

Under the skin: does psychiatric outcome of bullying victimization in school persist over time? A prospective intervention study

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Background: Research has shown a direct path between peer victimization and poor mental health outcomes. However, the impact of bullying prevention on mental health is a largely unexplored field. Therefore, our study examined the longitudinal association between bullying development and trajectories of psychiatric symptoms (emotional problems, total difficulties, nonsuicidal self-injury, and suicidality) and health-related quality of life (HRQL) during the implementation of school-based bullying prevention. **Methods:** Data of 4,873 pupils (grades 5–13) were collected in 23 schools implementing the *Olweus Bullying Prevention Program (OBPP)*. Self-report questionnaires were administered at three annual assessment waves and individual codes enabled the association of repeated assessments to the same pupil. Latent growth curve models (LGCMs) were used to examine the relation among bullying status and mental health outcome with mixed-effects linear regressions estimating the association of changes in bullying with changes in continuous scores and mixed-effects logistic regressions for categorical variables. **Results:** Latent growth curve models revealed an improvement of mental health and HRQL through the termination of bullying for every outcome variable of interest (all $p < .001$). Correspondingly, we found an explicit increase in psychopathology as well as decrease in HRQL within one year as a result of developing victimization (all $p < .001$). Interestingly, the growth of psychopathology associated with the onset of bullying was significantly steeper than its decline associated with the termination of bullying. The postulated cumulative effect of ongoing bullying for a further year could only be shown for HRQL ($p = .025$) and total difficulties ($p = .034$), but not for specific mental health problems (all $p > .117$). **Conclusions:** Latent growth curve models clearly showed that the adverse psychosocial consequences of bullying arise quickly but seem to reduce much slower and partly persist over time. Future long-term studies are necessary to clarify if mental health problems will return to baseline after several years or if residual symptoms will remain. **Keywords:** Bullying; victimization; mental health; prevention; adolescence; longitudinal.

Introduction

According to the Centers for Disease Control and Prevention, bullying among youths is “any unwanted aggressive behavior(s) by another youth or group of youths who are not siblings or current dating partners that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated.” (Gladden, Vivolo-Kantor, Hamburger, & Lumpkin, 2014, p. 17). The distress and suffering related to school-based bullying is immense; problems experienced by the victims of bullying include a wider range of serious mental health disorders. There is evidence of a direct path between peer victimization and poor mental health outcomes. A current meta-analysis including 165 studies (Moore et al., 2017) showed an increased risk of depression (OR = 2.21), nonsuicidal self-injury (NSSI; OR = 1.75), suicidal ideation (OR = 1.77), and suicide attempts (OR = 2.13) for bullied children. Data from the British National Child Development

Study was even able to show the long-term impact of bullying into midlife. Participants who were bullied in childhood not only had higher rates of depression, anxiety disorders, and suicidality at the age of 23 but also reported a lack of social relationships, financial problems, and low perceived quality of life at the age of 50 (Takizawa, Maughan, & Arseneault, 2014).

Reducing bullying might help to prevent subsequent development of mental health problems, not only in childhood and adolescence but even into adulthood. Over the last 30 years, various school-wide bullying intervention and prevention programs have been developed, implemented, and evaluated. However, these evaluations implied the reduction of bullying as main outcome and did not focus on the impact of bullying prevention on mental health. To the best of our knowledge, only one work by Williford et al. (2012) investigated this relationship in a Finnish large-scale study of the KiVa antibullying program, and suggested that the program is not only effective in reducing victimization but also in lowering students’ internalizing problems (anxiety and

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depression). In light of this research gap, the remaining question is how change in victimization over time can predict change in psychosocial adjustment and mental health problems.

Cohort studies collecting prospective data on bullying suggest that victims of bullying still have adjustment difficulties in late adolescence and early adulthood (Sourander et al., 2007; Takizawa et al., 2014). However, these longitudinal studies have often used long time-spans of several years between bullying and outcome measures and measured bullying experiences only at one point in time. Thus, these studies give little insights into the immediate consequences of new onset or just terminated bullying experiences on the development of mental problems. A meta-analysis of 18 longitudinal studies (Reijntjes, Kamphuis, Prinzie, & Telch, 2010) also contained shorter intervals (6–24 months) in exploring whether peer victimization predicts changes in internalizing problems. But again, single measurements of bullying do not allow differentiations between ongoing, newly experienced, or terminated bullying. Longitudinal assessments with an interval of 3 and 12 months were performed by Klomek et al. (2019), offering the possibility of comparing the adverse long-term effects of chronic versus sporadic bullying. Chronic victimization of any type increased the probability for later depression compared with sporadic and nonvictimization. Besides, chronic relational victimization increased the likelihood for later suicidal ideation, and chronic physical victimization increased the likelihood for suicide attempts. But former studies have never raised the question to what happens with its psychiatric outcome after the bullying stopped. In addition, all results described above were derived from studies investigating normative courses of bullying and its consequences, and were never obtained in a controlled intervention setting.

To answer these open questions, our study examined the impact of bullying and longitudinal bullying development on the course of health-related quality of life (HRQL) and psychiatric symptoms (total difficulties, emotional problems, NSSI, suicidality) during adolescence. A particular strength of our study is the controlled intervention design, which provides evidence for the assumption that changes in psychological adjustment are indeed caused by changes in bullying.

We expected that changes in victimization would predict corresponding changes in mental health outcomes. Specifically, we hypothesized that

1. Termination or decrease of bullying leads to a decrease of mental health problems in victimized students as well as to an increase in HRQL within one year.
2. Onset or increase of bullying leads to an increase of mental health problems in victimized students as well as to a decrease in HRQL within one year.

3. Ongoing bullying has a cumulative negative effect, that is, leads to a further increase of mental health problems in victimized students as well as to a further decrease in HRQL.

Methods

Study population and design

The *Olweus Bullying Prevention Program (OBPP)* (Olweus, 2012) is an evidence-based antibullying program which was developed in Norway in the 1980s and has been continuously adapted and expanded since then. Its effectiveness is well documented (Gaffney, Ttofi, & Farrington, 2019). Therefore, the Clinic of Child and Adolescent Psychiatry, Heidelberg translated the program materials and trainings and started a first scientific evaluation of the program in Germany. The project was funded by the foundation of Baden-Württemberg (*Baden-Württemberg Stiftung*). Schools in our state were informed about the possibility to participate in the program and could voluntarily sign in. Overall, 23 schools became enrolled in the study, 13 in 2015 and another ten in 2016. $N = 6,561$ students consented to participate (85.8% response rate). The implementation of the program took about 18 months, and annual student surveys for the duration of 24 months were part of the program. For details about the recruitment procedure and the program components, we refer to Ossa et al. (2020).

Study procedures

The study was performed in compliance with the Helsinki Declaration. It was appraised and approved by the ethics committee of the faculty of medicine at the University of Heidelberg (S-341/2014) and the respective school authorities. Furthermore, the study was registered at a WHO trial registry (*Deutsches Register Klinischer Studien*; DRKS00008202). Informed consent was appropriately obtained. All participants were extensively informed about the purpose, content, and conditions of the study by members of our research team in class as well as by information leaflets. Their respective caregivers were informed by information leaflets as well, and they were given the opportunity to contact our research team for questions as well as for declining their child's participation (opt-out). Students were assessed using self-report online questionnaires from July 2015 until July 2018. The assessments took place during regular class times and the duration was a maximum of 45 min. The investigation consisted of two parts: the first part included an anonymous self-report using the *Olweus Bullying Questionnaire (OBQ)*. The second part was optional and consisted of additional questionnaires concerning psychopathology and HRQL. If continuing with the second part, pupils were asked to create an individual code to enable the association of repeated assessments to the same pupil.

Assessment

Students filled in a self-report online-survey, including questions regarding socio-demographic characteristics as well as items comprising bullying experiences and diverse mental health problems. Experiences of bullying were assessed by the *Olweus Bullying Questionnaire (OBQ)* (Olweus, 1996), a widespread instrument with a clear definition of bullying. The global item on victimization can be answered on a five-point scale. With "two or three times a month," the common cut-off for bullying was used. For the assessment of emotional and behavioral problems, the *Strengths and Difficulties Questionnaire (SDQ)*, short-version self-report 11–16 years (Goodman,

2001) was administered. The 25 items of the SDQ are divided into five scales, each of which results in a score between 0 and 10. For our purpose, the total difficulties score as well as the subscale emotional problems were used. Since the item "Other children or young people pick on me or bully me" directly asks about bullying, it was removed from the total difficulties score. The KIDSCREEN-10 (The-KIDSCREEN-Group-Europe, 2006) was used for assessment of HRQL. Its ten items can be rated on a five-point scale and generate a global HRQL score for monitoring and screening uses. Non-suicidal self-injury (NSSI) was assessed with a single-item which clearly distinguished NSSI from suicidal behavior by its intent ("On how many days have you injured yourself in the last three months without the intent to die?"). The item was dichotomized between "not at all" = 0 and "on one day" or more = 1. Suicidal behavior was recorded using two dichotomized items, differentiating between suicidal ideation ("Have you thought about taking your life in the last three months? No/Yes") and suicide attempt ("Have you tried to kill yourself in the last three months? No/Yes").

Statistical analyses

For the association of the questionnaires from different time points to pupils, we used a similarity matching procedure to allow for typing errors of the pupils when they entered the self-generated code. Questionnaires were assigned to the same pupil if the school and gender were identical, the grade of a later assessment was not lower than the grade of earlier assessments, and the Levenshtein distance of the codes was not greater than 2.

Latent growth curve models (LGCs) were performed to test whether exposure to bullying compared with no victimization affects the development of psychopathology (emotional symptoms, total difficulties, NSSI, suicidality) and HRQL over two years. This modeling allowed for empirical exploration of developmental trajectories, and considered whether initial psychopathological symptoms and their change over time vary according to bullying exposure. In case of missing information about bullying in the previous year (at t0 or in case of missing data), we referred to the variable "How long has the bullying lasted" and coded positively for "it lasted about a year" or longer. The global item on victimization was used for coding current victimization. Assignable participants with at least two measurement points including complete information about bullying, HRQL, and psychopathology were included in the following analyses. Incomplete datasets were deleted. To check for a possible bias, that is, a systematic loss of participants which cannot be individually assigned, the two samples were compared with respect to gender, age, school type, victimization, HRQL, and psychopathological outcome variables via stepwise mixed-effects logistic regression with random effects for school and class within school, minimizing Bayes Information Criterion (BIC).

Since pupils can have repeated measurements in the prescribed change variables (change from first to second assessment and change from second to third assessment), mixed-effects regressions were used to fit the LGCs. We used mixed-effects linear regressions to estimate the association of changes in bullying with changes in continuous scores (emotional symptoms, total difficulties, HRQL) and mixed-effects logistic regressions for estimating the association of changes in bullying with changes in the categorical variables (NSSI, suicidal ideation, suicide attempts). Data were analyzed using Stata 16 (StataCorp, 2017).

Results

In total, 19,009 assessments were conducted during the course of three years. For 11,709 of them, an

association of at least two measurements to a pupil could be established. These data belonged to 4,873 different pupils (85% of all participants), 54.30% of them girls ($N = 2,646$), and 45.70% boys ($N = 2,227$). 38.19% ($N = 1,861$) of the participants visited A-level schools and 61.81% ($N = 3,012$) visited B-level schools. Participants visited grade 5–13, whereof at their first assessment 60.00% ($N = 2,924$) of them were in grades 5 to 7, 30.70% ($N = 1,496$) in grade 8–9 and only 9.30% ($N = 453$) were in grades 10–13. From 40.28% of the pupils ($N = 1,963$), three measurements could be obtained, and 59.72% ($N = 2,910$) only participated twice. Table 1 shows the distribution of bullying victimization, bullying perpetration, HRQL, and psychological problems of these pupils for their first point of measurement.

Examining the relationship between victimization and perpetration for the first point of measurement revealed that while 88.95% of the victims were victims only, 11.05% of victims belonged to the group of bully/victims. Chi²-test showed that the probability of becoming a victim was significantly higher for perpetrators (19.00%) than for nonperpetrators (7.30%) ($\chi^2(1) = 39.97, p < .001$). However, perpetration had no influence on the relationship between bullying victimization and psychological outcomes. For example, including *perpetration this year* as a further variable into our mixed-effects linear regression resulted in a negative estimated regression coefficient for this parameter for HRQL ($-2.43; p < .001$), indicating that also perpetrators had a lower level of HRQL compared with their nonbullied peers. This decrement was independent of whether perpetrators were pure bullies or bully/victims (interaction *perpetration this year x victimization this year* $p = .944$).

Table 1 Descriptive statistics: Bullying victimization, bullying perpetration, HRQL, and mental health problems at the first point of measurement ($N = 4,873$)

	Mean	SD
Emotional problems	2.72	2.30
Total difficulties	10.31	5.00
HRQL	49.73	10.35

	N	%
<i>Bullying victimization</i>		
No	4,491	92.16
Yes	382	7.84
<i>Bullying perpetration</i>		
No	4,627	95.44
Yes	221	4.56
<i>Suicidal ideation</i>		
No	4,422	90.74
Yes	451	9.26
<i>Suicide attempt</i>		
No	4,730	97.07
Yes	143	2.93
<i>NSSI</i>		
No	4,366	89.60
Yes	507	10.40

Table 2 presents the estimated regression coefficients for the fixed effects of the LGCMs. To ease the interpretation, the coefficients for the binary outcomes are shown in their exponentiated form, as odds ratios. The parameter *time* indicates a significant maturation effect for every outcome variable apart from NSSI, showing an increase of psychopathology and a decrease of HRQL with increasing age. The odds ratios < 1 of the parameter *gender boys* display a significantly lower level of suicidal ideation and NSSI for boys; correspondingly, the negative value of this parameter show a significantly lower level of emotional symptoms and total difficulties for boys.

To test our first objective, the difference between *victimization this year* and *victimization last year* was tested for statistical significance via chi²-test. We tested the hypothesis that the effect of bullying last year would be the same as the effect of bullying this

Table 2 Estimated regression coefficients for the fixed effects of the Latent Growth Curve Models (LGCMs) for emotional symptoms, total difficulties, HRQL, suicidality, and NSSI ($N = 11,709$)

	Coef.	<i>p</i>	95%CI
<i>Emotional symptoms</i>			
Time	0.07	<.001	0.03–0.11
Victimization last year	0.75	<.001	0.58–0.91
Victimization this year	1.63	<.001	1.45–1.81
Interaction for both years	–0.58	<.001	–0.90–0.26
Gender boys	–1.40	<.001	–1.51–1.30
<i>Total difficulties</i>			
Time	0.14	.001	0.06–0.23
Victimization last year	2.13	<.001	1.78–2.49
Victimization this year	4.26	<.001	3.87–4.64
Interaction for both years	–1.48	<.001	–2.17–0.80
Gender boys	–1.19	<.001	–1.42–0.95
<i>HRQL</i>			
Time	–0.58	<.001	–0.77–0.39
Victimization last year	–3.46	<.001	–4.25–2.68
Victimization this year	–6.76	<.001	–7.61–5.92
Interaction for both years	1.94	.013	0.41–3.46
Gender boys	3.47	<.001	2.99–3.96
	OR	<i>p</i>	95%CI
<i>Suicidal ideation</i>			
Time	1.15	.005	1.04–1.27
Victimization last year	2.95	<.001	2.12–4.11
Victimization this year	7.60	<.001	5.41–10.68
Interaction for both years	0.50	.022	0.28–0.90
Gender boys	0.46	<.001	0.37–0.56
<i>Suicide attempt</i>			
Time	1.21	.018	1.03–1.41
Victimization last year	2.82	<.001	1.74–4.57
Victimization this year	10.35	<.001	6.83–15.68
Interaction for both years	0.26	.001	0.12–0.56
Gender boys	0.84	.209	0.63–1.11
<i>NSSI</i>			
Time	1.02	.632	0.93–1.12
Victimization last year	2.71	<.001	1.97–3.72
Victimization this year	5.52	<.001	4.00–7.62
Interaction for both years	0.43	.004	0.24–0.76
Gender boys	0.61	<.001	0.50–0.74

year, implying no improvement of mental health through the termination of bullying. The test revealed that the opposite was the case, confirming our first objective for all outcome variables of interest (all $p < .001$). However, although a decrease of bullying led to a decrease of mental health problems and an increase in HRQL within one year, the elevated levels of the parameter *victimization last year* indicate that the effect of bullying still persists after one year.

The high values of the parameter *victimization this year* indicate a clear effect of bullying in form of an explicit increase in psychopathology as a result of developing victimization (all $p < .001$; second objective).

To test the postulated cumulative effect of ongoing bullying for a further year (third objective), the difference between the parameter *interaction for both years* and *victimization last year* was compared, showing a cumulative effect only for HRQL ($p = .025$) and total difficulties ($p = .034$), but not for specific mental health problems (all $p > .117$).

In order to improve visibility of the findings, three exemplary trajectories shall be presented graphically for all of the outcome variables (see Figure 1). These graphs (No-No-No displayed as a solid line, No-Yes-Yes displayed as a dashed line, and Yes-Yes-No displayed as a dotted line) show the estimated mean levels of each outcome variable and primarily illustrate the steep increase of psychopathology due to the onset of bullying (No-Yes-Yes). Second, if we look at the trajectory pattern of Yes-Yes-No, an ongoing effect of bullying even after the termination of bullying victimization becomes apparent. Although psychopathology significantly decreased by termination of bullying, it does not return to the baseline levels at t2. This means that the growth of psychopathology associated with the onset of bullying was significantly steeper than its decline associated with the termination of bullying. Finally, the apparent increase between t1 and t2 within the trajectory No-Yes-Yes was not significant for most mental health problems, implying that during this period of two years no cumulative effect of ongoing victimization was detectable (except for total difficulties and HRQL).

The final check for a possible bias caused by the exclusion of assessments that could not be assigned to a repeated measurement of the same pupil revealed several significant differences between the included and excluded assessments. Differences could be found according to gender (for boys OR = 0.53; 95%CI = 0.49–0.57; $p < .001$), emotional problems (OR = 1.13; 95%CI = 1.10–1.16; $p < .001$), total difficulties (OR = 0.94; 95%CI = 0.93–0.95; $p < .001$), HRQL (OR = 1.01; 95%CI = 1.01–1.02; $p < .001$), and suicide attempts (for yes OR = 0.67; 95%CI = 0.55–0.81; $p < .001$). Although significant, most of these differences are relatively small and therefore certainly negligible (mean emotional problems: 2.75 vs.

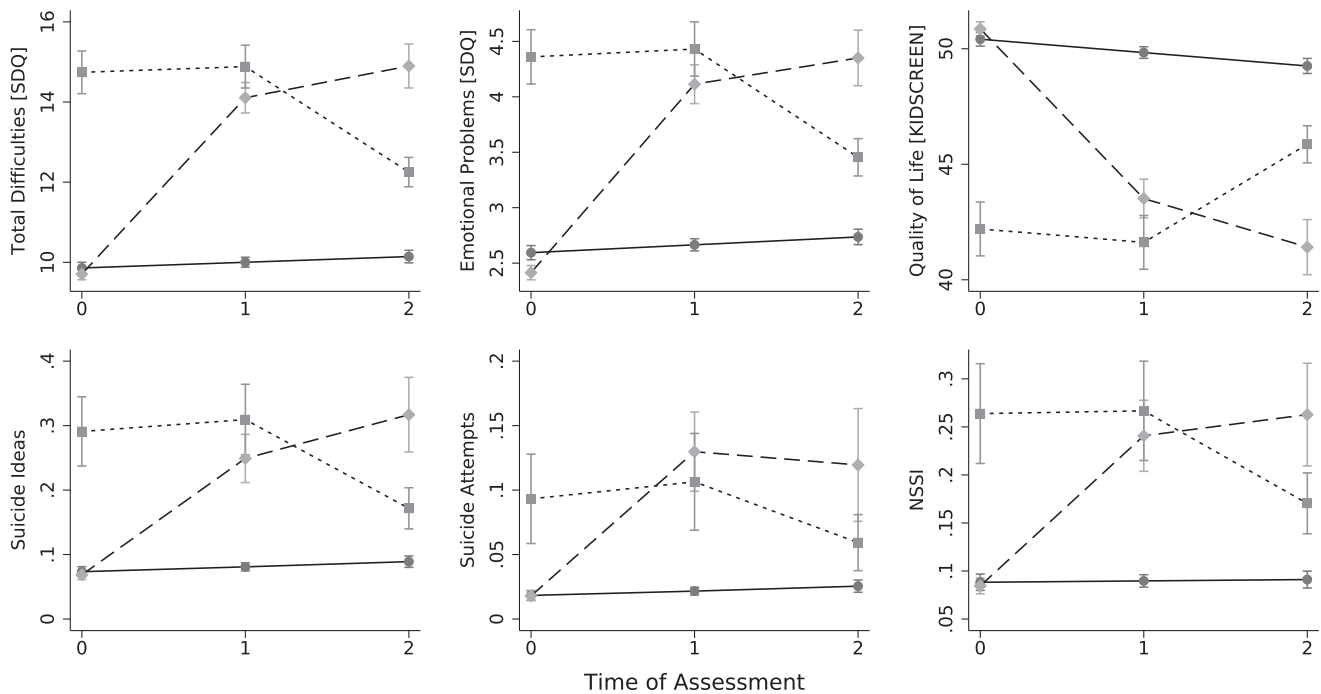


Figure 1 Trajectories of marginal means of the Latent Growth Curve Models (LGCs) for some exemplary patterns of bullying victimization visualize the effect of bullying on the slopes of the LGCs. No-No-No: solid line, No-Yes-Yes: dashed line, Yes-Yes-No: dotted line

2.68; mean total difficulties 10.30 vs. 11.27; mean HRQL 49.40 vs. 47.82). The only meaningful difference might be those in suicide attempts, which indicates a slightly lower strain in our sample than in the original study population (2.93% vs. 5.20%). Proportionally, more girls could be found in our sample indicating a gender bias. To test if this bias had an influence on the estimation of the effect of bullying on psychopathology, all LGCs were re-estimated with gender as a moderator of this effect. All likelihood-ratio tests of the moderator effect of gender were nonsignificant (all $p \geq 0.16$). A possible confounding could thus be ruled out.

Discussion

To the best of our knowledge, our study is the first to bring up an important new aspect concerning the relationship between bullying and psychosocial consequences. First of all, the termination or decrease of bullying leads to a decrease of mental health problems as well to an increase in HRQL within one year. But even after termination of experienced bullying victimization during a bullying prevention program, individuals lacked full recovery from mental health problems and presented with ongoing reduction of quality of life.

Interestingly, we did not observe a decline in psychopathology despite successful implementation of bullying prevention (Ossa et al., 2020). While bullying declined from 8.00% to 5.11% within two years, the observed level of emotional problems, total difficulties, non-suicidal self-injury, and suicidality

remained relatively stable. These findings may occur due to two reasons: First, the effect within the bullying group is not transferable to the entire study population. The pattern No-No-No, implying no bullying victimization at any time of measurement, was by far the largest proportion of our sample (87.6%), and no decrease of adverse outcomes through bullying prevention could be expected in this group. Thus, the mean trajectories of mental health problems are determined by a large group without bullying. Second, the longitudinal effect of bullying prevention may be confounded by the well-known effect of age on the development of psychopathology during early and midadolescence (Costello, Copeland, & Angold, 2011; Hawton, Saunders, & O'Connor, 2012). Due to the lack of a normative control group (without bullying prevention), we cannot rule out that the observed stability of mental health problems is in line with successful bullying prevention.

Second, our data clearly show that onset of bullying is associated with a distinct increase in psychopathology, expressed by clearly elevated means or odds ratios for emotional problems, total difficulties, suicidal ideation, suicide attempts, and NSSI as well as a decrease in means of HRQL. This relationship underpins the harmful potential of bullying and is also in line with numerous previous large-scale studies and meta-analyses (Moore et al., 2017; Takizawa et al., 2014). Several researchers (Book, Volk, & Hosker, 2012; Hawley, 2015; Rodkin, Espelage, & Hanish, 2015) have noted that bullying perpetration can be adaptive, in the sense that

bullying others helps to maintain one's social position. It might therefore be plausible that being victimized is only detrimental if there is not subsequent perpetration. To check this assumption, we tested if controlling for bullying perpetration impacts the relationship of victimization to psychological outcomes, but the fact that a victim was also a perpetrator did not change the impact of victim status on its negative consequences.

The third important aim of our study was the investigation of potential effects of long-term bullying. The postulated additive effect could only be shown for HRQL and total difficulties, but not for specific mental health problems such as emotional problems, suicidality, or NSSI. This partly contradicts previous studies where chronic victimization of any type increased the likelihood for later depression compared with sporadic and no-victimization (Klomek et al., 2019). Further studies may be needed to finally clarify this issue. In these, also the frequency of bullying should be considered, assuming a possible dose-response-effect in which the more frequent the victimization, the higher the risk for adverse outcomes (Moore et al., 2017).

In summary, our LGCMs clearly show that the adverse psychosocial consequences of bullying arise quickly but seem to reduce much slower and partly persist over time. Future long-term studies are necessary to clarify if mental health problems will return to baseline after several years or if residual symptoms will remain. In the latter case, former victims of bullying certainly represent an important target group for therapeutic interventions to fully recover from their harmful experiences. Unfortunately, specific therapeutic concepts are rare and it is largely unknown to date which ones prove to be effective (Hess, Wirtz, Allroggen, & Scheithauer, 2017).

Underlying mechanisms between bullying and development of psychopathology

Potential mechanisms for explaining the endurance of mental health problems among bullied children can be divided into physiological and psychological mechanisms. Into the physiological segment, response to stress is a well-documented reaction among bullied children or children who experienced other forms of maltreatment. Changes in biological stress response systems such as the hypothalamic-pituitary-adrenal axis (HPAA) may alter victims' stress reactivity. Since development of HPAA functioning is influenced by contextual factors, exposure to stress and interpersonal trauma have the potential to interfere with its normative development during adolescence. Such atypical development may, in turn, reduce an individual's capacity to respond to stress leading to an increased risk for a variety of stress-related disorders like depression or

NSSI (Roberts & Lopez-Duran, 2019). As an example, Ouellet-Morin et al. (2011) showed a blunted cortisol reactivity among bullied children, and Vailancourt et al. (2008) reported that peer victimization has been linked to lower levels of both diurnal and reactive cortisol. In addition, being victimized has even been shown to affect telomere length of linear chromosomes, a very new and innovative biomarker of stress (Shalev et al., 2013). Evidence for a gene \times environment interaction by variation in the serotonin transporter gene of victims of bullying has also been demonstrated (Karg, Burmeister, Shedden, & Sen, 2011), as well as neurobiological (Anda et al., 2006) or inflammatory (Copeland et al., 2014) changes in maltreated or bullied children. Finally, few neuroimaging studies have examined the underlying neural mechanisms associated with victimization (e.g. Eisenberger, 2012).

Besides, several social-cognitive mechanisms of explanation seem to mediate the long-lasting relationship between bullying and mental health problems. Dysregulation in the cognitive and emotional systems may be based on an inability to perform systematic coping strategies (e.g. problem solving) or to inhibit involuntary responses in the face of social stress. Furthermore, the experience of bullying could lead to a bias in the way children perceive their interpersonal environment. Victims may wrongly attribute reasons for negative events to themselves and generalize these cognitive biases on numerous situations in their lives. Victimized students were more likely to assign attributions for bullying that were internal and uncontrollable and this elevated self-blame increased the severity of internal problems (Perren, Ettekal, & Ladd, 2013). Eventually, bullying victimization could lead to further abuse from peers or adults, ending in a universal long-term cycle of victimization. Past studies have shown that minor victims of violence are at increased risk of revictimization of this kind and also of other forms of violence (Finkelhor, Ormrod, & Turner, 2007). This persistent victimization can prevent individuals from developing positive social skills.

Strengths, limitations, and future directions

This study had a number of strengths including the longitudinal design that comprised two years of development, the large sample size as well as the use of LGCMs for the statistical analyses. The interventional design (implementation of the OBPP) represents another advantage and supports the assumption that changes in psychological adjustment were indeed caused by onset or offset of bullying, respectively. However, despite the fact that a controlled intervention provides stronger evidence, only an RCT design would ultimately prove the direction of the effect and therefore permit causal attributions. Further limitations need to be acknowledged. First, our data come from students' self-reports only, and

other sources of information, such as clinical interviews for the assessment of depression, NSSI, and suicidal behavior should be included in future studies. In addition, a more valid recording of bullying through the additional use of observed behavior methods or teacher ratings would be desirable. Mere self-reports contain a further subjective component, which may result in an over- as well as underestimation of bullying frequencies. Bullying interventions may alter how individuals perceive social behaviors and might increase the salience of bullying and victimization. A good example of this was shown in Frey, Hirschstein, Edstrom, and Snell (2009), where informer reports showed decreased playground bullying after an intervention in grades 3–5, but participants actually reported increased bullying prevalence. It is therefore possible that an overreliance on self-reported data in the past has contributed to discouraging intervention results. Second, the impact of peer victimization is not the same for everyone. Therefore, further attention needs to be paid to factors that increase the risk for developing adverse consequences or protect against them, respectively. Looking at the risk and protective factors that moderate and/or mediate the relationship between the experience of victimization in childhood and psychological adjustment over time, Ttofi, Bowes, Farrington, and Lösel (2014) identified (a) individual factors such as social and cognitive skills, (b) family factors such as stability and positive relationships, and (c) social support via friendships as significant protective factors. The effect of victimization is not the same for everyone.

Conclusion

Bullying is a form of peer-to-peer maltreatment or as Zwierynska, Wolke, and Lereya (2013) expressed, "...a trauma that works itself under the skin" (p. 318). The distress and suffering caused by school-based bullying is immense and long-lasting. Due to permanent changes in the victims' physiological, social-cognitive, and emotional systems, these problems seem to be enduring and might outlast the actual harmful experience over an extended timespan. For this reason, the developed difficulties do not simply vanish with offset of bullying, but do persist over a longer period of time. In addition to preventive efforts, our findings suggest that tailored intervention measures, addressing mental health disturbances among victimized children, are needed.

Not only may this stop children's present hardship, it may also help to prevent long-lasting problems persisting to later adolescence or even adulthood. Given the fact that bullying is a highly stressful experience which provokes long-lasting changes in the physiological stress-systems, targeted interventions should also focus on improving the ways in which children and adolescents cope with emotional distress caused by being bullied. Besides, future research should continue to identify specific causal pathways leading from the onset of bullying to the development of psychopathology. These mechanisms could become appropriate matter for intervention programs aimed at undoing the effects of adverse bullying experiences.

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Informed consent and ethics approval

The study was appraised and approved by the ethics committee of the faculty of medicine at the University of Heidelberg and the respective school authorities. All research meets these ethical guidelines, including adherence to the German legal requirements. Informed consent has been appropriately obtained.

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Key points

- Within a controlled intervention design, the longitudinal association between bullying, health-related quality of life (HRQL), and mental health problems was explored.

- Latent growth curve models (LGCMs) revealed that termination or decrease of bullying leads to a decrease of mental health problems as well to an increase in HRQL within one year. Conversely, onset of bullying is associated with a distinct increase in psychopathology as well as a decrease of HRQL.
- Interestingly, affected individuals lacked full recovery from mental health problems after termination of experienced victimization and continue to show increased strain.
- Future long-term studies are necessary to clarify if mental health problems will return to baseline after several years or if residual symptoms will remain.

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