MODELING THE INTERRELATIONS OF ADOLESCENT LONELINESS, SOCIAL ANXIETY AND SOCIAL PHOBIA

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Abstract: The aim of this article is to present the validity, stability and interrelations of three measurement scales assessing adolescents' socio-emotional well-being. The first set of measurements, including loneliness, social anxiety, and social phobia were given during the first week of the adolescents' lower secondary school. The loneliness and social anxiety were re-tested twice, at the end of the first school-year and at the beginning of the next school-year. Social phobia was re-tested in the third measurement point. The findings of the confirmatory factor analysis supported a two-factor solution (social and emotional loneliness) for the Loneliness scale, a three-factor solution (fear of negative evaluation, social avoidance and distress in new situations, social avoidance and distress in general) for the Social Anxiety scale, and a one-factor solution for the Social Phobia scale. The resultant models were cross-validated to consecutive measurement points. The fit indexes implied that the factor patterns remained invariant. The stability of the scales was analyzed with longitudinal confirmatory factor analysis and was found to be at least moderate between the measurement points. According to the second-order latent variable structural equation models, the interrelations between loneliness, social anxiety and social phobia were noteworthy.

Keywords: Confirmatory factor analysis, Stability, Validity.

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INTRODUCTION

Peers become increasingly important when an individual goes through the transition from childhood to adolescence. When striving for personal autonomy from parents, peers are an important source for social support. Belonging and identification with a peer group is essential for enhancing self-concept, and peers serve as a base for social comparison (Harter, 1999). This also means a growing impact of peers on adolescents' behaviour and greater dependency from peers. Although more advanced socio-cognitive abilities may offer a better means than before to handle these current socio-emotional issues, this change may also mean increased vulnerability. Being an outsider may be devastating since adolescents become more dependent upon the acceptance of peers.

There is abundant evidence for the importance of peer relations for adolescents' psycho-social well-being (Prinstein, Boergers, & Vernberg, 2001; Spence, Donovan, & Brechman-Toussaint, 2000). For example, Rapee and Spence (2004) suggested that early to mid-adolescence is likely to be a critical time for many individuals with social anxiety due to the increasing importance of social interactions at this developmental stage. For example, peer victimization is one of the strongest traced risk factors for loneliness, social anxiety and depression (Eslea et al., 2003; Juvonen, Graham, & Schuster 2003; Spence et al., 2000; Storch & Masia-Warner, 2004). Excessive teasing, criticism, bullying, rejection, ridicule, humiliation and exclusion by significant others are found behind the development of social anxiety and social phobia (Asher & Coie, 1990; Rapee & Spence, 2004). Peers' responses of this type are likely to reflect a long-term history of social interaction patterns and gradual establishment of vicious cycles (Blöte, Kint, & Westenberg, 2007; Rapee & Spence, 2004). Lonely and socially anxious children and adolescents are less popular and more likely to be ignored, neglected, rejected and excluded by peer groups (Blöte & Westenberg, 2007; Gazelle & Ladd, 2003; Rapee & Spence, 2004). And vice versa, research findings point out that these children and adolescents tend to demonstrate more inhibited and less assertive behaviour in social situations, inferior social skills (Horowitz, French, & Anderson, 1982; Lau & Kong, 1999) and more negative interpretations of social situations (Blöte & Westenberg, 2007; Miers, Blöte, Bögels, & Westenberg, 2008) than others.

Beyond these, the transition from childhood to adolescence often involves a simultaneous ecological transition (Bronfenbrenner, 1979), that is,

moving to a new school environment. This may mean a thorough reorganization in peer networks and a challenge to create new contacts and to find one's own reference group in a new social setting. Accompanying these changes, many adolescents report worries about maintaining existing friendships and creating new ones (Cotterell, 1996; Wargo Aikins, Bierman, & Parker, 2005). It can be suggested that this transition may result in an, at least temporary, increase in feelings of loneliness and social anxiety. As indicated above, poor or interrupted social skills, earlier adverse social outcomes or difficulties in creating friendships are likely to diminish success in these challenges.

In the present study, the focus is on three related phenomena—loneliness, social anxiety and social phobia. Each of these phenomena is briefly described below.

Loneliness

Loneliness is a subjective, distressing feeling of being without the kind of relationships the person desires. It is a discrepancy between one's real and desired relationships (Peplau & Perlman, 1982; Rotenberg, 1999). Since 1973 two basic dimensions have been used to describe the nature of loneliness. Weiss (1973) used the terms "loneliness of social isolation" and "loneliness of emotional isolation." Although using somewhat different terms (for example network and dyadic loneliness), further research since then has consistently supported the existence of these two dimensions of loneliness (Clinton & Anderson, 1999; Hoza, Bukowski, & Beery, 2000; Qualter & Munn, 2002). The commonly accepted definition of social loneliness is that it refers to the absence of a social network or to the feeling that one is not part of a group. Emotional loneliness, in turn, refers to the lack of close, intimate attachment to another person (Asher, Parkhurst, Hymel, & Williams, 1990; Clinton & Anderson, 1999; Hoza et al., 2000; Qualter & Munn, 2002).

Since loneliness relies on one's subjective perception of unsatisfied social relationships, it may be relatively independent from the actual amount of social contacts or solitude—in other words, being alone does not necessarily imply feeling lonely. Besides focusing on these qualitatively different aspects it is also important to focus on the temporal differences of children's and adolescents' loneliness experiences.

According to the review by Heinrich and Gullone (2006) previous research failed to emphasize differences in the temporal persistence of loneliness. Accordingly, many researchers have argued for the necessity of distinguishing between transition (or state) loneliness and chronic (or trait) loneliness. Transient loneliness refers to current and immediate feelings of loneliness, whereas chronic loneliness refers to a relatively enduring experience of loneliness. Among these, chronic loneliness is a concomitant of a person's social and emotional well-being, such as negative attributions for loneliness and interpersonal failures, non-active coping strategies, weak social skills, depression and anxiety (Heinrich & Gullone, 2006). According to Spitzberg and Hurt (1987), the longer the person's loneliness persists the more likely it is the person's causal attributions to become more self-derogatory and the social skills to diminish either through lack of use or motivation to interact with others.

Further research has demonstrated a wide range of unfavorable outcomes of loneliness (Heinrich & Gullone, 2006). For example, loneliness has been found to be a concomitant of drop-out-of-school risk (McWhirter, Besett-Alesch, Horibata, & Gat, 2002; Page & Scanlan, 1994), depression and anxiety disorder (Buchholtz & Catton, 1999), low self-esteem (Nurmi, Toivonen, Salmela-Aro, & Eronen, 1997), as well as of negative coping styles and problems in adjustment (Milsom, Beech, & Webster, 2003; Pavri, 2001). Also, more serious mental health problems, such as avoidant and borderline personality disorders, schizophrenia, suicide attempts and suicide have been reported among lonely adolescents and adults (Heinrich & Gullone, 2006).

Prevalence of loneliness. In general, approximately 15%-30% of people experience persistent feelings of loneliness (Koening & Abrams, 1999). For 10%-20% of adolescents, loneliness is a persistent and painful state of mind (Heinrich & Gullone, 2006). In a review of the mean scores by Perlman and Landolt (1999) the prevalence of loneliness appears to peak during adolescence, drop between young adulthood and middle age and, then, perhaps rise slightly during old age.

Social anxiety

Social anxiety is an experience of fear, apprehension or worry regarding social situations and being evaluated by others. It could result from negative, aversive or exclusionary experiences with peers and may, in turn,

inhibit social interactions that are necessary for satisfactory socio-emotional development (La Greca, 1998; Stein & Stein, 2008). Social anxiety may contribute to problems in adolescents' peer relations which are critical for normal social and emotional development (La Greca, 1998). Indeed, adolescents with higher levels of social anxiety have fewer friend-ships and less intimacy, companionship and support in their friendships (La Greca & Lopez, 1998).

Socially anxious adolescents anticipate negative outcomes from social-evaluative situations and tend to evaluate their own performance more negatively than that of others (Voncken, Bögels, & Peeters, 2007). They also show a high level of negative cognitions (Spence et al., 2000) in stressful social performance situations (Kendall & Chansky, 1991; Treadwell & Kendall, 1996) and, consequently, they may prefer to be alone than try to connect with others.

The multifaceted embodiment of social anxiety. According to La Greca and Lopez (1998) adolescents' social anxiety consists of three aspects: social avoidance and distress in general, social avoidance and distress in new situations and fear of negative evaluation. Social avoidance and distress means discomfort, distress and avoidance or inhibitions in the company of others. It may be further differentiated as either specific to new situations and unfamiliar peers or as generally experienced in the everyday company of peers and other persons. In the first case, anxiety arises when meeting new people or when one is obliged to do something new in front of others, for example having a presentation in front of the class. In the generalized aspect, the person is quiet and shy even with familiar groups and afraid of being invited by peers to do things with them. The fear of negative evaluation refers to adolescents' worries and fears of what others think or say about them (La Greca, 1998; La Greca & Lopez, 1998).

Prevalence of social anxiety. A significant percentage of adolescents, 27%-47%, reports at least one social fear the most common being fear of doing something in front of others, for example, speaking in public (Essau, Conradt, & Petermann, 1999; Ranta, Kaltiala-Heino, Koivisto, Tuomisto, Pelkonen, & Marttunen, 2007; Ranta, Kaltiala-Heino, Rantanen, Tuomisto, & Marttunen, 2007; Wittchen, Stein, & Kessler, 1999). According to Essau et al. (1999), exposure to feared social situations is associated with numerous problems or concerns, such as fear of doing something embarrassing, being judged as stupid or crazy, having a panic attack or exhibiting avoidance

behaviour. In their study, a large number of adolescents with social fear reported for a long period anxiety and avoidance behaviour.

Social phobia

Whereas social anxiety and avoidance is common and can be transient, the core symptom of social phobia is a marked and persistent fear of one or more social or performance situations, leading to excessive anxiety or avoidance of such situations. The symptoms of social phobia focus on evaluative concerns accompanied by impairments or distress or both (Stein & Stein, 2008).

Social phobia is an anxiety disorder that typically has onset in early- to mid-adolescence, with the mean age of onset between 10 and 17 years. Before the age of 12 its prevalence is below 1% but by the ages 12-17 years is already 2%-3% (Essau et al., 1999; Ranta, Kaltiala-Heino, Rantanen, & Marttunen, in press; Wittchen et al., 1999). In prospective studies the course of social phobia seems to be chronic, with periods of exacerbation and alleviation of symptoms, but full remission during adolescence and young adulthood seems rare (Ranta, 2008). For example, a supportive friendship or partnership may bring relief from symptoms, but rigorous challenges in educational settings including requirements to participate in new performance or social situations may again cause full-blown symptoms (Ranta, 2008; Wittchen & Fehm, 2003). Indeed, Rapee and Spence (2004) suggest that the apparent onset of social phobia in early adolescence may, hence, have more to do with the increase in life interference caused by social anxiety at this developmental stage than with increases in actual levels of social distress.

In adolescence social phobia may cause significant impairment in both educational activities and establishing friendships (Essau et al., 1999; Wittchen et al., 1999; Wittchen & Fehm, 2003). In most cases social phobia is reported to have preceded the other co-morbid disorders (Lewinshon, Zinbarg, Seeley, Lewinsohn, & Sack, 1997; Wittchen et al., 1999). Co-morbid depressive disorder is found in approximately 30% of adolescents with social phobia (Essau et al., 1999; Nelson et al., 2000; Wittchen et al., 1999).

Is there a self-restorative cycle of loneliness, social anxiety and social phobia?

While the clinical manifestation of social phobia is still limited in number during childhood, expressions of loneliness and anxious solitude (Gazelle & Ladd, 2003) as well as social anxiety (LaGreca, 1998) are already identifiable. Like anxiety, loneliness also shows increasing levels and continuity during adolescence (Eronen & Nurmi, 2001; Laine, 1998; Renshaw & Brown, 1993). This raises the question about the interrelations between these phenomena, their chronological order, continuity and possible heterotypical continuum. By testing the heterotypic continuum, we can see whether the potential dysfunctional social behaviour expresses itself differently at consecutive developmental age points; for example, does loneliness in childhood transform into social anxiety, phobia or depression during adolescence or adulthood?

Research points out that various interconnections exist between these phenomena. For example, chronic loneliness with several years' duration is especially noteworthy (Asher & Paquette, 2003; Cotterell, 1996; Neto & Barros, 2000; Young, 1982) since loneliness is connected both with social anxiety (Inderbitzen-Pisaruk, Clark, & Solano, 1992; Storch & Masia-Warner, 2004) and social phobia (Beidel et al., 2007). It is also worthy of notice that loneliness and social anxiety have many common risk factors such as poor social skills, problems in peer relations, negative experiences both at school and home, lack of social support and some individual traits such as shyness, behavioural inhibition and low sociability (Rapee & Spence, 2004; Rotenberg & Hymell, 1999).

The present study

The present study is part of a longitudinal research project, entitled "Social and Emotional Learning and Well-being in Lower Secondary School", led by professor Päivi M. Niemi. The research project is conducted in multidisciplinary collaboration between researchers in psychology, medicine, educational and social sciences. The Finnish school system is undergoing massive changes, changes that include the school network being reorganized into larger units and inclusive and multicultural schools becoming more common. Consequently, adolescents may meet greater challenges than before in the transition from elementary to lower secondary education

school, for example, in maintaining old friendships and in forming new, emotionally close ties with peers. Therefore this research project aims to study the developmental paths through the transition period into lower secondary school until its end. Both individual and contextual risk- and protective factors associated with adolescents' adjustment and socio-emotional well-being are analyzed.

One particular aim of the present study was to analyze the validity of the measurement scales being used to evaluate adolescents' loneliness, social anxiety and social phobia in three measurement points within one year. The second aim was to investigate the stability of these three phenomena. Finally, it was aimed to analyze the interrelations between the adolescents' loneliness, social anxiety and social phobia within the first and third measurement points. These three aims are described in more detail below.

The validity of the scales. First, the factorial validity of the Loneliness, Social Anxiety, and Social Phobia scales being used was verified. Based on the previous research evidence, loneliness was hypothesized to consist of social loneliness and emotional loneliness (Hypothesis 1a); social anxiety to consist of social avoidance and distress in general, social avoidance and distress in new situations, and fear of negative evaluation (Hypothesis 2a); and social phobia to involve just one theoretical construct (Hypothesis 3a). To confirm these structures in the Finnish sample, confirmatory factor analysis was applied, first for the data from the first measurement point and next on the data from the second and third measurement points in order to cross-validate the resultant model.

The stability of the phenomena. Second, the stability of loneliness, social anxiety, and social phobia was tested. Adolescents' loneliness, social anxiety and social phobia were followed within the first weeks of their transition to lower secondary school and again a year later. Additionally, loneliness and social anxiety were tested after six months from the school beginning. Consequently, it was expected that the occurrences of loneliness may change, even dramatically, when the adolescents are starting to adjust themselves into new peer groups and environments; the same regarded, more or less, the other phenomena (Hypothesis 2). In particular, the stability of the measurement for each of the theoretical sub-constructs mentioned above (i.e., social loneliness, emotional loneliness, social avoidance and distress in general, social avoidance and distress in new situations, fear of negative evaluation, social phobia) was analyzed.

The interrelations between loneliness, social anxiety and social phobia. Our last aim was to analyze the interrelations between loneliness, social anxiety, and social phobia within the first weeks of lower secondary school and again a year later. Taking into consideration the existing research evidence, it is quite impossible to dictate which of them can be seen as causes and which as consequences (Rapee & Spence, 2004). However, based on the hypothetical temporal continuum, the model was started with adolescents' loneliness, continued with social anxiety, and concluded with social phobia. This order is in line with the previous research finding of the prevalence and age of onset of loneliness (Heinrich & Gullone, 2006), social anxiety (Essau et al., 1999), and social phobia (Wittchen et al., 1999).

This order may also be argued based on Rapee and Spence's (2004) review pointing out that it is important to notice when a personality trait or behavioral problem turns into a functional impairment causing distress. The diagnosis of social phobia requires that the individual suffers from functional impairment and considerable distress about the symptoms (Ranta, 2008). Childhood loneliness may be an expression of shyness or other personality traits which the child may have learned to cope with in a familiar and emotionally supportive social environment. For example, Stein and Stein (2008, p. 1117) write that «Shyness (i.e., social reticence) is a common personality trait, and is not by itself regarded as pathological. But when combined with concern on the part of the individual about their shyness and evidence that it has a detrimental effect on functioning, it can no longer be regarded as normal and a diagnosis of social anxiety disorder is probable.»

METHOD

Participants

The target groups of the study consisted of two consecutive age cohorts (13 years old) comprising 386 participating students. The first cohort consisted of 190 students and the second 196 students. The participants for the study came from two schools from a municipality in Southern Finland. The genders were almost equally represented in the sample (for the first cohort 94 boys and 96 girls; for the second cohort 95 boys and 101 girls). The adolescents and their parents were informed about the aims of the study and both gave a written consent allowing them to participate in the study.

Measures

Adolescents of the first cohort completed the self-report questionnaires in autumn 2006 (measurement point 1; Loneliness, Social Anxiety, and Social Phobia scales), spring 2007 (measurement point 2; Loneliness and Social Anxiety scales) and autumn 2007 (measurement point 3; Loneliness, Social Anxiety, and Social Phobia) and the adolescents of the second cohort completed the same first measurements in autumn 2007 (measurement point 1; Loneliness, Social Anxiety, and Social Phobia scales). At the time the analyses for the present study were conducted the data of the consecutive measurement points were not yet available. Therefore, the sample size was larger ($n = 381$) for the first than for the second ($n = 186$) and third ($n = 181$) measurement points. The participants were asked to complete the self-report questionnaires during a normal classroom lesson.

Loneliness. To assess adolescents' loneliness, that is, social and emotional loneliness, a translated and modified version of the Peer Network and Dyadic Loneliness Scale (PNDL; Hoza et al., 2000) was used. The PNDL scale measures loneliness associated with lack of involvement in a social network and with the absence of close dyadic friendships. These are basically the two main dimensions that Weiss (1973) brought up and are later defined as social and emotional loneliness. Asolescents rated their own feelings of loneliness against paired statements such as "Some students feel like they really fit in with others BUT some students don't feel like they fit in with others." Adolescents are first asked to select which of these two types of students they were most like, and then to specify whether the chosen description fitted her/him "very well" or "quite well." Item scores varied between 1 (very low loneliness) to 4 (very high loneliness).

The Finnish version of PNDL (Junttila & Vauras, in press) that was used in the present study included six items to measure social loneliness (example item is "Some students feel lonely a lot because they wish others included them more in things BUT some students don't feel lonely because they think others usually do include them in things.") and five items to measure emotional loneliness (example item is "Some students hardly ever feel lonely because they have a close friend BUT some students wish they had a close friend so they wouldn't feel so lonely"). The reliability coefficients (Cronbach's alpha) for the data of the present study (both cohorts in measurement point 1) in the three measurement points were .82, .87, and

.86 for Social Loneliness and .79, .84, and .90 for Emotional Loneliness, respectively.

Social anxiety. Adolescents' social anxiety was measured by the Social Anxiety Scale for Adolescents (SAS-A) (La Greca & Lopez, 1998; Finnish version: Ranta, Niemi, & Uhmavaara, 2006). The scale includes three subscales measuring adolescents' Fear of Negative Evaluation (FNE), Social Avoidance and Distress in General (SADG), and Social Avoidance and Distress in New Situations (SADN), respectively. There were eight items measuring FNE (example items are "I am afraid that others will not like me" and "I feel that others make fun of me"); four items measuring SADG (example items are "It is hard for me to ask others to do things with me" and "I feel shy even with peers I know very well"); and six items measuring SADN (example items are "I worry about doing something new in front of others" and "I only talk to people that I know really well"). The reliability coefficients (Cronbach's alpha) for the data of the present study (both cohorts in measurement point 1) in the three measurement points were .84, .89, and .88 for the FNE, .63, .79, and .80 for the SADG, and .76, .81, and .83 for the SADN, respectively.

Social phobia. To assess the adolescents' social phobia the Social Phobia Inventory (SPIN; Connor et al., 2000; Davidson, 2000) was used. (For the Finnish version see Ranta, Kaltiala-Heino, Koivisto, et al., 2007; Ranta, Kaltiala-Heino, Rantanen, et al., 2007.) The original scale had 17 items and three subscales, namely Fear in Social Situations (example item is "Being criticized scares me a lot"); Avoidance of Performance or of Social Situations (example item is "I avoid talking to people I don't know"); and Physiological Discomfort in Social Situations (example item is "I am bothered by blushing in front of people"). However in a Finnish sample of 12 to 17-year-old adolescents from the general population there appeared to be just one factor (Ranta, Kaltiala-Heino, Koivisto, et al., 2007; Ranta, Kaltiala-Heino, Rantanen, et al., 2007). The reliability coefficient (Cronbach's alpha) for the data of the present study (both cohorts in measurement point 1) in the two measurement points (measurement points 1 and 3) with the one factor solution was .89, and .92, respectively.

Statistical analyses

First, in order to test the construct validity of each scale (PNDL, SAS, SPIN) confirmatory factor analysis (CFA) was used. The CFA was applied to each

scale separately using only the data from the first measurement point. Subsequently, the data from the second and the third measurement points were used in order to cross-validate these modified models (cf. Breckler, 1990). Since the first measurement point's data were from two cohorts, the valid sample size ($n = 381$) was larger than for the second measurement point ($n = 186$) and for the third measurement point ($n = 181$). Second, the stability of the subscales was tested with CFA. Finally, the interrelations between the constructs were analysed with a second-order latent variable structural equation model. For the latter analyses, the data from the first and third measurement points were used since they provided data from all the three scales.

The estimation method and fit indexes. These models were fitted to the covariance matrix using the Robust Maximum Likelihood method with Mplus 4.1 (Muthén & Muthén, 2006). The covariance matrices are available from the first author. The fit of the models was evaluated using chi-square, the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), and the Standardized Root Mean Square Residual (SRMR). Chi-square evaluates the distance between the sample covariance matrix and the fitted covariance matrix. The RMSEA is an index of discrepancy per degree of freedom (Steiger, 1990). According to Hu and Bentler (1999), a cutoff value close to .06 for RMSEA indicates a good fit. The CFI indicates how much better the model fits than the independence model. The CFI index varies between 0 and 1, and the value should be close to .90 for the model to be suitable (Bentler, 1990). However, according to Little, Card, Preacher, and McConnell (in press), the values between .85 and .90 are considered to be mediocre. Also, the TLI, developed by Tucker and Lewis (1973), indicates how much better the model fits than the independence model. The TLI index varies between 0 and 1, and the value should, according to Hu and Bentler (1999), be close to .95 for the model to be suitable. The SRMR index is the average of the standardized residuals between the observed and the predicted covariance matrix; a cutoff value close to .08 indicates a good fit (Hu & Bentler, 1999).

RESULTS

Descriptive statistics for adolescents' loneliness, social anxiety and social phobia are presented in Table 1. Due to the considerable number of items

(124), we present the descriptive statistics by sum scores calculated on the basis of the final models for each subscale in each measurement point. If required, the detailed statistics of each item's descriptive are available from the first author. The skewness and kurtosis were within reasonable limits; that is, the statistics were all well below 2.0 for skewness and 7.0 for kurtosis (Curran, West, & Finch, 1996).

Table 1. Descriptive statistics for the sum scores of the study variables in the three measurement points

Variable	*M*	*SD*	Skewness	Kurtosis
Measurement point 1				
Loneliness (PNDL)				
Social loneliness (PN)	8.21	2.75	0.96	1.38
Emotional loneliness (DL)	8.43	2.95	0.75	0.59
Social anxiety (SAS-A)				
Social avoidance and distress in general (SADG)	5.07	1.83	1.13	2.43
Social avoidance and distress in new situations (SADN)	12.21	3.14	-0.02	0.12
Fear of negative evaluation (FNE)	15.54	4.68	0.39	0.20
Social phobia (SPIN)				
Social phobia	12.07	9.20	1.43	3.46
Measurement point 2				
Loneliness (PNDL)				
Social loneliness (PN)	8.41	3.10	1.24	1.56
Emotional loneliness (DL)	8.36	3.04	0.99	1.33
Social anxiety (SAS-A)				
Social avoidance and distress in general (SADG)	5.17	1.88	0.79	0.37
Social avoidance and distress in new situations (SADN)	12.84	3.47	-0.24	0.78
Fear of negative evaluation (FNE)	16.32	4.92	0.47	0.69
Social phobia (SPIN)				
Social phobia	—	—	—	—
Measurement point 3				
Loneliness (PNDL)				
Social loneliness (PN)	7.99	2.94	1.10	1.05
Emotional loneliness (DL)	8.21	3.51	1.15	.99
Social anxiety (SAS-A)				
Social avoidance and distress in general (SADG)	5.27	2.09	1.16	2.07
Social avoidance and distress in new situations (SADN)	12.69	3.46	0.18	0.72
Fear of negative evaluation (FNE)	16.60	4.68	0.42	0.63
Social phobia (SPIN)				
Social phobia	14.28	11.43	1.82	4.94

Validity of PNDL and stability of loneliness

The first model tested the hypothesized two-factor model of PNDL, namely the Social Loneliness (PN) and Emotional Loneliness (DL) factors. The factors were allowed to correlate; errors were assumed to be uncorrelated. This two-factor model fitted the cross-sectional data in the first measurement point reasonably well except for the item "Some students are often bored when they are with other students", which had low loading and R-square. Moreover, as many modification indexes pointed out, this item is unsuitable for this factor. Therefore the item was deleted from the Social Loneliness factor. The same decision has been made in two other Finnish studies where the same measurement scale was used (Junttila & Vauras, in press; Junttila, Vauras, & Laakkonen, 2007). After that modification the fit indexes were good, $\chi^2(34, N = 381) = 68.19$, CFI = .96, TLI = .95, RMSEA = .05, SRMR = .04 (Table 2). With the exception of the above mentioned item being excluded, there was no other need to improve the model.

Next, this solution was cross-validated for the cross-sectional data of the second and third measurement points (see Table 2). The fit indexes were even better than for the first measurement point. Specifically, for the second measurement point the fit indexes were $\chi^2(34, N = 186) = 58.01$, CFI = .96, TLI = .95, RMSEA = .06, SRMR = .05, and for the third measurement point $\chi^2(34, N = 181) = 48.52$, CFI = .99, TLI = .99, RMSEA = .05, SRMR = .05. These findings imply that the two-factor solution can be considered to be invariant across measurement points.

Second, the stability of adolescents' social and emotional loneliness measured at three time points within one year starting from the beginning of the lower secondary school was analyzed. These analyses were performed on the longitudinal data (see Table 2). The stability and invariance were tested with three differently constrained models. The first model was the baseline model with configural invariance (Model 1). The error autocorrelations were included where needed. Model 1 fitted the data acceptably, $\chi^2(390, N = 177) = 520.50$, CFI = .94, TLI = .94, RMSEA = .04, SRMR = .06. For the second model (Model 2) we added the invariance of the factor loadings by fixing the corresponding loadings to be equal in each time point. Model 2 was also acceptable, $\chi^2(406, N = 177) = 540.78$, CFI = .94, TLI = .94, RMSEA = .04, SRMR = .06. The difference in chi-square was statistically nonsignificant, $\Delta\chi^2(16) = 20.21, p = .211$ (see Table 2).
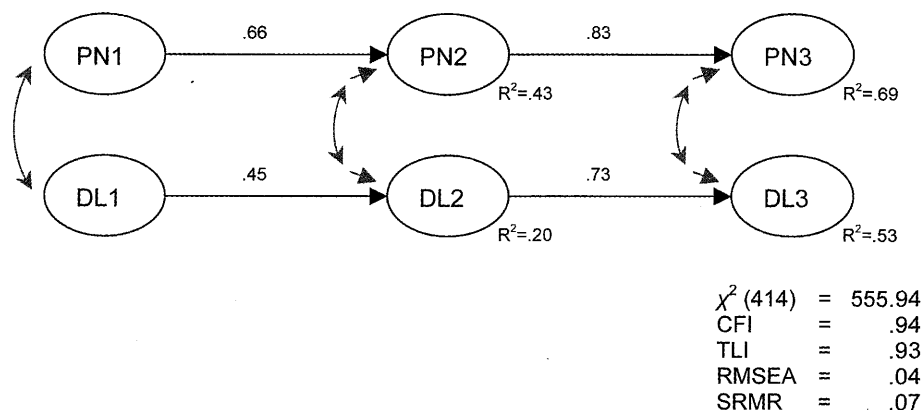
Figure 1. Longitudinal confirmatory factor analysis model, stability of Loneliness scale (PNDL) in measurement points 1, 2, and 3, respectively. Standardized solution (n = 177).

For the third model (Model 3) the interrelations between the consecutive latent variables (PN and DL) were also modelled as autoregressive paths (Little, Preacher, Selig, & Card, 2007). In this type of stability model, the only exogenous factor to the consecutive one (e.g., PN in measurement point 2, PN2) is the previous one (e.g., PN in measurement point 2, PN1). The difference in the fit of consecutive models was calculated with the chi-square difference test using scaling correction for the robust maximum likelihood method (Satorra & Bentler, 1999). The fit indexes for Model 3 and the statistical significance level of chi-square differences are presented in Table 2. According to the chi-square difference estimation between Models 2 and 3, $\Delta\chi^2(8) = 14.64, p = .067$, this longitudinal confirmatory factor model met the hypothesis of invariance in the longitudinal factor loadings and structural equation parameters.

The standardized coefficient of stability between the first and second measurement point was .66 for PN and .45 for DL and between the second and the third measurement point .83 for PN and .73 for DL (see Figure 1). These coefficients indicated a moderate to high stability of adolescents' loneliness.

To test whether the stability is statistically significantly different (lower or higher) from measurement point 1 to measurement point 2 than from measurement point 2 to measurement point 3, a model was constructed,

in which these autoregressive paths were fixed to be equal. Based on the chi-square difference estimation, the stability of PN1 to PN2 was equal to the stability from PN2 to PN3. However, the estimation indicated that the stability from DL1 to DL2 was statistically significantly lower than the stability from DL2 to DL3, $\Delta\chi^2(1) = 4.64, p = .031$. This finding indicates that emotional loneliness may more easily be transformed during the first nine months in lower secondary school than later on.

Additionally, the indirect effects from measurement point 1 to measurement point 3 via measurement point 2 were calculated. These were both statistically significant. The stability coefficient for PN was .55 and for DL .33.

Validity of SAS-A and stability of social anxiety

First, the original three-factor model, which includes the factors Fear of Negative Evaluation (FNE), Social Avoidance and Distress in New Situations (SADN), and Social Avoidance and Distress in General (SADG), was tested in the cross-sectional data. Similarly to the procedure presented for the Loneliness scale, the factors were allowed to correlate but the errors were assumed to be uncorrelated. To improve the fit we made two modifications. Based on the modification indexes, the SADG item "I'm quiet when I'm with a group of people" loaded also to the factor of SADN. This was somehow also the case in the study by La Greca and Lopez (1998). In their study the item loaded (with exploratory factor analysis) .51 to SADG and .30 to SADN. Thus, we constructed a new model in which the item had loading to both of these factors. The t-values of these loadings clearly show that in our data the item has stronger loading to the SADN (standardized path coefficient .60, t-value 7.37, $p < .001$) than to the SADG (standardized path coefficient .09, t-value 1.03, ns). Thus the item was moved to an estimator of the SADN factor.

Moreover, the FNE item "I feel that others make fun of me" was excluded, since many of the modification indexes focused on that item. As in the present study, in the study by La Greca and Lopez (1998) this item loaded besides to FNE (.58), also to SADG (.35) and to SADN (.25). In the Finnish version the wording of this item may refer more to an existing experience of teasing than the other items, which refers more to worries about being disliked or teased.

After these two modifications, the fit indexes for the first measurement point were good, $\chi^2(116, N = 381) = 181.17$, CFI = .96, TLI = .96, RMSEA

= .04, SRMR = .05. For the second and third measurement point the fit indexes were lower but still acceptable (see Table 2). These findings imply that the three-factor solution can be considered to be invariant across measurement points.

Second, the stability of adolescents' FNE, SADN, and SADG measured at three time points within one year starting from the beginning of the lower secondary school was analyzed. These analyses were performed on the longitudinal data (see Table 2). The stability and invariance was tested with three differently constrained models. The first model (Model 1) was again the baseline model with configural invariance. The error autocorrelations were included where needed. Model 1 fitted the data acceptably, χ^2(1167, N = 177) = 1766.07, CFI = .87, TLI = .86, RMSEA = .05, SRMR = .07 (Table 2). For the second model (Model 2) the invariance of the factor loadings was added by fixing the corresponding loadings to be equal in each time point. Model 2 was also acceptable, χ^2(1195, N = 177) = 1787.93, CFI = .87, TLI = .86, RMSEA = .05, SRMR = .07. The chi-square difference test resulted in a nonsignificant difference between Models 1 and 2, $\Delta\chi^2$(28) = 25.23, p = .615 (see Table 2).

Again, for the third model (Model 3) also the interrelations between the consecutive latent variables (FNE, SADN and SADG) were modelled as autoregressive paths. The fit indexes for Model 3 and the statistical significant level of chi-square differences are presented in Table 2. Model 3, in which the only exogenous factor to the consecutive one (e.g., FNE in measurement point 2, FNE2) is supposed to be the previous one (e.g., FNE in measurement point 2, FNE1), resulted in non-acceptance based on the chi-square test, $\Delta\chi^2$(21) = 51.35, p < .05. Nevertheless, the other fit indexes remained almost or exactly the same as for the Model 2. According to Chen, Sousa, and West (2005) only the difference in CFI larger than .01 indicates a meaningful difference in the model fit. Thus, we may also consider accepting this loading invariance and autoregressive restricted Model 3.

The standardized coefficient of stability between the first and second measurement point was .68 for the FNE, .67 for the SADN and .71 for the SADG (Figure 2). Between the second and third measurement points the stability coefficients were very close to the first ones: .68 for the FNE, .71 for the SADN and .73 for the SADG. These values indicate at least moderate stability in the aspects of adolescents' social anxiety.

χ^2 (1216) = 1843.54
CFI   =   .86
TLI   =   .86
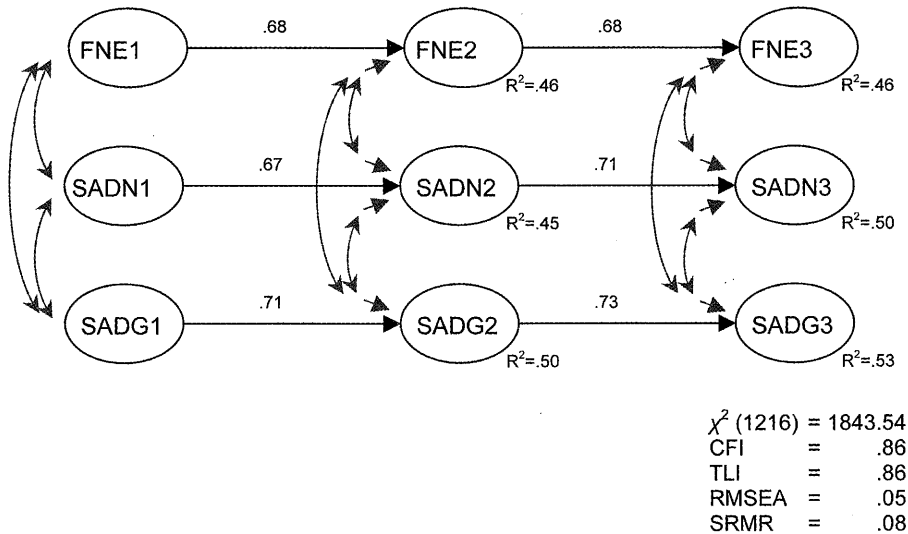RMSEA   =   .05
SRMR   =   .08

Figure 2. Longitudinal confirmatory factor analysis model, stability of Social Anxiety scale (SAS-A) in measurement points 1, 2, and 3, respectively. Standardized solution (n = 177).

Similar to the procedure done in loneliness measurement stability testing, to test whether the stability is statistically significantly different (lower or higher) from measurement point 1 to measurement point 2 than from measurement point 2 to measurement point 3 a model was constructed, in which these autoregressive paths (within FNE, SADN and SADG) were fixed to be equal. Based on the chi-square difference estimation, the stability of all these three factors were similar between consecutive measurement points, $\Delta\chi^2(3) = 2.997, p = .392$.

Again, the indirect effects from measurement point 1 to measurement point 3 via the measurement point 2 were calculated. These were all statistically significant and moderate in magnitude: .46 for the FNE; .47 for the SADN; and .52 for the SADG.

Validity of SPIN and stability of social phobia

For Social Phobia (SPIN) a one-factor solution based on the previous Finnish research (Ranta, Kaltiala-Heino, Koivisto, et al., 2007; Ranta, Kaltiala-Heino,
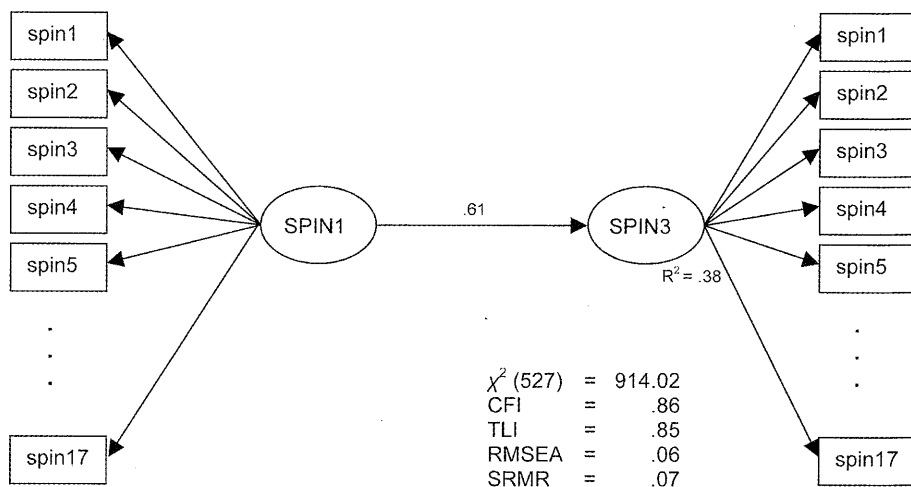
Figure 3. Longitudinal confirmatory factor analysis model, stability of Social Phobia scale (SPIN) in measurement points 1 and 3, respectively. Standardized solution (n = 177).

Rantanen, et al., 2007) was tested in the cross-sectional data. After making two minor modifications, an adequate fit for the one-factor model was obtained, $\chi^2(117, N = 381) = 196.48$, CFI = .90, TLI = .89, RMSEA = .06, SRMR = .05 (see Table 2). We allowed a correlation between the errors of "I avoid speaking to anyone in authority" and "I am afraid of people in authority" and between "I avoid going to parties" (spin8) and "Parties and social events scare me". The conceptual and verbal similarity of these two pairs is quite obvious and, thus, the correlation of the errors was justified.

After these modifications, the same solution was applied to the next measurement point. Unlike loneliness and social anxiety, social phobia was measured only twice — in the beginning of the lower secondary school (the first measurement point) and in the beginning of the second school year (the third measurement point). The fit indexes for the second SPIN measurement point's data were acceptable (see Table 2). This finding implies that the one-factor solution can be considered to be invariant across measurement points.

Second, the stability of adolescents' social phobia measured at two time points within one year starting from the beginning of the lower secondary

school was analyzed. These analyses were performed on the longitudinal data (see Table 2). The stability and invariance was tested with three differently constrained models. The procedure was similar to the ones with PNDL and SAS-A, except for Model 3 (equality of structure, loading invariance and structural paths). Since the SPIN model had only one factor, Model 3 was equal to Model 2.

The first model (Model 1) was again the baseline model with configural invariance. The error autocorrelations were included where needed. Model 1 fitted the data acceptably, $\chi^2(511, N = 177) = 898.58$, CFI = .86, TLI = .84, RMSEA = .07, SRMR = .07 (Table 2). Model 2 was also acceptable, $\chi^2(527, N = 177) = 914.02$, CFI = .86, TLI = .84, RMSEA = .06, SRMR = .07.

When comparing the restricted model (M2) to Model 1 the chi-square difference test was again nonsignificant, $\Delta\chi^2(16) = 16.42, p = .424$ (see Table 2). Thus, the structure of the social phobia seems to be stable by equality of the overall structure and loading invariance between the one-year measurement points. The standardized coefficient of stability between measurement points was .61, which indicates moderate stability of adolescents' social phobia.

The interrelations between loneliness, social anxiety, and social phobia

To investigate the interrelations between loneliness, social anxiety, and social phobia, a second-order latent variable structural equation model of these phenomena was constructed. Due to the considerable number of the parameters to be estimated versus the sample size, we had to execute the analyses separately within the two measurement points. Based on previous research, in this model social anxiety (SAS-A) was regressed onto loneliness (PNDL) and, subsequently, social phobia (SPIN) was regressed onto social anxiety within the first and third measurement points (see Figures 4 and 5, respectively). The analyses were performed on the covariance matrices using maximum likelihood robust estimation. The first-order factor models remained similar to the ones used in confirmatory factor analyses.

Within the first measurement point there were interrelations between loneliness, social anxiety and social phobia and the model's fit indexes were good, $\chi^2(892, N = 381) = 1428.02$, CFI = .91, TLI = .90, RMSEA = .04,

Table 2. Fit indexes for the CFA and Stability Models of loneliness, social anxiety, and social phobia

	χ^2	df	CFI	TLI	RMSEA	SRMR	$\Delta\chi^2$ (scaling corr. for MLR)
				Loneliness			
Cross-sectional CFA							
Time 1 (N = 381)	68.19	34	.96	.95	.05	.04	
Time 2 (N = 186)	58.01	34	.96	.95	.06	.05	
Time 3 (N = 181)	48.52	34	.97	.97	.05	.05	
Longitudinal CFA							
Model 1 (N = 177)	520.50	390	.94	.94	.04	.06	
Model 2 (N = 177)	540.78	406	.94	.94	.04	.06	$\Delta\chi^2(16) = 20.21, p = .211$
Model 3 (N = 177)	555.94	414	.94	.93	.04	.07	$\Delta\chi^2(8) = 14.64, p = .067$
				Social anxiety			
Cross-sectional CFA							
Time 1 (N = 381)	181.17	116	.96	.96	.04	.05	
Time 2 (N = 186)	197.17	116	.93	.92	.06	.07	
Time 3 (N = 181)	244.32	116	.90	.88	.08	.08	
Longitudinal CFA							
Model 1 (N = 177)	1766.07	1167	.87	.86	.05	.07	
Model 2 (N = 177)	1787.93	1195	.87	.86	.05	.07	$\Delta\chi^2(28) = 25.23, p = .615$
Model 3 (N = 177)	1843.54	1216	.86	.86	.05	.08	$\Delta\chi^2(21) = 53.27, p < .05$
				Social phobia			
Cross-sectional CFA							
Time 1 (N = 381)	196.48	117	.90	.89	.06	.05	
Time 3 (N = 181)	247.65	117	.90	.89	.08	.06	
Longitudinal CFA							
Model 1 (N = 177)	898.58	511	.86	.84	.07	.07	
Model 2 (N = 177)	914.02	527	.86	.84	.06	.07	$\Delta\chi^2(16) = 16.42, p = .424$
Model 3 (N = 177)	914.02	527	.86	.84	.06	.07	equal fit

Note: Time 1, Time 2, and Time 3 are measurement points 1, 2, and 3, respectively. Model 1: equality of overall structure, with significant error autocorrelations; Model 2: Model 1 + loading invariance; Model 3: Model 2 with structural paths (stability).

SRMR = .06. The standardized path coefficient between the loneliness and social anxiety was .64 and between the social anxiety and social phobia, .77 (Figure 4). The indirect effect from loneliness to social phobia was .50. Albeit the path coefficients between the measurement scales were strong, the
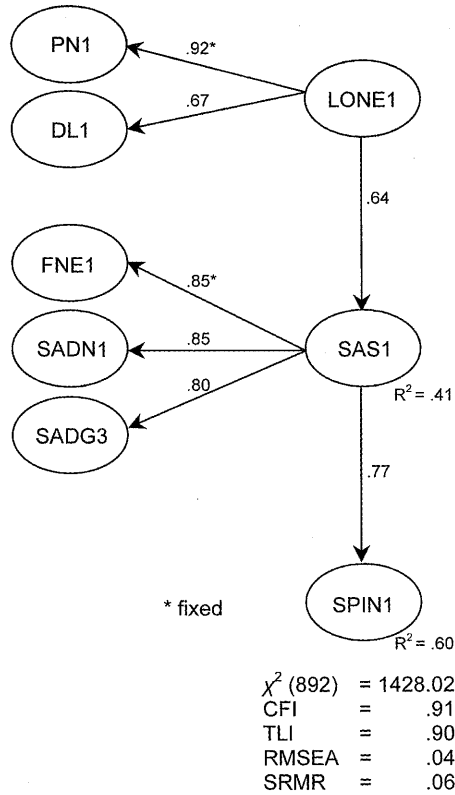
*Figure 4. Second-order latent variable structural equation model
(measurement point 1). Standardized solution (n = 381).*

fit indexes supported our hypothesis that loneliness, social anxiety and so-
cial phobia are interrelated but still separate phenomena. There was no
need for modifications of the loadings or errors between the factor struc-
tures of separate measurement scales. Only one minor modification was in-
cluded based on the modification indexes. We allowed a correlation be-
tween the errors of "I avoid talking to people I don't know" and "Talking
to strangers scares me". Like for the error correlations included in the con-
firmatory analyses of this broad scale, the conceptual and verbal similarity
of this pair of items seems obvious and, thus, the correlation of the errors
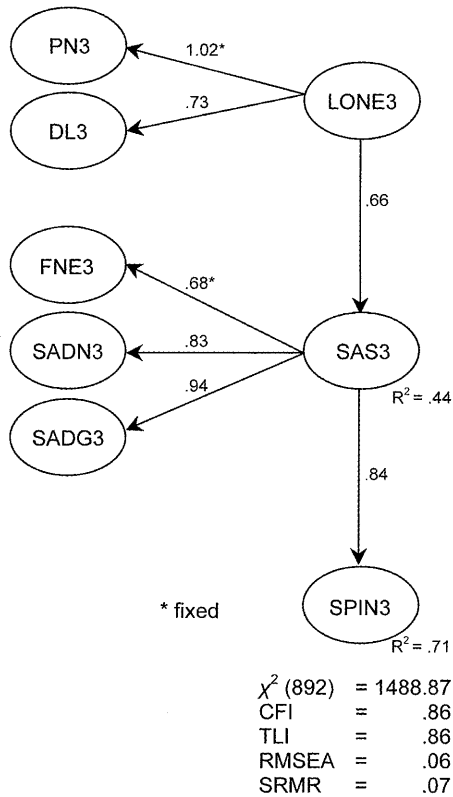seemed to be justified.

*Figure 5. Second-order latent variable structural equation model
(measurement point 3). Standardized solution (n = 181).*

Within the third measurement point the constructed model was similar to the model of the first measurement point and the fit indexes were acceptable, $\chi^2(892, N = 181) = 1488.87$, CFI = .86, TLI = .86, RMSEA = .06, SRMR = .07. The standardized path coefficient (Figure 5) between loneliness and social anxiety was .66 and between social anxiety and social phobia .84, which are somewhat higher than the similar path coefficients within the first measurement point (.64 and .77, respectively). The indirect effect from loneliness to social phobia was .55.

DISCUSSION

The increased prevalence rates in mental health problems such as social phobia and depression in the transition from childhood to adolescence have raised questions about individual and environmental risk factors and continuity in these socio-emotional problems. Our challenge is to recognize the signs and developmental paths of adolescents' socio-emotional ill-being, before the possible problems become more severe. Therefore validated instruments for assessing adolescents' multifaceted and levelled social-emotional problems are needed.

Consequently, the purpose of this study was to examine the validity, stability and interrelations of three measurement scales assessing adolescents' socio-emotional ill-being, namely loneliness, social anxiety and social phobia. By using CFA a relatively good fit was found to each of the measurement scales. The cross-validation analysis supported the hypothesized structure (Hypotheses 1a, 1b, and 1c) and the stability analysis supported the continuity (Hypothesis 2) of these phenomena. The second-order latent variable structural equation models showed that loneliness, social anxiety and social phobia are strongly interrelated, yet different phenomena. The issues of stability and interrelation are discussed below.

The stability of loneliness, social anxiety, and social phobia

Considering loneliness, the stability coefficients between the first and second, and second and third measurement points were similar for social but not for emotional loneliness. For emotional loneliness, the stability coefficient was lowest for the first period, that is, in the lower secondary school. This implies that those who felt emotionally lonely at the beginning of the first school year may have found a close friend by the end of the school year and vice versa, those having close emotional ties with peers at the beginning might have lost them during the first school year. Therefore, the first year in lower secondary school seems to be a period when adolescents tend to build new important emotional friendships in the context of a new school. Later on, those who were successful in creating a close friendship maintain these relationships while the others, who did not, remain lonely. On the contrary, the stability analysis of social loneliness showed that it is quite stable already during the first year in a new school. This may indicate that adolescents create their

social networks relatively quickly and also maintain them; and vice versa, those being outsiders tend to be outsiders also later on.

Considering social anxiety, the stability between the first and second measurement point was almost the same as between the second and the third measurement point. Also, the stability of adolescents' social phobia remains at least moderate during the first year in lower secondary school. This may indicate that aspects of social anxiety (i.e., the fear of negative evaluation, and the social avoidance and distress in general or especially in a new situation) and social phobia may reflect more permanent and personally related traits or dysfunctions of social behavior and, thus, they are observed to be more stable through the transition (Hayward, Wilson, Lagle, Kraemer, Killen, & Taylor, 2008; Wittchen et al., 1999).

In sum, if the experience of loneliness and social anxiety seems quite stable already in the first year in lower secondary school, it is probable that these lonely and anxious adolescents will have problems in creating satisfying social contacts also in the future (cf. Milson et al., 2003). Subsequent social avoidance and adverse social outcomes probably reduce opportunity for further psychosocial development and perpetuate the assumption that social events will lead to negative outcomes (Banerjee & Henderson, 2001). Social withdrawal, avoidance behaviour and exclusion by others are proposed to limit opportunities for further social skills development and social learning.

The interrelations of the phenomena

To continue with the idea of accumulation, the interrelations between loneliness, social anxiety, and social phobia were already quite strong within the first measurement point. After one year in a new peer environment the interrelations between the adolescents' socio-emotional problems were even a little higher. Predictably, the strongest relationship was between social anxiety and social phobia (cf. Wittchen et al., 1999). Still, the direct effect from loneliness to social anxiety (.64 and .66 in the first and third measurement point, respectively) and indirect effect from loneliness to social phobia (.50 and .55 in the first and third measurement point, respectively) are noteworthy. Although previous research has pointed out a wide range of unfavourable outcomes of loneliness, such as depression (Heinrich & Gullone, 2006), it still seems to be a somewhat underestimated sign of children's and adolescents' socio-emotional ill-being.

Several studies indicate that the increase in depression rates is especially marked at the ages of 14–16, in other words during the lower secondary school years. It is notable from a life-span and preventive perspective that after each depressive episode the probability of a new episode shows significant increase (Hart, Craighead, & Graighead, 2001). Considering the fact that loneliness, social anxiety and social phobia are all among the strongest concomitants of depression (Hayward et al., 2008; Heinrich & Gullone, 2006) these phenomena should be taken as alarming signs. Prevention, or intervention after the first signs are identified, may save the adolescent from more serious mental health problems and, as Essau et al. (1999) also noted, in light of scarce resources, is an important and cost-effective policy implication.

As Rapee and Spence (2004) point out «it is not clear why some young people progress to develop emotional and behavioural problems while others do not; it is even less clear why some individuals develop a specific disorder such as social phobia, rather than some other form of psycho-pathology» (p. 755). The outcomes reflect a rather complex interplay between biological processes, psychological strengths or vulnerabilities and environmental general and specific influences. A major task, then, for researchers is to tease out these interrelations (Rapee & Spence, 2004).

Limitations and future directions

The major limitation of this study is the rather small sample size. Due to the fact that data collection is still in process, we had to leave out comparisons of the genders and the possibility to use a cross-lagged design to analyse the heterotypic continuum (e.g., whether loneliness converts into social anxiety or phobia) of the subscales of loneliness, social anxiety and social phobia. After finishing the data gathering covering the whole three-year period of lower secondary school of both cohorts, we shall be able to explore these interrelations in more detail.

To conclude, longitudinal studies are needed to model the temporal course of these phenomena, to identify antecedent expressions of dysfunctional development, perhaps still at a normal or "under-threshold" range on the continuum of loneliness and social anxiety but already identifiable before the onset, manifestation and formal diagnosis of clinical disorder. The above findings also suggest the need for more thorough analyses on the

interrelations and continuities of loneliness, social anxiety and social phobia. Since marked overlap or co-morbidity is more a rule than an exception, we have to make detailed analyses of the methods used to measure loneliness, pre-clinical forms of social anxiety and more severe clinical forms of social phobia.

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