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Involvement in bullying and depression in a 2-year follow-up in middle adolescence

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Abstract The main objective was to analyse whether involvement in bullying at school predicts depression, and whether depression predicts involvement in bullying in middle adolescence. A total of 2,070 15-year-old girls and boys in two Finnish cities were surveyed at ninth grade (age 15) at schools, and followed up 2 years later in the Adolescent Mental Health Cohort Study (AMHC). Depression was measured by a Finnish modification of the 13-item short Beck Depression Inventory. Involvement in bullying was elicited by three questions focusing on being a bully, being a victim to bullying, and being left alone by peers against one's wishes. Similar questions were posed at both time points. Statistical analyses were carried out using cross-tabulations

with chi-square/Fisher's Exact Test statistics, and logistic regression. The results summarized that, both being a victim to bullying and being a bully predicted later depression among boys. Among girls, depression at T1 predicted victimisation at T2. Depression at T1 predicted experience of being left alone at T2 among both sexes. It was concluded that victimisation to bullying may be a traumatising event that results in depression. However, depression also predicts experience of victimisation and of being left alone against one's wishes. Depression may impair an adolescent's social skills and self-esteem so that the adolescent becomes victimised by peers. However, depression may also distort and adolescent's experiences of social interactions.

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Introduction

Bullying at school is defined as aggressive behaviour where one or more pupils purposefully intend to harm the victim psychologically, verbally or physically, repeatedly over-time, and in a situation where there is a power imbalance between the victim and the bully/bullies [28, 39, 42]. Bullying may involve different forms of aggressive behaviours, from calling names, spreading rumours and saying nasty things to taking the victim's belongings and physical violence [15, 39]. Bullying may also involve exclusion from social interaction [15], and it has been suggested that this is a particularly typical form of bullying among girls [44]. A total of 10–20% of children and adolescents are frequently involved in bullying, either as victims, as bullies or as both, and boys are involved more than girls, younger subjects more than older [7, 23, 29, 36, 39, 46, 58].

In cross-sectional studies being subjected to bullying has been associated with psychosomatic complaints, low self-esteem, symptoms of depression and anxiety, and suicidal ideation and attempts [7–9, 16, 23, 25, 26, 29, 31, 49, 59] but also with violence-related behaviours [36, 38] and predisposition to psychotic experiences [10]. Being a bully has been associated with disruptive disorders, understandably, as being a bully is aggressive behaviour characteristic of disruptive disorders, but also with depression, anxiety, psychosomatic symptoms and suicidality [19, 23, 25, 26, 29, 36, 38, 39, 48, 49, 52], while some authors have suggested that being a bully has no association with depression or psychosomatic symptoms [16]. Many studies have found similar associations between involvement in bullying and psychosocial maladjustment in boys and girls [17, 23, 25, 38], yet others have not targeted gender differences at all [10, 16, 19, 36]. Gender difference suggesting stronger associations between victimisation and suicidal ideating in girls was reported by Kim et al. [26], whereas Nansel et al. [39] found evidence for stronger associations between victimisation and problems in psychosocial adjustment for boys.

In victims of bullying, depression could be a consequence of victimisation, brought about by traumatisation and through lowering of self-esteem. On the other hand, it is also possible that depressed adolescents become victims of bullying due to inept social behaviour and lack of self-esteem, and inability to defend themselves due to depression. Finally, experience of being bullied could also reflect the negative attributions the depressed adolescent gives to the behaviours of others, and not actually deliberate aggression displayed by the others. Among bullies, depression could be an underlying problem with bullying representing acting out, or depression could result from being disliked by peers.

Follow-up studies have suggested that victimisation to bullying is followed by emotional, behavioural and psychosocial problems among children [21, 33]. Other studies have shown that children with internalising and externalising problems are more likely to later become victims of bullying [8, 22]. Hodges and Perry [22] and Sweeting et al. [56] particularly concluded that associations between bullying and internalising and social problems were reciprocal. This was also suggested by Sourander et al. [53] in a follow-up from childhood to adolescence. In a preadolescent sample, Fekkes et al. [17] showed that victimisation was followed by psychosomatic, depressive and anxiety symptoms. On the other hand, depression and anxiety, but not physical symptoms, predicted subsequent victimisation to bullying. Kumpulainen and Räsänen [32] found that victimisation in childhood, at age 8, predicted psychiatric symptoms at age 15.

Sourander et al. [55] followed up a cohort of boys from 8 to 18 years and demonstrated that victimisation in childhood was followed by anxiety disorders in late adolescence, and being a bully was predictive of antisocial personality disorder. In another study [54], victimisation in childhood was not predictive of criminality in late adolescence, but being a bully and being a bully-victim predicted later criminality. Finally, Klomek et al. [30] claimed that victimisation to bullying at age 8 did not predict depression or suicidality at age 18, whereas being a bully did.

Among adolescent samples, Barker et al. [2] studied developmental pathways in involvement in bullying, delinquency and self-harm, and suggested that victims are likely to become bullies, but bullies usually do not later become victims, and that being a bully predicted later delinquency. Being a bully-victim predicted delinquency in boys and self-harm in girls. Bond et al. [6] wrote that victimisation was predictive of depression and anxiety in girls, but that prior mental health problems were not predictive of victimisation. Kim et al. [27] showed that victimisation to bullying resulted in problems in social relationships, being a bully-victim was predictive of aggression, and externalising symptoms in general, and psychopathology was not predictive of involvement in bullying. No associations were detected between involvement in bullying and anxiety and depression in any direction. Sweeting et al. [56] reported that the associations between peer victimisation and depression were reciprocal in a study involving measurements at ages 11, 13 and 15; only among boys at age 15, their analyses revealed that depression rather predicted victimisation than vice versa. Thus, follow-up studies in adolescent samples so far leave the direction of causality open, and also suggest that some gender differences might exist in the causal relationship between involvement in bullying and depression in adolescence.

To summarise, evidence of the causal relationships between involvement in bullying and depression is scarce and contradictory. It has not been established whether involvement in bullying predicts subsequent depression, and whether this is true for being victim or for being a bully, or for both. On the other hand, a converse causal relationship with depression predicting future involvement in bullying, is also an open question. Finally, most studies on longitudinal associations between bullying and depression use childhood experiences and behaviours as risk factors. The incidence of depression peak in adolescence, and the relationships between social interactions (such as bullying) and depression are of particular interest in adolescence as well, given the importance of social relationships to adolescent development.

The aims of this study were to carry out an exploratory analysis in an adolescent population 2-year follow-up sample, on

- (1) whether involvement in bullying at age 15 predicts depression at age 17, and
- (2) whether depression at age 15 predicts involvement in bullying at age 17.

Materials and methods

The Adolescent Mental Health Cohort Study

The Adolescent Mental Health Cohort Study (AMHCS) is an ongoing follow-up study among an adolescent population sample conducted in two Finnish cities; Tampere (200,000 inhabitants) and Vantaa (180,000 inhabitants). The present samples consist of surveys at two waves (T1 and T2) during a 2-year follow-up conducted during the academic year 2002–2003 (T1) and during the academic year 2004–2005 (T2).

At T1 data were collected in a school survey completed by the ninth graders in all the Finnish-speaking secondary schools in the two cities. The students were identified from the school registers. A person-identifiable survey was completed during a school lesson under the supervision of a teacher. For students absent from school on the original survey day, another opportunity to participate was offered in the school within a couple of weeks. For students not present on either occasion the questionnaires were sent by post twice, after which it was concluded that the student was not willing to participate. The parents of the students were informed in advance by letter, but parental consent to participation was not required since the Finnish legislation on medical research allows a 15-year-old subject to decide alone. The procedure at T1 is described in detail in our previous report [47].

At T1 the ninth graders of the participating schools totalled 3,809, of whom 3,597 responded to the survey (response rate 94.4% at T1). Six respondents were excluded due to obvious facetiousness, and 313 respondents were excluded as they were completed by adolescents under 15-years-old. Thus, the initial sample at T1 was 3,278 students of whom 1,609 were girls (49.1%). The mean age at T1 was 15.5 (SD = 0.4).

Eligible participants at T2 data were students who had participated at T1. Multiple approaches were used to contact the adolescents at follow-up. School-based surveys like that at T1 were organised in upper secondary schools and vocational schools. Adolescents not reached through schools were contacted by postal survey. Finally, the same survey was offered by Internet to those who had not yet

responded via their schools or by post. The subjects of the present study were the 2,070 adolescents who completed the survey at both T1 and at T2. The response rate of the final sample was 63.1% (2,070/3,278). Of the respondents 56.4% (1,167) were girls.

Measures

Involvement in bullying

Involvement in bullying was elicited at T1 and T2 by two questions derived from the WHO youth health study [28]. An introduction specified bullying as follows: “We say a pupil is being bullied when another pupil, or a group of pupils, say or does nasty things to him or her. It is also bullying when a pupil is being teased repeatedly in a way she or he does not like. But it is not bullying when two pupils of about the same strength quarrel or fight.” Thereafter the respondents were asked how frequently they had been bullied during the ongoing school term, and how often they had bullied others. In addition to our earlier studies [23, 25] a third question was posed on how often the respondent had been left alone by peers against her/his wishes. The response alternatives for each question were: *many times a week, about once a week, less frequently* and *not at all*. In the analyses, the responses to the bullying questions were dichotomised to “many times a week or about once a week” (=frequent involvement) versus “less frequently or not at all”.

Depression

R-BDI, a Finnish modification [45] of the 13-item Beck Depression Inventory was used to assess depression at T1 and T2 [3]. The Beck Depression Inventory is a widely used scale with established validity and reliability in both adult and adolescent samples [4, 41]. The Finnish modification of the 13-item BDI showed good psychometric properties in a large population sample of adolescents [24]. The 13-items indicating different feelings, cognitions and physical symptoms related to depression were scored 0–3 (3 indicating the greatest severity) and the scores were summarized (theoretical range 0–39). A cut-off point of 8 indicates moderate to severe depression [3], and this was used to define caseness in the present study.

Covariates

Family structure

The adolescents were asked (T1), with whom they live: mother and father, mother and stepfather, father and stepmother, mother only, father only, with some other legal

guardian. For the analyses, family structure was dichotomised to “living with both parents” and “not living with both parents”. Of the girls, 72.4%, and of the boys, 74.1% ($P = 0.21$) reported living with both their parents at T1.

Parental education

Parental educational levels were ascertained by eliciting the highest level of education that the mother had completed and the highest level the father had completed. The alternatives were comprehensive school only/vocational school/college level/university degree. In the analyses, these were combined and dichotomised to “academic” and “non-academic” according to the better educated parent. Parental education was elicited at T1. Of the girls, 35.2%, and of the boys, 34.9% ($P = 0.50$) reported at least one parent with academic education.

Age

Age was calculated from dates of birth and time of the T1 survey, and used as a continuous variable. The mean (SD) age of the girls was 15.5 (0.36) years, of the boys 15.5 (0.36) years ($P = 0.42$) at T1.

Drop-out

Those who dropped out from follow-up differed from those who participated in both waves. Of the T2 drop-outs, 65% lived with both parents at T1, of participants, 73% ($P < 0.001$). Of drop-outs, 34% had at least one parent with academic education, of participants, 38% ($P = 0.03$). Drop-outs were somewhat older, with 11 vs. 5% being 16 years or older at T1 ($P < 0.001$), and there were more boys than girls among them (63 vs. 37%, $P < 0.001$).

Depression at T1 was more common in drop-outs (12 vs. 9%, $P = 0.02$). Those dropping out reported more often being bullies at T1 than those participating at the follow-up (5 vs. 3%, $P = 0.002$). However, drop-outs were not more often victimised to bullying at T1 than participants (4 vs. 3%, $P = 0.6$), nor left alone by peers against their wishes (3 vs. 2%, $P = 0.6$).

Statistical analyses

Frequency distributions of the variables describing involvement in bullying and depression are given for girls and boys (Table 1). Cross-sectional associations between involvement in bullying and depression were analysed at age 15 and 17 using cross-tabulations with chi-square statistics/Fisher's Exact Test where appropriate. The associations between involvement in bullying at age 15 and

Table 1 Involvement in bullying and depression in baseline at age 15, and in 2-year follow-up, among girls and boys in the Adolescent Mental Health Cohort Study

	Girls $n = 1,167$	Boys $n = 903$
Victim to bullying T1		
Yes	2.1	4.8
No	97.9	94.9
Missing	–	0.3
Bully T1		
Yes	1.3	2.3
No	98.5	97.2
Missing	0.2	0.4
Isolated from peers T1		
Yes	2.1	2.3
No	97.3	97.2
Missing	0.5	0.4
Victim to bullying T2		
Yes	0.7	2.4
No	97.7	96.3
Missing	1.6	1.2
Bully T2		
Yes	0.4	2.3
No	98.0	96.6
Missing	1.5	1.1
Isolated from peers T2		
Yes	2.4	2.7
No	95.8	95.7
Missing	1.8	1.7
Depression T1		
Yes	11.5	6.0
No	88.0	93.5
Missing	0.5	0.6
Depression T2		
Yes	10.3	6.3
No	89.5	92.8
Missing	0.2	0.9

At T1, 9.2% of the boys and 5.1% of the girls were involved in bullying in any of the studied ways ($P < 0.001$), at T2, 5.3% of the boys and 2.9% of the girls ($P = 0.004$)

depression at age 17 were first analysed using cross-tabulations with chi-square statistics/Fisher's Exact Test where appropriate.

Next, logistic regression analyses were used. Depression at age 17 was entered as the dependent variable. Being a victim at age 15, being a bully at age 15, and being left alone by peers at age 15 were entered each in turn as independent variables, first alone, secondly controlling for depression at age 15, and finally controlling for depression at age 15 and age, parental education (academic versus non-academic) and family structure (both parents versus

other). Odds ratios with 95% confidence intervals are presented.

To analyse whether depression at age 15 predicts involvement in bullying at age 17, being victim to bullying, being a bully, and being left alone by peers against one’s wishes at age 17 was first cross-tabulated by depression at age 15, and chi-square/Fisher’s Exact Test statistics were used to analyse statistical significances’ of the detected associations. The involvement variables were then each in turn entered in logistic regression as the dependent variable. Depression at age 15 was entered as independent variable, first alone and secondly with being a victim/being a bully/being left alone at age 15, respectively. Thirdly, age, parental education and family structure were added.

All the analyses were carried out separately for girls and boys, because both the prevalence of depression and figures for being victimised to bullying and for being a bully differed by sex in both T1 and T2. Also, because all the analyses were considered exploratory, no correction for multiple testing was conducted [5].

The analyses were done using SPSS 16.0.

Results

Does involvement in bullying predict subsequent depression?

Among both girls and boys, there was a cross-sectional association between victimisation to bullying and depression both at age 15 and at age 17, and victimisation at age 15 predicted depression at age 17. Among girls, only a cross-sectional association between being a bully and depression was found at age 17. Among boys being a bully was cross-sectionally associated with depression both at age 15 and 17, and depression at age 17 was also predicted by being a bully at age 15. In both sexes, being left alone was cross-sectionally associated with depression both at age 15 and at age 17, and being left alone at age 15 predicted depression at age 17 in bivariate analyses using cross-tabulations with chi-square statistics (Table 2).

Being victim to bullying at age 15 predicted depressions at age 17 when entered in the logistic regression model alone. Adding depression at age 15 into the model levelled out the association between victimisation at age 15 and depression at age 17 among girls. However, among boys, victimisation persisted as a predictor of depression 2 years later both when controlling for depression at age 15, and when controlling for depression at age 15 and sociodemographic variables (Table 3).

Being a bully at age 15 was not a predictor of subsequent depression among girls, but among boys it

Table 2 Prevalence of depression (%, *n/N*) by involvement in bullying among girls and boys at age 15 and 17, and depression at age 17 by involvement in bullying at age 15

	Victim			Bully			Isolated			<i>P</i>
	Yes	No	<i>P</i>	Yes	No	<i>P</i>	Yes	No		
Girls										
Depression by involvement at T1	28.0 (7/25)	11.2 (127/1136)	0.02	20.3 (3/15)	11.4 (131/1145)	0.2	48.0 (12/25)	10.8 (122/1131)	<0.001	
Depression by involvement at T2	37.5 (3/8)	9.8 (112/1138)	0.04	40.0 (2/5)	9.9 (113/1142)	0.08	42.9 (12/28)	9.2 (103/1117)	<0.001	
Depression at T2 by involvement at T1	24.0 (6/25)	10.0 (114/1140)	0.04	20.0 (3/15)	10.2 (117/1148)	0.2	29.2 (7/24)	10.0 (113/1135)	0.008	
Boys										
Depression by involvement at T1	19.0 (8/42)	5.3 (45/853)	0.002	23.7 (9/38)	5.2 (45/858)	<0.001	26.3 (5/19)	5.5 (48/875)	0.004	
Depression by involvement at T2	28.6 (6/21)	5.7 (49/864)	0.001	30.0 (6/20)	5.8 (50/866)	0.001	45.8 (11/24)	5.1 (44/857)	<0.001	
Depression at T2 by involvement at T1	23.3 (10/43)	5.5 (47/850)	<0.001	20.5 (8/39)	5.7 (49/855)	0.002	19.0 (4/21)	6.1 (51/871)	0.04	

Table 3 Risk (OR, 95% CI; *P*) for depression at age 17 according to involvement in bullying at age 15

	Girls						Boys					
	Model 1	<i>P</i>	Model 2	<i>P</i>	Model 3	<i>P</i>	Model 1	<i>P</i>	Model 2	<i>P</i>	Model 3	<i>P</i>
Victim T1	2.8 (1.1–7.3)	<0.03	1.8 (0.6–5.6)	0.28	1.8 (0.6–5.4)	0.30	5.2 (2.4–11.1)	<0.001	4.2 (1.8–9.5)	0.001	4.6 (2.0–10.8)	<0.001
Depression T1	#		14.1 (9.2–21.7)	<0.001	13.4 (8.6–20.8)	<0.001	#		6.6 (3.3–13.3)	<0.001	6.6 (3.3–13.5)	<0.001
Age	#		#		1.1 (0.6–1.8)	0.74	#		#		0.8 (0.3–2.0)	0.66
Parental education ^a	#		#		0.9 (0.6–1.4)	0.56	#		#		0.8 (0.5–1.6)	0.67
Family structure ^b	#		#		1.9 (1.2–2.9)	0.006	#		#		1.1 (0.5–1.6)	0.70
Bully T1	2.2 (0.6–7.9)	0.23	1.8 (0.4–8.1)	0.43	1.6 (0.4–7.4)	0.53	4.3 (1.9–9.7)	0.001	3.0 (1.2–7.4)	0.02	3.1 (1.2–7.7)	0.02
Depression T1	#		14.3 (9.2–22.0)	<0.001	13.5 (8.7–21.0)	<0.001	#		6.4 (3.2–12.8)	<0.001	6.7 (3.3–13.7)	<0.001
Age	#		#		1.1 (0.7–1.8)	0.70	#		#		0.8 (0.3–1.9)	0.58
Parental education ^a	#		#		0.9 (0.6–1.4)	0.56	#		#		0.9 (0.5–1.6)	0.86
Family structure ^b	#		#		1.8 (1.2–2.9)	0.007	#		#		1.0 (0.5–2.0)	0.92
Isolated T1	3.7 (1.5–9.2)	0.004	1.3 (0.4–3.6)	0.68	1.3 (0.4–3.8)	0.65	3.6 (1.2–11.2)	0.03	1.6 (0.4–6.5)	0.48	1.7 (0.4–6.7)	0.47
Depression T1	#		14.0 (9.1–21.8)	<0.001	13.3 (8.5–20.6)	<0.001	#		7.3 (3.7–14.6)	<0.001	7.5 (3.7–15.1)	<0.001
Age	#		#		1.1 (0.7–1.8)	0.76	#		#		0.8 (0.3–1.9)	0.35
Parental education ^a	#		#		0.8 (0.5–1.3)	0.54	#		#		0.9 (0.5–1.5)	0.60
Family structure ^b	#		#		1.9 (1.2–2.9)	0.006	#		#		1.1 (0.6–2.1)	0.79

In the first models, each form of involvement in bullying is entered alone. In the second models, depression at age 15 is controlled for. In the third models, age, parental education (T1), and family structure (T1) are controlled for

^a OR for non-academic as compared to academic

^b OR for other as compared to living with both parents

Variable not in the model

persisted as a predictor of subsequent depression when depression at age 15 and also sociodemographic variables were added into the model (Table 3).

Being left alone at age 15 was first associated with depression at age 17 when entered into the model alone, but controlling for depression at age 15 levelled out the association among both sexes (Table 3).

Does depression predict involvement in bullying 2 years later?

Among boys, depression at age 15 was not associated with being victim to bullying at age 17. Being a victim at age 17 was also not predicted by being a victim at age 15.

Of girls depressed at age 15, 2.4% were victims of bullying at age 17, of those not depressed at age 15, 0.5% ($P = 0.05$; OR 4.9, 95% CI 1.5–20.1, $P = 0.03$). The association weakened (OR 4.4, 95% CI 1.0–19.0, $P = 0.05$) when victimisation at age 15 was added. Being a victim at age 17 was not predicted by being a victim at age 15 (OR 4.7, 95% CI 0.5–42.2, $P = 0.16$). When sociodemographic variables were added into the model, depression at age 15 as predictor of victimisation to bullying at age 17 was levelled out (OR 4.1, 95% CI 0.9–17.7, $P = 0.06$), and victimisation at age 15 or the sociodemographic variables did not emerge as predictive of victimisation at age 17 either.

Being depressed at age 15 was not associated with being a bully at age 17 in either sex. Instead, being a bully at age 17 was strongly predicted by being a bully at age 15 among boys (OR adjusted for depression at age 15 12.1, 95% CI 4.3–34.3, $P < 0.001$) and among girls (OR adjusted for depression at age 15 16.9, 95% CI 1.7–169.2, $P = 0.16$).

Of girls depressed at age 15, 8.7% reported being left alone at age 17, of those not depressed at age 15, 1.7% ($P < 0.001$; OR 5.6, 95% CI 2.5–12.2, $P < 0.001$). When being left alone at age 15 was added, being left alone at age 17 was still predicted by depression at age 15 (OR 5.5, 95% CI 2.5–12.5, $P < 0.001$), but being left alone at age 15 was not predictive of being left alone at age 17 (OR 1.9, 95% CI 0.4–9.4, $P = 0.41$). Adding sociodemographic variables, depression at age 15 still predicted being left alone at age 17 (OR 5.3, 95% CI 2.3–12.1, $P < 0.001$). Being left alone at age 17 was not predicted by being left alone at age 15 or the sociodemographic variables in the final model.

Among boys, being left alone by peers against one's wishes at age 17 was more common among those depressed at age 15 (9.6 vs. 2.0%, $P = 0.007$; OR 5.1, 95% CI 1.8–14.4, $P = 0.002$). The association persisted (OR 3.8, 95% CI 1.2–11.5, $P = 0.19$) when being left alone at age 15 was added, and being left alone at age 15 was also predictive of being left alone at age 17 (OR 9.1, 95% CI 2.6–32.3, $P = 0.001$). Adding sociodemographic variables

did not change the detected associations (depression at age 15, OR 4.3 (1.4–13.2), being left alone at age 15, OR 8.8 (2.5–30.9)), and the sociodemographic variables were not predictive of being left alone at age 17.

Discussion

Both being victimised to bullying, being a bully and being left alone by peers were cross-sectionally associated with depression among boys at both ages 15 and 17. All types of involvement in bullying at age 15 also predicted depression at age 17 among boys, when bivariate associations were considered. Among girls, all types of involvement in bullying was cross-sectionally associated with depression at both age 15 and 17. Being a victim and being isolated from peers at age 15 also predicted depression at age 17 in bivariate analyses, but both these forms of involvement were levelled out when baseline depression was controlled for in multivariate analyses. This suggests that among girls, continuity of depression itself is a stronger feature than influence of peer victimisation, whereas among boys, involvement in bullying plays more clearly an independent role as a risk factor for later depression.

Among boys, victimisation to bullying at age 15 predicted depression two years later in multivariate analyses controlling for baseline depression. On the other hand, depression at age 15 did not predict subsequent victimisation to bullying. Our finding that victimisation to bullying was a risk factor for depression in middle adolescent boys is in accordance with the earlier findings suggesting that victimisation to bullying is followed by emotional, behavioural and psychosocial problems among children, or from childhood to adolescence [17, 21, 32, 33, 55]. Bond et al. [6] also found that victimisation to bullying in adolescence predicted later depression, although only in girls, but Kim et al. [27] found no association between victimisation and depression in a follow-up study among adolescents. Kim et al. [27] commented themselves on this lack of association, assuming that different ways of measuring both depression/anxiety and involvement in bullying may have contributed. Sweeting et al. [56], however, reported the opposite than our results regarding boys. Even if depression and peer victimisation mainly had reciprocal influence on each other, among boys from age 13 to 15, depression predicted victimisation more than vice versa. It is possible that different developmental phase explain this difference. Sweeting et al. [56] focused on early adolescents whereas our subjects were in middle adolescent developmental phase.

In girls, the association between victimisation to bullying and depression was different from that in boys. Victimisation was first predictive of subsequent depression,

but the association was levelled out when baseline depression was controlled for. It was in the first place depression at age 15 that predicted depression at age 17 in girls, and victimisation to bullying had no independent role. On the other hand, depression at age 15 was borderline predictive of victimisation to bullying at age 17 among girls, also when baseline victimisation was controlled for. In girls, the experience of being bullied may be explained by negative attributions a depressed girl gives to social interactions, or then depressed girls may also over time become victims of bullying because of being less adept in social relationships [34]. This direction of causality has also received support in some previous studies [8, 17, 22], but not previously regarding specifically depression, or not among middle adolescents.

Among boys, being a bully at age 15 was also predictive of depression at age 17. This is in line with the findings of Klomek et al. [30] from childhood to adolescence. A possible explanation is that peers tend to dislike bullies [51]; depression could follow from realising this, and from being rejected by peers. Depression at age 15 was in neither sex predictive of later being a bully. This seems to be in contradiction with the acting-out hypothesis, that negative emotional states like depression are acted out in externalising behaviour [11, 43], but it is to be kept in mind that our subjects at T2 were already more than 17 of age and perhaps essentially less likely to externalise emotions than younger adolescents or children.

Being socially isolated by peers has been suggested to be one form of victimisation in bullying [15, 44]. In the present study, being left alone by peers despite one's desire to be included was predictive of later depression in bivariate analyses, but the association was levelled out by controlling for baseline depression, suggesting that the perception of being excluded may itself reflect depression. Instead, depression at age 15 predicted later experience of being left alone in both girls and boys. This could also reflect the depressed adolescent's distorted perception of social interactions. On the other hand, depression in adolescence has been shown to impair social relationships even after recovery of the actual disorder [34]. Depression is likely to impair the social skills and self-assurance of an adolescent who therefore may have difficulties in making satisfactory contacts with peers. Among girls, the findings that depression was borderline predictive of being bullied later, and being isolated from peers in the follow-up, were consistent and together suggest that depressed girls either are selected to targets of negative interactions by peers, or give negative attributions to neutral social interactions. Among boys, experiences of being bullied and that of being left alone by peers may have different origins, the latter rather reflecting the boy's own impaired social skills.

Victimisation to bullying at age 15 was not predictive of victimisation at age 17 in either girls or boys when baseline depression was controlled for. This contradicts with previous findings that being a victim is rather persistent across childhood and adolescence [50, 53, 56]. Different time frames may explain this finding in the present study. It is noticeable that our subjects completed the 9 year compulsory education between T1 and T2, and by T2 they had changed environment to secondary education that brings about new peer groups (perhaps with more converging interests and goals), and new physical environment. This may indeed have brought about a change in their social status as well. Moreover, victimisation has been suggested to diminish with age and the proportion of individuals being victimised continuously through the adolescent years may be quite small [2].

In girls, consistently, experience of being left alone by peers at age 15 did not predict the same experience at age 17. However, in boys, confusingly, experience of being left alone at baseline was—independently of depression at baseline—predictive of the same experience at follow-up. Perhaps the experience of being left alone is particularly among boys indicative of impaired social skills that may be an underlying factor for both depression and victimisation, and the feeling of being excluded.

Being a bully was a stable feature in both sexes. This has also been noted before [53] and concurs with findings that associate being a bully with later delinquency and antisocial behaviour [54, 55]. Being a bully may be a part of conduct disorder that is persistent across adolescence [14, 18]. This is supported by findings that cross-sectionally associate being a bully with a number of antisocial behaviours [36, 38, 39].

The study was based on a large population sample. The coverage of compulsory comprehensive school until age 16 in Finland is more than 99%. The cohort may thus be considered representative of Finnish adolescents except for those with mental handicaps or severe sensory deficits. The response in the Adolescent Mental Health Cohort baseline survey was good. However, among drop-outs, psychosocial and health problems may be more common than among participants. Thus, their absence could result in the presented prevalence rates being underestimates at T1. The response rate in the Adolescent Mental Health Cohort follow-up was satisfactory. The attrition in the Adolescent Mental Health Survey follow-up was, however, associated with faring worse in the baseline survey. It is likely that in the follow-up, the prevalence of psychosocial and mental health problems were to some extent an underestimate. However, there is no particular reason to assume that this would influence the associations between the phenomena.

Despite the relatively large sample size, the subgroups especially in girls were sometimes very small. It is possible

that some phenomena which rare but important in girls are not captured here due to small sample size in subgroups, even if appropriate statistics were used, for example among girls who bully.

Previous literature is strongly pointing that there are associations between involvement in bullying and depression, but literature is inconsistent as to the exact nature of these associations regarding direction of causality, and the effect of age and sex on it. Therefore, our aim was not to test a pre-specified hypothesis as is the case in confirmatory studies, but the analyses were exploratory. Further studies are needed to confirm the conclusions of the present study. Given the exploratory nature of the study, we did not perform multiplicity corrections that are needed in confirmatory analyses. Exploratory studies do not usually have a clear structure of multiple testing, and hence, appropriate multiple test adjustment is even not possible [5].

The material was collected exclusively in urban areas, thus the results may not be generalisable to rural populations. However, both involvement in bullying and depression are at a comparable level across Finland in the age group studied [37], and this again gives supports the assumption that the results may not carry a risk of bias due to being derived exclusively from an urban sample.

The age range in the study samples was narrow: hence the data are homogenous regarding age. The main interest was in middle adolescents, since this is the central developmental phase with significant changes and social relationships. It is also associated with the onset of major mental disorders and problems most prevalent in adulthood. For example, in depression research the usefulness of samples with both children and adolescents in studies of risk factors has been criticised, considering the increase in prevalence of during transition from childhood to adolescence [14, 20, 40]. In earlier research focusing on longitudinal associations between involvement in bullying and depression, few have concentrated on middle adolescence [2, 6, 27].

The measures of the present study have previously been used in large community samples of adolescents in Finland and also elsewhere. The Finnish modification of the short 13-item BDI has been widely used to study depression in unselected European populations and in screening depression in clinical work in Finland [45]. In epidemiological research aiming at identifying, the determinants of mental health problems or need for treatment the use of self-reported symptom lists is arguable, especially in children and adolescents. Symptoms causing functional impairment may hinder normal development even with the presence of no DSM or ICD disorder [1, 35]. Self-reported depression is also persistent in adolescence [12] and predicts major depressive disorder [34].

Involvement in bullying was measured only by self-reports. It is possible that peer nominations or observational methods could give a more reliable and comprehensive picture of an adolescent's involvement in bullying [13, 27]. It has been suggested that a self-report survey method is likely to result in underreporting of victimisation [57]. However, many studies on involvement in bullying and psychosocial adjustment have relied on the same or very similar questions as used in the present study [16, 17, 19, 36, 38, 39]. Furthermore, observational methods could only be used in essentially smaller studies, and we specifically wanted to study these features at population level. In reporting being a bully, the effect of social desirability might result in underreporting. Indeed, involvement in the present data was less than generally assumed, but on the other hand, we only took into account involvement at least weekly or more frequently, not, for example, monthly involvement or infrequent involvement.

Bullying has been a target of rather extensive public discussion in Finland over recent years. Increasing consciousness of bullying and its harmful effects on mental health could also result in increasing self-report of being bullied, if the young people learn to be more sensitive about negative interactions and more easily conceptualise them as bullying. In the questionnaire we used, an attempt to avoid this is made by first defining bullying as intentional and as involving power imbalance [15, 28, 39]. As figures of involvement in bullying are similar across Finland and have not been subject of significant change since mid 1990s [37], adolescents' understanding of what is bullying does not seem to be very subjective but they share a common understanding of the feature. Experience of being left alone by peers is perhaps a less homogenous feature, as reflected in differences in its associations with depression as compared to the associations between being actively bullied and depression. Experience of being left alone by peers may arise, for example, both from not being noticed, being purposefully and maliciously excluded, and being rejected and feared. These different features are likely to have different associations with mental disorders.

Covariates were used age, family structure and parental education. The validity of adolescent report on parental education may be less than optimal. This is why we chose to dichotomise parental education to academic versus non-academic only. Academic education is appreciated in the Finnish society and we therefore assume that this information could be more valid than adolescent reported differentiation between the other elicited levels (comprehensive school only/vocational school/college level). The adolescent reported proportion of parents with academic education corresponded with the proportion of academic education in the Finnish adult

population (http://www.tilastokeskus.fi/tup/julkaisut/isbn-952-467-461-0_tuononen.pdf).

Conclusion

Depression is cross-sectionally associated with both being subjected to bullying and being a bully, but the causality between the phenomena cannot be concluded from cross-sectional associations. Among adolescent boys, being involved in bullying predicts future depression. Teachers and school health professionals should pay especial attention to the prevention and treatment of depression among adolescents involved in bullying. On the other hand, depression predicts victimisation to bullying in girls, and also experience of being left alone by peers against one's wishes in both girls and boys. Among depressed adolescents, involvement in bullying should be questioned, interventions to stop bullying should be implemented, and associated trauma should be taken into account in treatment. Social skills training in the school context is advised, targeted at adolescents presenting with depression or involved in bullying.

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