI = .93, TLI = .91; $\Delta\chi^2 = 111.65$, $\Delta df = 4$, $p < .001$. The first slope factor in the piecewise model indicated that average shyness levels increased with .09 standard deviations (*SD*) per year from age 1.5 to age 4.5 ($p < .01$; see Figure 1). Between ages 4.5 and 12.5, however, average shyness levels were found to decrease with .05 standard deviations per year ($p < .01$). Lower levels of shyness at baseline (age 1.5) were associated with increasing levels in shyness during early childhood (slope 1: $r = -.27$, $p < .001$) as well as later in childhood (slope 2: $r = -.37$, $p < .001$). Furthermore, greater increase in shyness during early childhood was associated with less increase in shyness levels during later childhood ($r = -.25$, $p < .001$). Gender significantly predicted the intercept ($\beta = .20$, $p < .001$), indicating that girls were rated to have higher initial shyness levels in early childhood (see Figure 1). Gender also predicted change in early shyness (slope 1: $\beta = -.21$, $p < .001$) as well as later shyness (slope 2: $\beta = .11$, $p = .03$),

indicating that boys had a steeper increase in shyness levels than girls up to age 4.5 years, whereas girls' shyness trajectories decreased less than boys' shyness trajectories later in childhood.

Childhood Shyness Predicting Personality Outcomes in Adolescence

To examine prospective associations between shyness trajectories in childhood and personality outcomes in adolescence, we regressed each of the outcome variables on the intercept and slope factors of shyness, controlling for gender. The results are shown in Table 4. The intercept for shyness significantly predicted several of the Big Five domains at age 16.5, with high initial levels of shyness in infancy being related to lower levels of extraversion, emotional stability, and openness to experience. Concerning the first and second slope, a comparably greater increase in shyness during toddlerhood (from age 1.5 to age 4.5), as well as a less decrease in shyness in childhood (from age 4.5 to age 12.5) predicted lower levels of extraversion at age 16.5. Multi-group analyses showed no significant gender differences in any of these prospective pathways ($p > .05$).

The Role of Peers

As a final step, we examined the mediating effects of peer problems by estimating all possible indirect pathways (i.e., from intercept, slope1, slope2 to the outcomes via peer problems) in analyses performed for each of the outcome variables separately. We only assessed mediational pathways for those outcome variables found to be significantly predicted by the shyness growth factors (i.e., extraversion, emotional stability, and openness). Results showed problems with peers at age 14.5 to mediate four prospective paths between shyness development and personality at age 16.5 (see Figure 2). A significant indirect path emerged from high initial shyness levels (intercept) to low

extraversion via high peer problems; specific indirect estimates: $b = -.08$, 95% CI [-0.152, -0.029], $\beta = -.07$. High levels of peer problems also partly accounted for the prospective path between growth in shyness in late childhood (slope 2) and extraversion; $b = -.70$, 95% CI [-1.399, -0.257], $\beta = -.07$. Peer problems mediated the association from high initial levels of shyness to low emotional stability; $b = -.06$, 95% CI [-0.138, -0.017], $\beta = -.05$, as well as from less decrease in shyness across late childhood to low emotional stability in adolescence; $b = -.57$, 95% CI [-1.327, -0.192], $\beta = -.06$. Additional mediation analyses were then run in a multi-group framework to estimate gender specific indirect effects. Regression coefficients were first constrained to be equal for boys and girls, and then one path at a time was opened. Results indicated that no gender differences existed in these indirect pathways as the unconstrained regression models did not result in poorer model fit.

Discussion

The goals of this population-based longitudinal study were to examine how shyness development from infancy to adolescence predicted personality traits in adolescence, and explore the role of peer experiences and gender in these prospective associations. The analyses revealed at least three noteworthy results. First, shyness levels were found to rapidly increase from infancy and up to the age of five years—perhaps as a result of emerging self-awareness and the increased importance of the social context during this period— while shyness levels remained relatively stable thereafter. This developmental pattern implies that children, on average, do not appear to become increasingly shy with age despite that their cognitive sense of self progressively becomes more advanced and elaborated over time. Second, shyness as assessed at different stages

of development demonstrated distinct predictive associations with aspects of adolescent personality. Whereas *early* phases of shyness predicted lower levels of extraversion, emotional stability, and openness to experience, *later* phases of shyness development was only predictive of lower extraversion. These findings illustrate the importance of assessing prospective linkages from temperament in childhood to personality in adolescence from a developmental perspective. Third, perceived problematic peer relations were found to significantly mediate the prospective associations of both initial shyness and growth in shyness across later childhood with lower emotional stability and extraversion in adolescence. This finding imply that youth's personality development may be substantially related to the quality of their social relationships (Wrzus & Neyer, 2016).

Predictive Links between Childhood Shyness and Adolescent Personality

Our findings suggest that different stages of shyness development in childhood are predictive of different personality traits in adolescence. For example, as expected, initial levels of shyness in early childhood predicted lower emotional stability (i.e., greater neuroticism) in adolescence. This association may be due to a common behavioral inhibition/anxiety temperament system underlying both early-developing shyness and inner-directed aspects (i.e., fearful, anxious) of neuroticism (Ahadi & Rothbart, 1994; Gray & McNaughton, 2000; Shiner & DeYoung, 2013). The finding is in line with prior studies showing early shyness to predict emotional problems in adolescence (Bohlin & Hagekull, 2009; Karevold, Røysamb, Ystrøm, & Mathiesen, 2009), and is particularly noteworthy given the substantial time span between the measurement points.

At the same time, this finding differs from the previous longitudinal studies which did not observe significant links from early shyness to neuroticism in middle childhood (Hagekull & Bohlin, 1998) and adolescence (Asendorpf et al., 2008; Caspi et al., 2003). These inconsistencies might be due to basic differences between the studies with respect to conceptualization and measurement of shyness, as well as the specific age-groups considered. However, as only high initial shyness levels in early childhood (but not growth in shyness over time) were predictive of later neuroticism, we should be cautious about concluding that childhood shyness, per se, is a temperamental forerunner of later neuroticism. Yet, this finding may add support to the theoretical suggestion by Buss (1986) that early shyness may later manifest as a form for social anxiety. Indeed, shyness is considered one of the strongest predictors of the later development of social anxiety disorder (for a recent meta-analysis, see Clauss & Blackford, 2012).

Our results also indicated that both high initial shyness levels, and growth in shyness across all developmental periods, were predictive of lower extraversion in adolescence. These findings are in line with results from previous longitudinal studies showing shy children to develop into reserved individuals with a cautious attitude to social life (Caspi et al., 2003; Hagekull & Bohlin, 1998). These associations could be due to a common behavioral approach/activation system underlying both shyness and extraversion (Ahadi & Rothbart, 1994; Shiner & DeYoung, 2013). Further, as expected, later phases of shyness development was more relevant for extraversion than early shyness development. This finding may be explained by the notion that later phases of shyness is more intertwined with children's developing self-representations and more strongly determined by social experience than earlier phases of shyness (Buss, 1986).

Thus, on a general basis, our findings add support to the theoretical proposition that shyness constitutes one of the central childhood predictors of later introversion (Ahadi & Rothbart, 1994; Shiner & DeYoung, 2013).

We expected shyness development at all phases to predict lower openness to experience in adolescence, but somewhat contrary to our expectations, this was only found for early shyness. This finding is noteworthy, particularly since the openness factor is thought to be largely reflective of cognitive skills that might not be fully present until middle to late childhood (Digman, 1990; Lamb, Chuang, Wessels, Broberg, & Hwang, 2002). This result is also interesting in light of previous research showing that childhood openness is primarily defined by items associated with conscientiousness (Mervielde & De Fruyt, 2000).

Notwithstanding, our finding that low openness in adolescence originates from early shyness is conceptually plausible, as both concepts reflect responses to novelty. For example, early shyness is thought to predominantly reflect inhibited behavior and fearful avoidance to novel situations and people (e.g., Buss, 1986), whereas openness to experience is characterized by a proneness to seek out and enjoy novelty (i.e., trying new activities, open to new ideas, visiting new places; John & Srivastava, 1999). Thus, the finding that shyness levels as early as toddlerhood significantly predicted individual differences in openness to experience almost 15 years later add to our limited knowledge of the etiology of the openness dimension.

The Role of Peers

Our results also supported the notion that perceived negative peer experiences helped to account for links between shyness in childhood and aspects of personality in

adolescence. Both high initial levels and growth in shyness predicted lower acceptance and support from peers early in adolescence, which in turn predicted lower extraversion and emotional stability later in adolescence. Accordingly, these findings suggest a sequential developmental process, wherein shy youth are at increased risk of social exclusion and non-support from peers, which in turn might intensify their social fears and avoidant tendencies over time. This is in line with theoretical frameworks emphasizing reciprocal and transactional influences between individual characteristics and social experiences (Back et al., 2011; Fraley & Roberts, 2005; Rubin, Hymel, Mills, & Rose-Krasnor, 1991). However, this study was the first to demonstrate that such dynamic processes may ultimately contribute to the development of lower extraversion and emotional stability. Thus, our findings add support to the growing recognition that personality and social relationships are intrinsically connected (Wrzus & Roberts, 2016).

Finally, we found no evidence of significant gender differences in the prospective associations from shyness development to the personality outcomes in adolescence. This was somewhat surprising, particularly given the accumulating body of evidence suggesting that shyness is a greater risk factor for boys than girls with respect to socioemotional and interpersonal difficulties (Doey et al., 2014). Thus, future longitudinal studies should explore if there are certain conditions under which shyness development may predict different personality outcomes for boys and girls.

Limitations and Future Directions

The longitudinal design of this study entails several advantages with respect to assessing the developmental course of temperamental shyness throughout childhood and how such development predicted personality outcomes in adolescence. First, our data

material comprised measurements from as early as 1.5 years and spanned across 15 years. Second, the relatively large sample size enabled adequate statistical power in our analyses. Third, our study included different informants, with mother reports on child shyness and children's self-report from early adolescence, thereby reducing the risk of common method bias.

Despite these advantages, our study also has some important limitations. First, selective attrition is often an issue with long-term longitudinal studies. For instance, previous attrition analyses of the current sample have shown maternal drop out from child age 1.5 to 12.5 years to be predicted by low maternal education level, and adolescent attrition from child age 1.5 to age 16.5 to be predicted by male gender and low maternal education level (Nilsen et al., 2017). In light of evidence demonstrating that family socioeconomic status, and particularly parental education level, is a powerful predictor of many aspects of child development (Bornstein, Hahn, Suwalsky, & Haynes, 2003; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007), it is possible that findings from this study are not generalizable to children in families with low socio-economic status. However, a recent meta-analysis indicates that parental SES may not have much impact on the development of children's personality (Ayoub, Gosling, Potter, Shanahan, & Roberts, 2017). Further, we employed contemporary missing data routines (i.e., FIML) to reduce the impact of selective attrition on the results. Moreover, previous attrition studies on the TOPP sample have indicated that the association between variables at baseline do not significantly differ among drop-out families versus those families remaining in the study (Gustavson, von Soest, Karevold, & Røysamb, 2012). Thus, despite issues of

selective attrition, the external validity of the findings in this study might still be considered as fairly good.

A related limitation pertains to the representativeness of the sample, as respondents were predominately Norwegian children and adults. Given emerging evidence of differences in the meaning, acceptability, and implications of shyness across cultures (Chen, 2010), the trajectories of shyness development and their associations found with later personality traits may not be generalizable to non-western cultures. Thus, future studies should examine if shyness development and its long-term associations with personality traits found in this study may be similar or differ across different cultural contexts. We are also cautious about the extent to which our findings about youths' personality scores at age 16.5 may be generalizable to adulthood, particularly in light of studies showing that personality in adolescence may be less stable than in adulthood (Soto, 2016; Soto, John, Gosling, & Potter, 2011).

Further, given that shyness is thought to become increasingly influenced by the social context with increasing age, it has been questioned whether shyness beyond infancy and toddlerhood should be considered as temperamental or rather as an aspect of personality (Rothbart & Mauro, 1990). Buss (1986), however, argued that since the cognitive, affective, and behavioral expressions of shyness in both early and later childhood involve activation of autonomic nervous system responses, shyness across all developmental phases is most adequately conceptualized as a temperament trait.

Moreover, this study assessed peer problems by combining two related, albeit distinct peer-related measures, which is most likely the reason for the somewhat low reliability estimate of peer problems. Moreover, the impact of peer problems was only

examined at one time point. This could have served to attenuate the true impact of peer problems over time. As previous studies have indicated that prolonged peer problems might have the greatest impact on youth's developmental outcomes (Ladd & Troop-Gordon, 2003), future longitudinal studies on the personality outcomes of shy children should strive to include several assessments of shy children's peer experiences across different age periods.

Finally, in the current study personality was conceptualized and assessed from the perspective of the Big Five. Although the Big Five framework has been recognized for providing a common language for organizing individual differences across diverse languages and cultures (DeYoung, Quilty, & Peterson, 2007), future studies should also examine longitudinal associations between shyness and other approaches to personality. For example, there is some evidence to suggest concurrent links between shyness and BIS/BAS in later adolescence/early adulthood (Bowker, Stotsky, & Etkin, 2017).

In conclusion, this study adds to the extant literature by reporting longitudinal associations between shyness development across childhood and personality outcomes in adolescence. In particular, this study extends our knowledge in this area by suggesting that these associations (1) vary based on the developmental period of shyness and (2) are partially accounted for by peer experiences in early adolescence. Interestingly, the role of peers appeared to be particularly pronounced in the links between shyness and aspects of personality that are particularly relevant for adolescents; social and emotional functioning (i.e., emotional stability, openness and extraversion). As socioemotional functioning and peer relations are crucial for adolescents' subsequent adjustment, the findings of this study may guide efforts to design preventive actions aimed at improving the social lives

and interpersonal skills of shy and withdrawn youth. Moreover, given the influential role of personality for a wide range of important life-outcomes, obtaining detailed knowledge about the temperamental predictors of later personality is important. The findings of this study are in this respect of particular relevance because they show the importance of exploring youth's personality development from early childhood to adolescence from a developmental perspective.

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Table 1

Results of confirmatory factor analyses (CFA) and invariance testing of shyness subscale of the Emotionality, Activity and Sociability Temperament Survey at age 1.5 to age 12.5.

	χ^2	<i>Df</i>	RMSEA	CFI	TLI	Model	$\Delta\chi^2$	Δdf	<i>p</i>
<i>CFA of 5- and 4-item shyness factor at different ages</i>									
age 1.5, 5 items	66.05	5	.114	.94	.87				
age 1.5, 4 items	2.90	2	.022	.99	.99		63.15	3	<.001
age 2.5, 5 items	67.84	5	.127	.93	.95				
age 2.5, 4 items	4.10	2	.037	.99	.99		63.74	3	<.001
age 4.5, 5 items	83.75	5	.147	.92	.88				
age 4.5, 4 items	1.60	2	.000	1.0	1.0		82.15	3	<.001
age 8.5, 5 items	106.23	5	.200	.85	.70				
age 8.5, 4 items	1.57	2	.000	1.0	1.0		104.66	3	<.001
age 12.5, 5 items	118.28	5	.196	.84	.67				
age 12.5, 4 items	2.67	2	.024	.99	.99		115.61	3	<.001
<i>Invariance testing across age 1.5 to 12.5 years</i>									
Configural invariance	179.67	121	.023	.99	.98				
Weak invariance	214.52	133	.026	.98	.98	1&2	34.85	12	ns
Strong invariance	825.51	145	.071	.87	.83	1&3	645.84	24	<.001
Partially strong invariance	349.67	142	.039	.96	.95	3&4	475.84	3	<.001

Note. *df* = Degrees of freedom, RMSEA = Root Mean Square Error of Approximation, CFI =

Comparative Fit Index, TLI = Tucker Lewis Index. $\Delta\chi^2$ = Difference of the chi-square values,

Δdf = Difference of the degrees of freedom, Partially strong invariance = Strong invariance

model but with relaxed intercept constraints for one indicator at age 8.5 and two indicators at age 12.5.

Table 2

Means, standard deviations (*SD*), and reliability estimates for all study variables for girls and boys

Variable	Girls		Boys		α
	Mean	<i>SD</i>	Mean	<i>SD</i>	
Shyness age 1.5	2.26	.75	2.06	.67	.75
Shyness age 2.5	2.35	.73	2.16	.66	.75
Shyness age 4.5	2.36	.69	2.32	.72	.78
Shyness age 8.5	2.37	.75	2.35	.73	.75
Shyness age 12.5	2.42	.69	2.29	.68	.69
Peer problems age 14.5	1.97	.82	1.81	.75	.67
Extraversion age 16.5	4.86	1.02	4.96	1.01	.83
Emotional Stability age 16.5	4.29	.99	5.11	.98	.81
Agreeableness age 16.5	5.15	.90	5.20	.74	.75
Conscientiousness age 16.5	4.60	1.01	4.50	.92	.82
Openness age 16.5	4.53	.99	4.45	.96	.64

Table 3

Correlations among study variables

	1	2	3	4	5	6	7	8	9	10	11
1. Shyness age 1.5											
2. Shyness age 2.5	.58**										
3. Shyness age 4.5	.45**	.59**									
4. Shyness age 8.5	.34**	.46**	.61**								
5. Shyness age 12.5	.25**	.38**	.49**	.65**							
6. Peer problems age 14.5	.11*	.04	.09	.16**	.23**						
7. Extraversion age 16.5	-.16**	-.17**	-.14*	-.35**	-.43**	-.39**					
8. Emotional Stability age 16.5	-.16**	-.06	-.06	-.11	-.18*	-.25**	.38**				
9. Agreeableness age 16.5	-.07	-.01	-.11	-.08	-.14*	-.27**	.24*	.41**			
10. Conscientiousness age 16.5	.01	.09	.04	.09	.09	-.14*	.08	.34**	.47**		
11. Openness to Experience age 16.5	-.11*	-.14*	-.12*	-.15*	-.16*	-.15**	.34*	-.02	.12*	-.04	
12. Gender	.12**	.11**	.01	.00	.08	-.07	-.05	-.38**	-.03	.05	.04

Note. * $p < .05$, ** $p < .01$

Table 4

Standardized regression coefficient of relationship between growth factors of shyness (intercept, slope 1, and slope 2), personality factors (age 16.5), and peer problems (age 14.5)

	Intercept	Slope 1	Slope 2
	β (SE)	β (SE)	β (SE)
Extraversion	-.43** (.09)	-.19* (.09)	-.48** (.09)
Emotional Stability	-.15* (.07)	-.02 (.08)	-.15 (.08)
Agreeableness	-.08 (.07)	-.09 (.08)	-.05 (.08)
Conscientiousness	.11 (.07)	.15 (.09)	.08 (.08)
Openness to Experience	-.26** (.07)	-.07 (.08)	-.15 (.08)
Peer Problems	.24** (.07)	.13 (.08)	.23* (.08)

Note. All analyses are controlled for gender. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

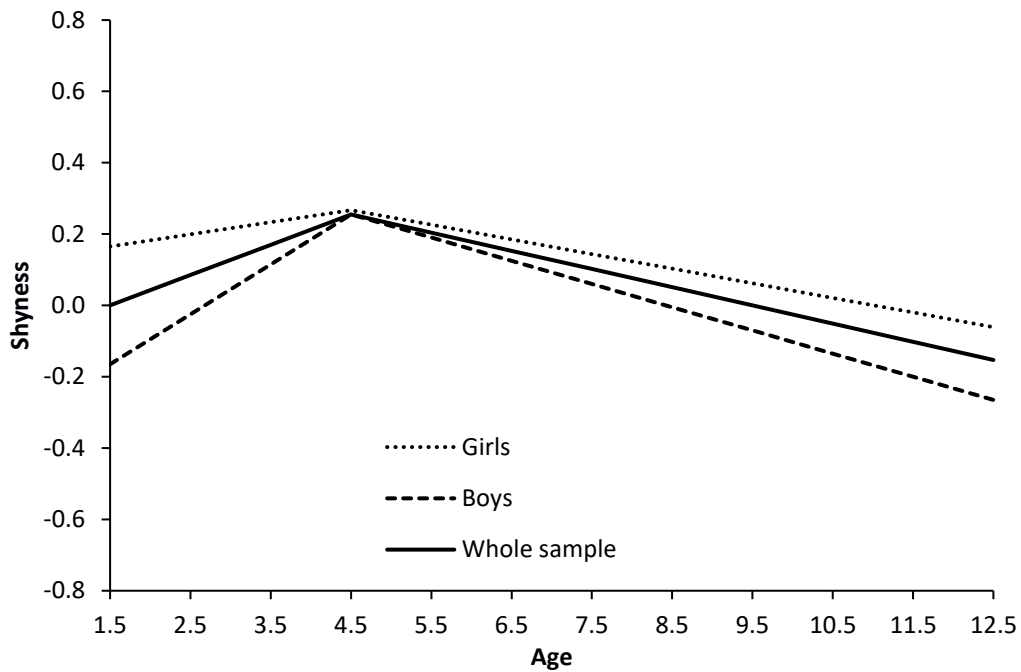
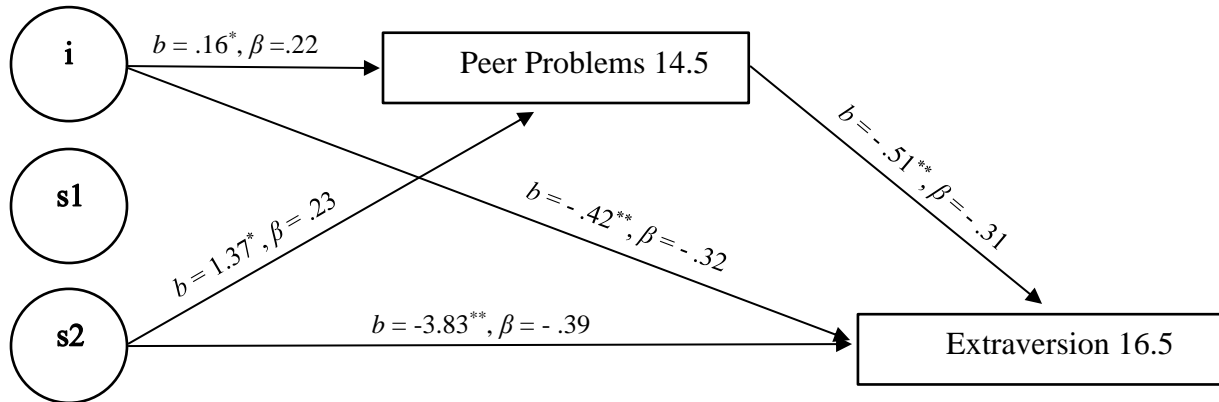


Figure 1. Estimated development of temperamental shyness across age 1.5 to age 12.5 for whole sample, boys and girls. The estimated shyness scores are based on an approximately standardized metric in a second order growth curve model. More specifically, in line with Ferrer et al.'s (2008) scaling method, the analyses were specified to set the mean of the latent shyness factor at age 1.5 to 0 and the standard deviation to 1. Latent shyness factors at other ages were scaled relative to the shyness metric at age 1.5. Shyness scores can thus be interpreted as values that are standardized relative to shyness at age 1.5.

Model A)



Model B)

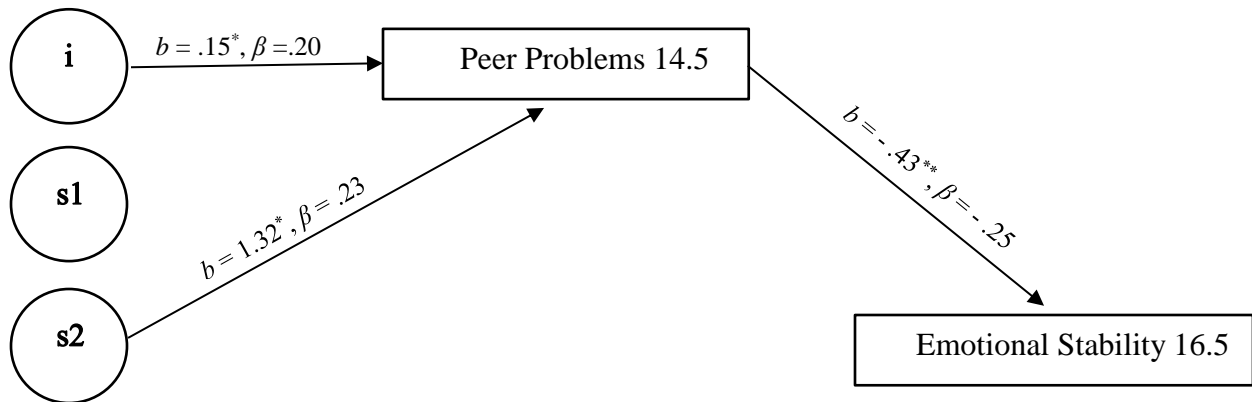


Figure 2. Mediating effects of peer problems at age 14.5 on the relation between shyness development in childhood and extraversion (Model A) and emotional stability (Model B) at age 16.5. Only significant paths are displayed. * $p < .05$, ** $p < .01$