

Social skills and symptoms of anxiety disorders from preschool to adolescence: a prospective cohort study

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Background: Prior research, mostly cross-sectional or prospective studies with short follow-up periods, has indicated that childhood anxiety is associated with difficulties with social interaction. However, the etiological role of social skills in the development of anxiety in childhood remains unknown. Moreover, it is not known whether childhood anxiety impedes the development of age-appropriate social skills. **Methods:** The relation between anxiety and social skills was, therefore, examined in two birth cohorts of children who were assessed biennially from the ages of 4 to 14 years ($n = 1,043$). Semistructured psychiatric diagnostic interviews of children (from age 8) and parents were used to measure symptoms of separation, generalized, and social anxiety disorders as well as specific phobias. Social skills were measured through the parent-reported Social Skills Rating System. A random intercept cross-lagged panel model was used to analyze the data, adjusting for observed time-variant covariates (emotion regulation, secure attachment, bullying victimization, and global self-esteem) and all unobserved time-invariant confounding effects. **Results:** Reduced social skills predicted increased symptoms of anxiety at ages 8, 10, and 12 ($\beta = -.26$, $\beta = -.17$, and $\beta = -.15$, respectively), whereas an increased number of anxiety symptoms did not forecast changes in social skills. **Conclusions:** The findings suggest that reduced social skills may be involved in the development of anxiety symptoms in middle childhood and should, therefore, be considered in efforts to prevent and treat childhood anxiety. **Keywords:** Adolescence; anxiety disorders; random intercept cross-lagged panel model; longitudinal; social skills.

Introduction

As one of the most prevalent psychiatric disorders in children and adolescents, anxiety disorders have a lifetime prevalence of 32% (Merikangas et al., 2010). They are often persistent (Steinsbekk, Ranum, & Wichstrøm, 2021) and associated with a range of negative repercussions, including poor academic achievement (de Lijster et al., 2018), peer rejection (Chiu, Clark, & Leigh, 2021), low self-esteem (Sowislo & Orth, 2013), physical complaints (Ginsburg, Riddle, & Davies, 2006), sleeping difficulty (Alfano, Ginsburg, & Kingery, 2007), and a higher rate of other mental health problems (Gotham, Brunwasser, & Lord, 2015). Existing evidence indicates a probable effect of psychotherapy on anxiety in the short term, whereas any long-term effect is uncertain (James, Reardon, Soler, James, & Creswell, 2020). Hence, there is a need for more effective interventions. We argue that such interventions should be based on etiological knowledge.

A considerable body of studies has found difficulties in social interaction to be associated with social anxiety (McClure & Nowicki, 2001; Pickard, Rijdsdijk, Happé, & Mandy, 2017), but relational difficulties have also been found to be involved in other types of anxiety, such as generalized anxiety (Scharfstein, Alfano, Beidel, & Wong, 2011) and separation anxiety (Vaughan, Coddington, Ahmed, & Ertel, 2017). According to evidence, the absence of

age-appropriate abilities for effectively managing social tasks, that is, low social skills (Rose-Krasnor, 1997), may play an etiological role in childhood anxiety. Social skills encompass abilities such as cooperation, empathy, assertiveness, and self-control (Cheung, Siu, & Brown, 2017). Indeed, social skills training is often included as a part of effective treatments for anxiety (James et al., 2020). Alternatively, children with symptoms of anxiety are more likely than others to withdraw from social contact (Kingery, Erdley, Marshall, Whitaker, & Reuter, 2010) and may have fewer opportunities to practice their social skills, potentially causing a decline in social competencies (de Lijster et al., 2018). Hence, anxiety may hamper the development of social skills (Motoca, Williams, & Silverman, 2012). Such potential bidirectionality between anxiety and social skills has not been examined, except for social anxiety. Although research lends some support to the notion that limited social skills might be involved in the emergence and continuity of anxiety in children (Pickard, Happé, & Mandy, 2018) and vice versa (Duvekot, Ende, Verhulst, & Greaves-Lord, 2018), a variety of issues limit the conclusions that can be drawn from these studies. To illustrate: (a) there is evidence that children with autism spectrum disorder (ASD) have social and communication difficulties that predict future anxiety (Duvekot et al., 2018). However, findings from clinical samples may not generalize to the general population, and the severe difficulties of children on the autism spectrum likely tap into

Conflict of interest statement: No conflicts declared.

only a small part of the wide construct of social competence, including moderate problems and behavior at the skillful end of the continuum. The ASD—as well as its subclinical forms—manifest as reduced social skills, as empirical research has repeatedly shown (Ke, Whalon, & Yun, 2018). In addition, autistic traits confer risks for anxiety symptoms (Jolliffe, Adams, & Simpson, 2022; Pickard et al., 2017). A prospective test is needed to determine whether the effects of autistic traits on anxiety are mediated by reduced social skills, or whether autistic traits serve as confounders, producing spurious relationships between the two. (b) Some studies have found that low social competence predicts later internalizing problems (Bornstein, Hahn, & Haynes, 2010). Although anxiety is a part of the internalizing spectrum, poor social competence may relate differently to different types of internalizing behavior (Mesman, Bongers, & Koot, 2001). Thus, conclusions concerning whether deficiencies in social skills specifically predict anxiety are uncertain. (c) Some longitudinal studies have reported that difficulties with social skills are more often found among those with a high and increasing trajectory of anxiety disorders (Letcher, Sanson, Smart, & Toumbourou, 2012), particularly social anxiety (Miers, Blöte, de Rooij, Bokhorst, & Westenberg, 2013). However, given the possibility that anxiety might impede social skills, associations between social competence and future and concurrent anxiety levels/trajectories cannot shed light on the order of effects. In sum, the impact of reduced social skills on increased anxiety has not been directly tested, and it will, therefore, be examined herein.

All the above studies have asked whether children who have higher social competence than *other* children will have less anxiety than *other* children in the future, thus blending between- and within-person information. However, for the clinician, the crucial question is whether *increased* social skills will predict a future decrease in anxiety symptoms *in that specific person*. By applying a within-person approach and thereby having children act as their own controls, we test the hypothesis that decreased social skills predict increased symptoms of DSM-5-defined anxiety disorders. We also examine the opposite direction of effects, that is, whether changes in anxiety level predict changes in social skills. Although a within-person approach will adjust for all time-invariant confounding effects (Mulder & Hamaker, 2021), the relationship between social skills and anxiety may still be impacted by time-varying confounders. Therefore, we adjust for a range of likely candidates, namely, attachment to parents (Lam, Rai, & Lam, 2019), global self-esteem (Sowislo & Orth, 2013), emotion regulation (Everaert & Joormann, 2019), and bullying victimization (Kaloeti, Manalu, Kristiana, & Bidzan, 2021).

Acknowledging that there are substantial changes in the types and prevalence of anxiety during childhood and adolescence (Steinsbekk et al., 2021) and that social competence increases during this period (Arnold & Lindner-Müller, 2012), we examine the possibility of developmental differences in the importance of social skills to anxiety (and vice versa); however, given the lack of prior evidence, we remain open to whether and when predictions are the strongest.

Materials and methods

Procedure and participants

Enclosed with the invitation to a regularly scheduled community health screening for 4-year-olds was a letter inviting the 2003–2004 birth cohorts and their parents in Trondheim, Norway ($N = 3,456$) to participate in the Trondheim Early Secure Study-TESS (Steinsbekk & Wichstrøm, 2018). The letter also contained the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), a screener for children's emotional and behavioral problems. Of the 3,358 parents presenting at the well-child clinic, 2,477 (82.2% of those eligible) consented to participate (176 were excluded due to inadequate language proficiency, and 166 did not receive an invitation by mistake). The SDQ scores of the children were used to divide them into four strata in order to improve variability and thus power (cutoff points of 0–4, 5–8, 9–11, and 12–40). Those with higher scores had a higher probability of being selected for the study (.37, .48, .70, and .89 in each stratum), yielding a sample of 1,250 families, from whom we were able to obtain information from 1,007 at the first wave (T1; $M_{age} = 4.7$, $SD = .3$; 50.9% girls). Children were subsequently assessed at ages 6 (T2; $n = 795$; $M_{age} = 6.72$, $SD = .17$; 49.8% girls), 8 (T3; $n = 699$; $M_{age} = 8.8$, $SD = .24$; 51.1% girls), 10 (T4; $n = 702$; $M_{age} = 10.51$, $SD = .17$; 52.3% girls), 12 (T5; $n = 668$; $M_{age} = 12.49$, $SD = .15$; 51.9% girls), and 14 (T6; $n = 628$; $M_{age} = 14.33$, $SD = .59$; 53.0% girls). Analytical samples consisted of participants who had valid information from at least one time point ($n = 1,043$). Most children (91.0%) were of Norwegian origin; 5.8% were from Europe, the USA, Canada, Australia, or New Zealand; 3.2% were from Africa, Latin America, or Asia. The Regional Committee for Medical and Health Research Ethics of Mid-Norway approved the study. Parents were informed about the TESS by nurses and provided written consent to participate.

Measures

Anxiety symptoms. Anxiety symptoms at ages 4 and 6 were assessed by the Preschool Age Psychiatric Assessment (PAPA; Egger et al., 2006), which is a semistructured parent interview. At ages 8, 10, 12, and 14, parents and children were interviewed separately with the corresponding and age-appropriate Child and Adolescent Psychiatric Assessment (CAPA; Angold & Costello, 2000). Children and families were interviewed by trained interviewers with a BA or higher in related fields and extensive experience working with children and families. The PAPA and CAPA contain mandatory questions and optional follow-ups, and interviewers continue to probe until a decision can be made whether a symptom is present, either reported by the child or the parent. A 3-month primary period was employed, and the onset, duration, and intensity of symptoms were recorded. The number of symptoms of separation anxiety (range = 0–8), social anxiety (range = 0–2), and generalized anxiety disorder (range = 0–6) as well as the number of specific phobias (range = 0–7) was

recorded. Blinded coders recoded recordings of 88 PAPA and 279 CAPA interviews, yielding intraclass correlation coefficients (ICCs) of the number of anxiety disorder symptoms on the PAPA and CAPA of .83 and .86, respectively.

Social skills. The preschool version of the Social Skills Rating System (SSRS) was used to assess social skills (Gresham & Elliott, 1990) at ages 4 and 6 (39 items; $\alpha = .89$ and .93 at T1 and T2, respectively) and the elementary version at ages 8 and 10 (38 items; $\alpha = .93$ and .92 at T3 and T4, respectively). The Social Skills Improvement System (SSiS) (Gresham & Elliott, 2008), which is a further development of the SSRS, was used at ages 12 and 14 (46 items; $\alpha = .96$ at both T5 and T6). The SSRS assesses cooperation, assertiveness, self-control, and responsibility, whereas the SSiS also measures communication, empathy, and engagement. Parents rated all items of the Norwegian versions on a 4-point scale (from 1 = “never” to 4 = “very often”). The mean total scores were computed, where higher scores indicate greater social skills.

Covariates

Secure attachment. At ages 4 and 6, attachment was measured by the Manchester Child Attachment Story Task (MCAST; Green, Stanley, Smith, & Goldwyn, 2000), which identifies children’s representations and behavioral manifestations of attachment by means of a narrative story tool that applies doll vignettes, that are played out in a doll’s house using a child doll (representing the child) and a parent doll (representing the parent accompanying the child to the testing). At ages 10, 12, and 14, the Middle Childhood Attachment Strategies Coding System (MCAS; Brumariu, Kerns, Bureau, & Lyons-Ruth, 2013) was used for children to assess behavioral manifestations of attachment patterns involving three tasks (warm-up, conflict task, and vacation planning) for parent-child pairs. MCAS and MCAST interviewers were trained and certified by the creators of the tests. A detailed description of the attachment measures is displayed in Appendix S1.

Bullying victimization. The child’s primary teacher reported on the 5-item Olweus Bully Victim Questionnaire (OBVQ; Solberg & Olweus, 2003) at ages 6 to 14 to record direct and indirect forms of bullying during the previous 3 months. These items are rated on a five-point Likert scale (1 = never, 2 = rarely, 3 = 1–3 times a month, 4 = 1–4 times a week, and 5 = every day). Cronbach’s alpha values varied between .66 and .79 from T2 to T6.

Emotion regulation. The Emotional Regulation Checklist (ERC) was completed by the primary teacher of the children (Shields & Cicchetti, 1997); this 24-item measure of emotion regulation consists of two subscales: emotion regulation and lability/negativity (L/N). Responses are given on a 4-point scale ranging from 1 (almost always) to 4 (never). We used the L/N subscale since it refers to the lack of flexibility, promptness, and unpredictability of mood change in reaction to emotional antecedents (15 items; $\alpha = .79$ to .85 at different ages).

Self-esteem. To assess global self-esteem, the Self-Description Questionnaire I (SDQ-I) (Marsh, Barnes, Cairns, & Tidman, 1984), which is appropriate for primary school students, was administered at ages 6, 8, and 10. The 8-item SDQ-I global self-esteem scale was applied and rated on a 5-point Likert scale (1 = wrong to 5 = true). Cronbach’s alphas for the SDQ-I ranged from .82–.87 at ages 6, 8, and 10. At ages 12 and 14, the corresponding age-appropriate 5-item global self-

worth scale of the Revised Self-Perception Profile for Adolescents (SPPA-R; $\alpha = .79$ –.84) was applied (Harter, 1988; Wichstrøm, 1995) using a 4-point scale, ranging from 1 = “describes me very poorly” to 4 = “describes me very well”.

Autism Spectrum disorder. The PAPA (but not the CAPA) contains questions pertaining to the B-criteria for the ASD as follows: (a) stereotyped or repetitive motor movements, use of objects, or speech (11 questions; e.g., body rocking, hand flapping, spinning, echolalia, or clanging); (b) insistence on sameness and inflexibility (5 questions, e.g., difficulty with transitions, unusual habits); (c) restricted, fixated interest with abnormal intensity or focus (3 questions, i.e., repetitive and static play, preoccupation with parts of toys or other objects, unusual and special interests); (d) hyper- or hyporeactivity to sensory input (9 questions, e.g., oral hypersensitivity – tactile defensiveness in response to contacts with certain food textures, sensory hyposensitivity). Additionally, it includes some A-criteria (4 questions, e.g., prefers to play alone, difficulties in making friends, avoids eye contact). A symptom count was computed at T2, the only time point at which ASD symptoms, anxiety and social skills were all measured.

Statistical analysis

To examine whether changes in social skills predicted changes in anxiety symptoms (and vice versa) and thus adjusted for all unmeasured time-invariant confounding effects and covariates (emotion regulation, secure attachment, bullying victimization, global self-esteem) (conceptual model, Figure 1), we fitted a random intercept cross-lagged panel model (RI-CLPM; Mulder & Hamaker, 2021) using Mplus Version 8.7 (Muthén & Muthén, 1998–2020). In doing so, latent random intercepts loading on social skills, anxiety symptoms, and each of the covariates were included to capture time-invariant between-person differences, with factor loadings set to 1. These random intercepts were allowed to correlate. For each observed variable, a corresponding latent variable was created with a factor loading of 1 and variance in the observed variable set to 0, thereby transferring the variance from the observed to the latent variable. In effect, the latent variable thus captured each child’s deviation from her or his mean level of the variable in question. At all time points except T1, these latent variables were regressed on all latent variables at the previous time point, and concurrent latent variables were allowed to correlate. Note that secure attachment was not assessed at the third time point (T3). Therefore, T4 variables were regressed on T2 attachment. Because emotion regulation, global self-esteem, and bullying victimization were not measured at T1, the T1 values of these variables were not included in the model.

To estimate parameters, a robust maximum likelihood estimator and robust standard errors (MLR) were employed, as well as a full information maximum likelihood (FIML) estimator to account for missing data. Due to the oversampling of children with emotional and behavioral problems, to obtain correct estimates of the population, a population weight corresponding to the number of children in the population divided by the number of cases in each stratum was applied. Because of severely right-skewed distributions, bullying victimization and anxiety symptoms were log-transformed.

To test whether there were developmental differences in cross-lagged paths between social skills and symptoms of anxiety (i.e., whether the strengths of the associations differed by age), models where these paths were freely estimated were compared to models where they were fixed to be equal using the Satorra-Bentler scaled chi-squared test (Satorra & Bentler, 2001). We set a statistical significance threshold at a two-tailed p value equal or less than .05. Because multiple paths

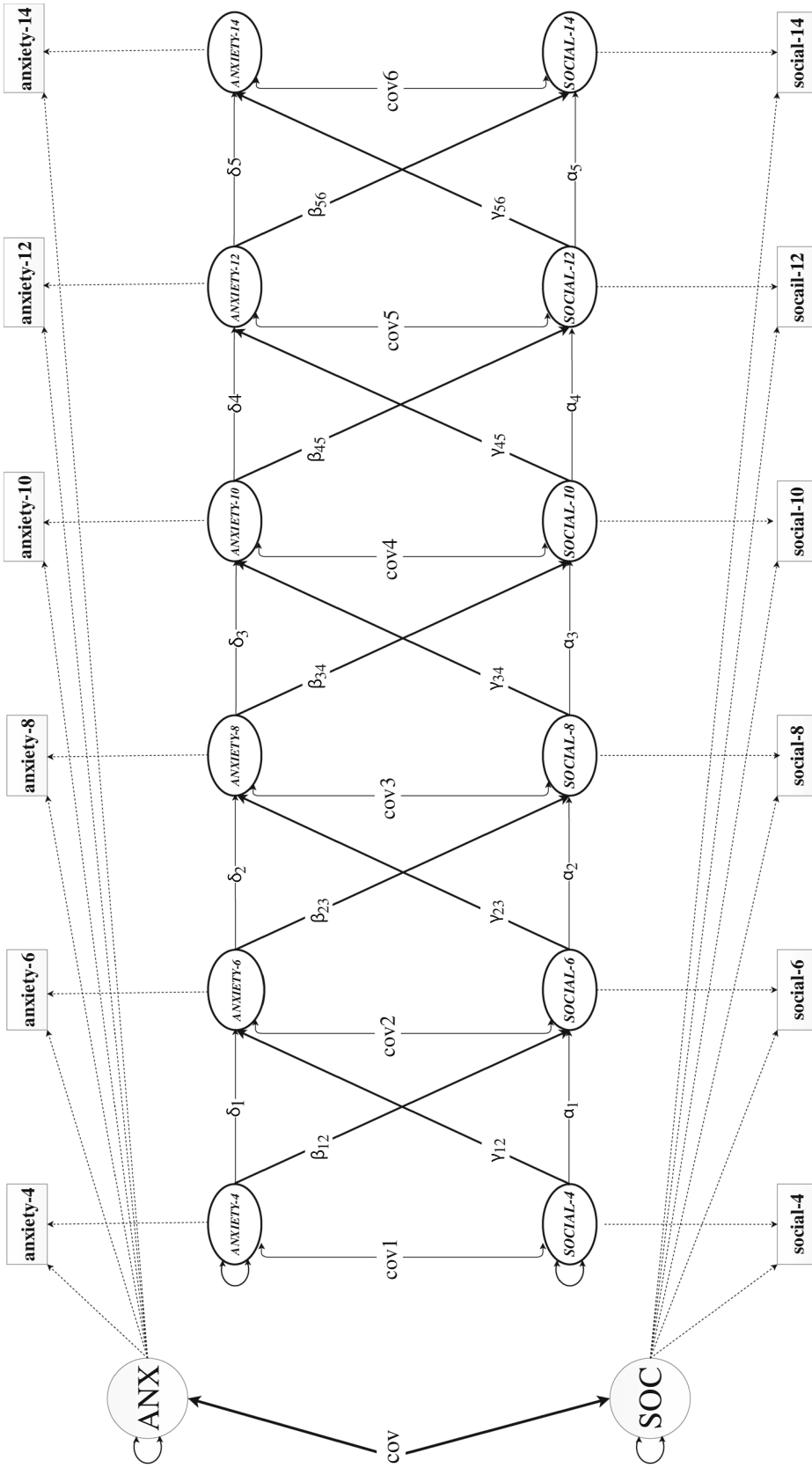


Figure 1 Conceptual model: Random intercept cross-lagged panel model between social skills and symptoms of anxiety disorders. All analyses adjusted for time-varying covariates, including emotion regulation, secure attachment, bullying victimization, and global self-esteem. To minimize complexity, the covariates included in our conceptual model are not shown. [Corrections made on 31 March 2023, after first online publication: Figure 1 has been corrected in this version to include the latent arrows.]

were examined, p values between .01 and .05 should be interpreted with caution.

Results

Descriptive statistics and bivariate correlations are presented in Table 1. Overall, lower social skills were cross-sectionally associated with more anxiety symptoms across all ages, except for certain ages (4 to 6 and 12 to 14), for which the association was nonsignificant.

At T2, the number of ASD symptoms ($M = 1.03$, $SD = 2.28$) was correlated with the number of anxiety symptoms, $r = .28$, $p < .001$, and social skills, $r = -.16$, $p < .001$. To determine whether ASD symptoms acted as a confounder in the relationship between social skills and prospective symptoms of anxiety disorders, anxiety symptoms at T3 were first regressed on such symptoms at T2 and social skills at T2 while also adjusting for all covariates at T2 (T2 was the only time point at which all these variables were measured). In this model, social skills predicted future anxiety symptoms, $\beta = -.14$, $p = .001$ after adjustment for covariates other than ASD. The effect of ASD symptoms on prospective anxiety symptoms after adjusting for all covariates except social skills was $\beta = .10$, $p = .026$. However, after adjustment for social skills, the direct effect of ASD did not predict future anxiety symptoms, $\beta = -.07$, $p = .136$, whereas the effect of social skills on future anxiety symptoms remained unchanged ($\beta = -.13$, $p = .005$); thus, ASD did not act as a confounder. Instead, the effect of ASD on anxiety was mediated through lower social skills.

The RI-CLPM fit the data well ($\chi^2(264) = 365.92$, $p = .001$, $RMSEA = .022$, $SRMR = .047$, $CFI = .96$, $TLI = .92$). Reduced levels of social skills at ages 6, 8, and 10 years predicted increased symptoms of anxiety 2 years later (Figure 2). These predictions were not seen in early childhood and adolescence. To test whether these seeming developmental differences were significant, the above model was compared to a model in which all paths from social skills

to anxiety were set to be equal. This latter model fit the data worse than the freely estimated model ($\Delta\chi^2 = 15.79$, $df = 4$, $p = .003$), suggesting significant developmental differences. To establish whether this difference was present between middle childhood and the other two periods, that is, early childhood and adolescence, a model in which the paths from social skills to anxiety at ages 8, 10, and 12 were set as equal and the paths to anxiety at ages 6 and 14 were set as equal was examined. This model did not have a worse fit than the fully freely estimated model ($\Delta\chi^2 = 3.28$, $df = 3$, $p = .35$), indicating that the paths from social skills to anxiety in middle childhood were indeed different from the corresponding paths in early childhood and adolescence (see Table S1). Even so, anxiety at age 14 was still predicted by reduced social skills at age 10 through the impact of social skills on anxiety at age 12 and thereafter the stability of anxiety from age 12 to 14 (mediation effect: $\beta = -.05$, 95% CI = $-.07$ to $-.02$, $p = .002$). As depicted in Figure 2, increased anxiety did not forecast a reduction in social skills; thus, no evidence for a reverse direction of influence was detected. See Table S2 for the prediction from the covariates to symptoms of anxiety. According to the within-person analysis, increased levels of bullying victimization at age 12 ($\beta = .13$, 95% CI = $.02$ to $.24$, $p = .026$) predicted increased levels of anxiety at age 14. Decreased levels of emotion regulation at ages 6 ($\beta = -.14$, 95% CI = $-.23$ to $-.04$, $p = .006$) and 10 ($\beta = -.10$, 95% CI = $-.19$ to $-.01$, $p = .041$) as well as increased levels of secure attachment at age 10 ($\beta = .11$, 95% CI = $.03$ to $.19$, $p = .009$) predicted increased social skills 2 years later; however, not at other ages and/or for other covariates (see Table S2).

Discussion

We tested whether reduced social skills predict increased symptoms of DSM-5-defined anxiety disorders across ages 4 to 14 and vice versa after controlling for time-varying covariates and all

Table 1 Bivariate correlation coefficients between social skills and anxiety symptoms as well as descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	M	SD
1. AN ₄ ($n = 1,021$)	1											.39	.51
2. AN ₆ ($n = 793$)	.10	1										.52	.57
3. AN ₈ ($n = 699$)	.28***	.31***	1									.55	.56
4. AN ₁₀ ($n = 702$)	.28**	.20***	.41***	1								.62	.60
5. AN ₁₂ ($n = 663$)	.27**	.26***	.35***	.47***	1							.59	.62
6. AN ₁₄ ($n = 627$)	.11*	.15*	.24***	.24***	.50***	1						.72	.66
7. SS ₄ ($n = 895$)	-.08	-.03	-.04	-.06	.03	-.01	1					2.59	.26
8. SS ₆ ($n = 751$)	-.11*	-.13**	-.19***	-.16***	-.11*	-.09	.62***	1				2.78	.31
9. SS ₈ ($n = 655$)	-.12**	-.15**	-.19***	-.20***	-.16***	-.06	.52***	.72***	1			2.91	.36
10. SS ₁₀ ($n = 691$)	-.13**	-.08	-.14**	-.25***	-.18***	-.15**	.49***	.67***	.77***	1		2.94	.35
11. SS ₁₂ ($n = 652$)	-.11*	-.14*	-.15**	-.20***	-.25***	-.14*	.32***	.54***	.61***	.71***	1	3.27	.36
12. SS ₁₄ ($n = 614$)	-.10*	-.12*	-.11*	-.23***	-.22***	-.19**	.41***	.55***	.60***	.69***	.74***	3.26	.35

The subscript numbers (e.g., 4) indicate participant age at a given time points. AN, symptoms of anxiety; M , mean; n , sample size in each wave; SD , standard deviation; SS, social skills. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

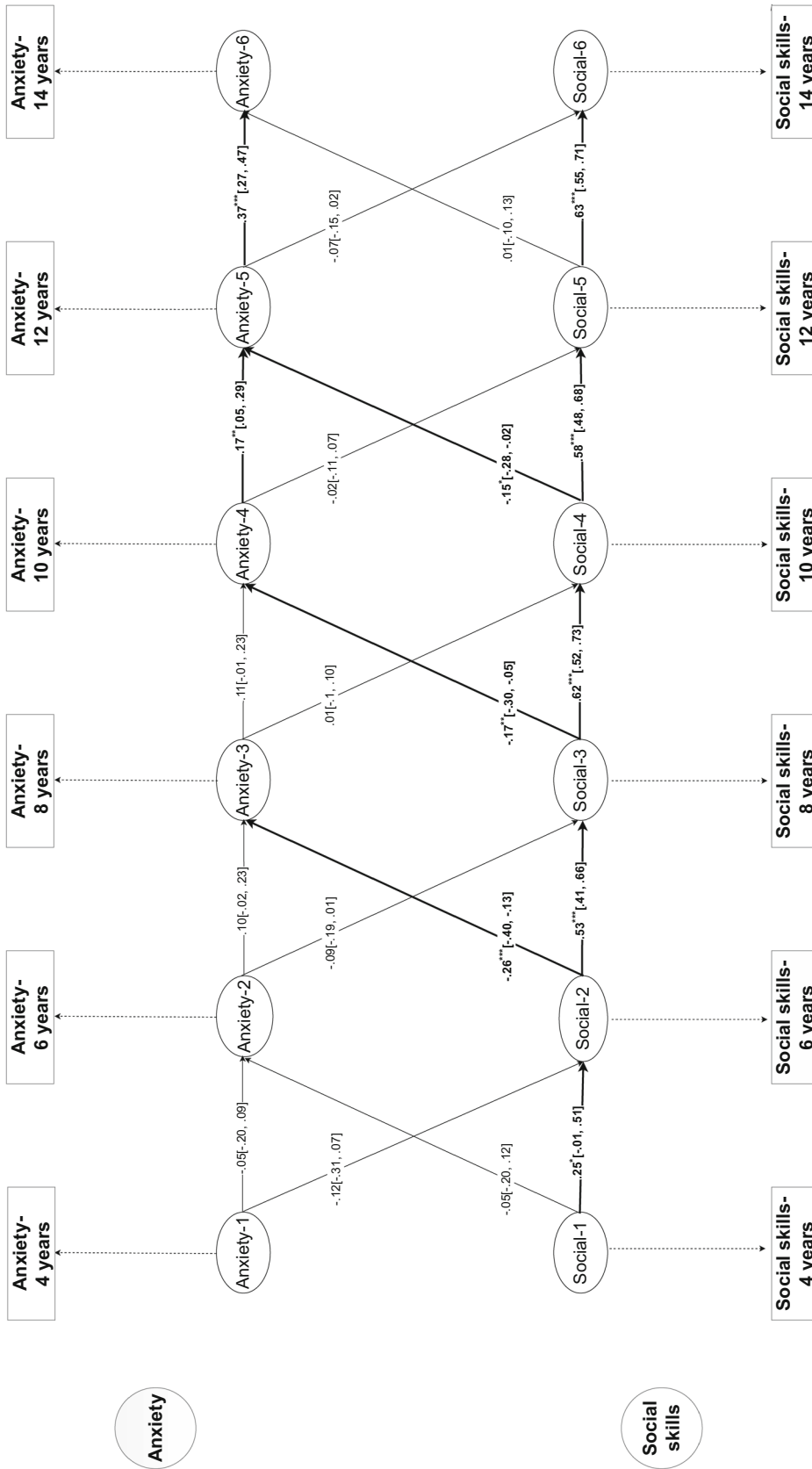


Figure 2 Random intercept cross-lagged panel model of the symptoms of anxiety disorders and social skills. All analyses adjusted for the following time-varying covariates: emotion regulation, secure attachment, bullying victimization, and global self-esteem. All coefficients are standardized; significant paths are shown in bold. * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

unmeasured time-invariant effects of potential confounders.

Our main hypothesis—that decreased social skills would predict increased symptoms of anxiety—was partly supported, as this relationship was found for anxiety symptoms appearing in middle childhood but not earlier or later. The present study was not designed to determine the mediating mechanisms through which reduced social skills might increase proneness to anxiety, but as the included covariates (emotion regulation, secure attachment, bullying victimization, and global self-esteem) did not predict anxiety, likely candidates should be sought elsewhere. For example, children with diminished social skills tend to have poor social performance (Jonsson et al., 2019), which may lead to peer rejection (Crawford & Manassis, 2011) and a lack of self-efficacy in social interactions, which, in turn, may contribute to the development of and/or increase in anxiety symptoms (Rapee & Spence, 2004).

Of note, we found no predictive role of social skills during preschool ages on later anxiety. In a study of children aged 4–10 (Butler, 1989), the author reported that social comparisons were associated with high levels of evaluative anxiety, but only among children aged 9 and 10 and not in younger children. Through a series of developmental stages, children gain self-awareness and self-evaluation skills (Buunk & Gibbons, 2000). Compared with preschoolers, school-aged children are more likely to experience increased peer interaction, wider friendship networks, and higher pressure to perform well (Cremeens, Eiser, & Blades, 2007). As children grow, they might become more inclined to draw comparisons with peers who are more socially competent (Dijkstra, Kuyper, van der Werf, Buunk, & van der Zee, 2008), due to increased cognitive capacities in combination with the school environment, which affords many peers with whom children can contrast themselves. Thus, older children are possibly more likely than younger children to evaluate their abilities through (upward) social comparisons. By default, most children will fall short of such upward comparison, and the resulting feelings of inferiority (Burleson, Leach, & Harrington, 2005) and a lack of self-efficacy (Xing, Yao, Zhu, Li, & Liu, 2022) may, in turn, cause more worry and anxiety (Mitchell & Schmidt, 2014). Studies have shown that children who receive social skills training (James et al., 2020) are less likely to experience several forms of anxiety. Socially skilled children tend to be confident, self-aware, self-controlled, empathic, cooperative, and self-sufficient (Little, Swangler, & Akin-Little, 2017). Hence, they will be able to overcome the adverse effects associated with social comparisons, such as anxiety. However, future research involving additional measures of potentially mediating mechanisms between social skills and anxiety is needed to shed light on any developmental differences in effects.

Furthermore, although no predictive role of social skills on later anxiety during adolescence was observed, we found evidence that anxiety at age 12 mediated the relationship between social skills at age 10 and anxiety at age 14. As children approach adolescence, the stability of anxiety increases at the within-person level (Steinsbekk et al., 2021). Hence, for many children, social skills may contribute to anxiety that first emerges during middle childhood, whereas strategies to cope with this anxiety (e.g., avoidance) might contribute to the anxiety continuing or increasing into adolescence. However, measures of how children are coping with their anxiety are needed to substantiate these assumptions.

Contrary to our expectations, increased anxiety did not predict reduced social skills, suggesting that the relationship is one way. As previously demonstrated (Pickard et al., 2017), increased social anxiety symptoms did not predict increased social and communication difficulties in a population-based cohort study of children at ages 7, 10, and 13. Generally, anxious children tend to be neglected rather than rejected by their peers (Scharfstein et al., 2011). Although anxiety can result in fewer close friendships, poorer quality of social interactions with peers, and a decreased likelihood of receiving positive responses from peers (Crawford & Manassis, 2011; Scharfstein et al., 2011), children with anxiety may still have daily interactions with their parents, siblings, teachers and friends. These interactions may give children enough opportunities to practice their social skills, potentially explaining why increased anxiety does not forecast reduced social skills.

Limitations

This study has several strengths, including its examination of symptoms of anxiety using DSM-5-based clinical interviews, its inclusion of a representative cohort sample spanning preschool to adolescence, and its use of strong analytical methods to adjust for time-invariant confounding factors as well as time-varying covariates. However, we acknowledge some limitations. First, the prevalence of anxiety symptoms (Asnaani, Richey, Dimaite, Hinton, & Hofmann, 2010), the development of social skills (Edwards, de Guzman, Brown, & Kumru, 2006), and their relationships (LaFreniere et al., 2002) differ across ethnic and racial groups. Thus, the homogeneity of the current sample limits the generalizability of the findings to non-Western countries and ethnicities. Second, the assessment of anxiety at ages 4 and 6 relied on parent reports. Although child reports of anxiety were included from age 8 and concurrent anxiety was adjusted for, our prospective findings involving parent-reported social skills might be subject to common rater effects. However, to the extent that such rater effects have trait-like components, they were

adjusted for in the analyses through the time-invariant factors. Third, we counted the symptoms of four anxiety disorders. Three of these disorders have a similar number of DSM-5-described symptoms, whereas social anxiety has just two symptoms. Hence, social anxiety was underrepresented in our composite measure. Moreover, we conceptualized anxiety as a continuous construct. Therefore, despite the lack of evidence for the idea that anxiety disorders are naturally categorical (Haslam, Holland, & Kuppens, 2012), our results cannot be generalized to diagnostically defined anxiety disorders. Fourth, measures of autistic traits were limited to those included in the PAPA. Several ASD A-criteria (deficits in social communication and interaction) were not included in the PAPA. Even though the effect of the measured aspects of ASD on future anxiety was mediated by reduced social skills, and ASD did not confound the relationship between social skills and anxiety, we do not discount the possibility that an ASD measure including more comprehensive assessment of the social interaction and communication problems in ASD might reveal—at least to some extent—a confounding effect. We also cannot confirm that none of these ASD-associated social difficulties were captured by our social skills measure (rather than our measure of ASD); if so, the prospective relation between reduced social skills and increased anxiety may be due to increased autistic traits. However, even if a more comprehensive measure of ASD was included in the present study, our within-person analysis adjusted for all time-invariant effects of all unmeasured potential confounders. Even though autistic traits trajectories in community-dwelling children evince some heterogeneity in development through childhood (Pender et al., 2021), there is also considerable overall stability, approaching the internal consistency of the measures used (e.g., Haraguchi et al., 2019). Thus, any consistent confounding effects of autistic traits on the relation between social skills and anxiety would have been adjusted for by our within-person design, resulting in potential influences of only smaller variations in ASD.

Conclusions

The present study found a one-way relationship between social skills and anxiety: Increased social skills predicted reduced anxiety in middle childhood but not vice versa. Deficiencies in social skills may thus be involved in the etiology of anxiety in middle childhood, whereas anxiety may not hinder the development of appropriate social skills. Most

preventive programs aimed to improve social skills target preschoolers (Werner-Seidler et al., 2021), but we found that the period where childhood social skills might be involved in increasing symptoms of anxiety was from ages 8 to 12. Consequently, while this finding has yet to be replicated, the present results support the notion of including social skills training in the prevention and treatment of anxiety symptoms, particularly in middle childhood.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Table S1. Developmental changes analysis for the RI-CLPM: Fit indices for freely estimated and constrained models for children aged 4 to 14.

Table S2. RI-CLPM's cross-lagged path estimates from time-varying confounding factors to latent factors of anxiety symptoms and social skills.

Appendix S1. A detailed description of the Manchester Child Attachment Story Task (MCAST) and the Middle Childhood Attachment Strategies Coding System (MCAS).

Acknowledgements

This work was funded by the Research Council of Norway (grant number ES611813) and by a grant from the Liaison Committee between Central Norway RHA and NTNU. The authors thank all the children, parents, teachers in Trondheim who participated in the project.

Author Contributions are as follows: M.H.A. involved in conceptualization, methodology, software, formal analysis, investigation, data interpretation, draft of the results section, data curation, writing the original draft, review and editing, visualization, review and approval of the final draft. S.S. involved in conceptualization, methodology, investigation, resources, review and editing, supervision, project administration, funding acquisition, review, and approval of the final draft. L.W. involved in conceptualization, methodology, software, formal analysis, investigation, resources, data curation, review and editing, supervision, project administration, funding acquisition, review, and approval of the final draft. All authors have read and agreed to the published version of the manuscript. The authors have declared that they have no competing or potential conflicts of interest.

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Key points

- Research indicates that childhood anxiety is correlated with difficulties in social interaction, but the impact of social skills on the development of anxiety (and vice versa) remains unknown.
- The prospective relation between symptoms of anxiety disorders and social skills was examined in a cohort of Norwegian children assessed at the ages of 4, 6, 8, 10, 12, and 14 years.
- Reduced social skills predicted increased symptoms of anxiety disorders in middle childhood; thus, social skills should be considered in efforts to prevent and treat childhood anxiety.
- Anxiety symptoms did not impede the development of social skills.
- To prevent and treat childhood anxiety, efforts should be made to improve social skills during middle childhood.

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Accepted for publication: 26 January 2023