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The Personality Trait of Environmental Sensitivity Predicts Children's Positive Response to
School-Based Anti-Bullying Intervention

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Intervention; Environmental Sensitivity; Highly Sensitive Child Scale.

Abstract

Background: Meta-analyses on the effectiveness of anti-bullying interventions show that average effects tend to be significant but small. Informed by the *Vantage Sensitivity* framework (Pluess and Belsky, 2013) the current study aims at testing whether individual differences in Environmental Sensitivity predict treatment response to an anti-bullying intervention.

Method: Large randomized controlled trial with 2,042 pupils (grade 4 and 6) randomly assigned to a treatment or control condition.

Results: Significant Intervention effects on victimization and internalizing symptoms (but not bullying or externalizing symptoms) were moderated by both *Environmental Sensitivity* and gender, with boys scoring high on sensitivity benefitting significantly more than less sensitive boys from the effects of the intervention regarding reduced victimization and internalizing symptoms.

Conclusions: Findings are consistent with the notion of Vantage Sensitivity, suggesting that some individuals are disproportionately likely to respond to treatment while others are more resistant as a function of individual differences in environmental sensitivity.

Declaration of interest: None.

The Personality Trait of Environmental Sensitivity Predicts Children's Positive Response to School-Based Anti-Bullying Intervention

Bullying among school children is recognized as a significant and serious issue in the educational sector (Srabstein & Leventhal, 2010). Many intervention programs have been developed in order to prevent and reduce bullying at schools, including the KiVa anti-bullying program (Salmivalli, Kärnä, & Poskiparta, 2010). Meta-analyses on the efficacy of anti-bullying interventions show that they are generally effective but average treatment effects tend to be modest (Ttofi, Eisner, & Bradshaw, 2014). What has not been investigated yet, is whether children vary in how much they benefit from such interventions due to individual differences in their *Environmental Sensitivity*, defined as the inherent ability to perceive and process environmental stimuli (Pluess, 2015). This hypothesis builds on the developmental frameworks of *Differential Susceptibility* (Belsky & Pluess, 2009) and *Vantage Sensitivity* (Pluess & Belsky, 2013; Pluess, 2015) according to which children vary in their sensitivity to environmental quality with some being generally more responsive to supportive experiences than others. Hence, the present study investigates the role of self-reported *Environmental Sensitivity* in children, measured with the recently developed *Highly Sensitive Child* (HSC) scale (Pluess, Assary, Lionetti, Lester, Krapohl, Aron & Aron, 2018) regarding the response to KiVa, an established and effective universal school-based anti-bullying program (Kärnä, Voeten, Little, Poskiparta, Kaljonen, & Salmivalli 2011; Kärnä, Voeten, Little, Poskiparta, Alanen, & Salmivalli, 2011).

Bullying affects a large proportion of children all over the globe. According to a recent international survey (Inchley, Currie, Young, Samdal, Torsheim et al., 2015), 13% of 11-year old children across the world reported having been bullied at least twice in the past two months and 8% admitted to having bullied others. Bullying has been associated with various mental health problems, for both bullies and victims alike. For example, active bullying behavior has been found to predict *externalizing disorders* (Klomek, Sourander, Elonheimo, 2015), criminal offenses (Ttofi,

Farrington, Lösel, Loeber, 2011), and antisocial personality disorder (Copeland, Wolke, Angold, Costello, 2013). Victims of bullying, on the other hand, tend to report significantly higher levels of *internalizing problems*, such as anxiety and depression, as well as heightened risk of suicidal ideations and suicide attempts, self-harming behaviors, higher levels of psychosomatic symptoms, and substance abuse (Fisher, Moffitt, Houts, Belsky, Arseneault, et al. 2012; Nansel, Overpeck, Pilla, Ruan, 2001). Importantly, associations between bullying behaviors and mental health problems are not restricted to childhood but extend well into adulthood, even when accounting for other important childhood risks and preexisting psychiatric problems (Copeland et al., 2013).

Over the last thirty years, several school-based intervention programs have been developed to prevent and counteract the negative effects of bullying in schools. The more effective programs feature multiple components and are based on universal actions such as improving whole-school and classroom climate, introducing schoolwide rules related to bullying, as well as providing specific training for teachers and parents (Farrington & Ttofi, 2009). Some programs combine these universal actions with additional more selective and indicated actions (Bradshaw, 2015). KiVa, for example, is a systematic universal school-based multicomponent anti-bullying program (Salmivalli, Kärnä, Poskiparta, 2010) that targets the whole school and classrooms (i.e., universal actions) as well as individual children (i.e., indicated actions). The universal prevention component involves a 10 session teacher-taught curriculum which is targeted at all students and delivered throughout the school year. KiVa has been shown to be effective in reducing bullying-related behaviors in Finland where it has been developed (Kärnä et al., 2011a; Kärnä et al., 2011b) and, more recently, also in Italy in a study featuring the same sample as the current one (Nocentini & Menesini, 2016).

Generally, meta-analyses of anti-bullying programs provide evidence for their efficacy in reducing direct behavioral outcomes related to bullying behavior and victimization (Ttofi, Eisner, & Bradshaw, 2014), although effects tend to be small with $d = .14 - .17$ (Evans, Frater, & Cotter, 2014; Ferguson et al., 2007; Jimenez-Barbero, Ruiz-Hernandez, Llor-Zaragoza, Perez-Garcia, &

Llor-Esteban, 2016; Lee, Kim, & Kim, 2015; Ttofi & Farrington, 2011; Yeager, Fong, Lee, Espelage, 2015). Effects of antibullying programs on internalizing and externalizing behaviors have also been studied. In particular, the evidence-based KiVa antibullying program showed efficacy in reducing students' levels of internalizing problems (Cohen's $d = 0.13$) related to the effect of being victims and living in a social environment perceived as unsafe (Williford et al., 2013). Focusing on externalizing symptoms, the evidence-based Olweus Bullying Prevention Program showed a significant reduction in self-reported delinquency, vandalism, and alcohol use (Olweus, 1993; Limber, Nation, Tracy, Melton, & Flerx, 2004; Olweus & Limber, 2010). Effects are stronger in European and/or ethnically homogeneous samples (Evans, Fraser, & Cotter, 2014) and, not surprisingly, when programs are longer, more intensive, and implemented with higher fidelity (Ttofi & Farrington, 2011). Furthermore, individual child characteristics also emerged as important moderators of treatment efficacy. For example, children with more severe symptoms and problematic behaviors at baseline (Ferguson et al., 2007; Yanagida, Strohmeyer, Spiel, 2016) and of younger age (Yeager, Fong, Lee, Espelage, 2015) tend to benefit more from anti-bullying interventions. And at least one study provided evidence that treatment effects are stronger in boys than girls (Kärnä, Voeten, Little, Alanen, Poskiparta, Salmivalli, 2013). What has not been investigated yet, however, is whether children may also differ in their response to anti-bullying intervention as a function of individual differences in sensitivity or susceptibility to environmental influences (i.e., *Environmental Sensitivity*) as suggested by the *Differential Susceptibility* (Belsky & Pluess, 2009) and *Vantage Sensitivity* concepts (Pluess & Belsky, 2013). The *Vantage Sensitivity* framework (Pluess & Belsky, 2013) specifically proposes individual differences in response to *positive* experiences and provides the theoretical basis for the hypothesis that some children are more likely to benefit from intervention, such as anti-bullying programs, than others due to their heightened sensitivity to positive aspects of the environment. The hypothesized mechanism underlying such differences is that some children register contextual changes that result from

school-wide anti-bullying programs more easily and more deeply than other children due to heightened *Environmental Sensitivity* (Pluess et al., 2018; Pluess, 2015), a stable and heritable personality trait (Assary et al., submitted), characterized by heightened behavior inhibition, emotional reactivity, sensitivity to subtle stimuli, and deeper cognitive processing of environmental stimuli (as proposed by *Sensory Sensitivity Processing theory*, Aron et al., 2012). According to the *Neurosensitivity* hypothesis (Pluess & Belsky, 2013; Aron & Aron, 1997), individual differences in *Environmental Sensitivity* may reflect a more sensitive central nervous system. Applied to the school context and bullying programs, High Sensitive children, who tend to make up a minority of about 20-30% (Pluess et al., 2018), may benefit more from treatment effects of anti-bullying interventions compared to the majority of less sensitive children because they are more likely to register program-induced improvements in the social school environment.

Environmental Sensitivity can be measured in children and adolescents with the 12-item *Highly Sensitive Child* (HSC) scale (Pluess et al., 2018), an adapted version of the *Highly Sensitive Person* (HSP) scale for adults (Aron, 1996). The HSC scale has been developed, validated and tested across four independent samples of British children with a total sample size of more than 3,500 and found to be reliable, psychometrically robust and largely distinct from other established temperament and personality traits (Pluess et al., 2018). In children, heightened sensitivity has been associated with more internalizing and less externalizing problems, specifically fights and bullying behaviors (Boterberg, Warreyn, 2016). First empirical evidence for the moderating effect of the HSP scale emerged in an experimental study on the emotional reactivity to doing well or not well in a test, providing findings that undergraduate students scoring high on HSP reported increased sensitivity to both negative and positive conditions (Aron, Aron & Davis, 2005). More recently, it has been shown that HSC moderates the effects of a school-based depression prevention program (Pluess & Boniwell, 2015; Pluess, Boniwell, Hefferon & Tunariu, 2017). Applying a two cohort treatment/control design in a sample of 363 11-year-old girls, it was found that the intervention was

successful in reducing depression in girls scoring high on the HSC scale while not being effective at all in girls scoring low on the same measure. The validity of the measure of HSC has been further supported in a recent longitudinal study aimed at testing whether parent-reported HSC moderated the effects of parenting quality on child outcomes (Slagt et al., 2017). Consistent with theory, children that were rated as more sensitive were more strongly affected (i.e., teacher rated externalizing behavior problems) by changes in both negative and positive parenting practices compared to less sensitive children. The current study overcomes methodological limitations of the previous studies, such as lack of a randomized design and relatively small samples, in order to test whether highly sensitive children benefit indeed more from school-based interventions than less sensitive ones, featuring a randomized controlled design and a large sample of over 2,000 boys and girls.

In summary, the aim of the present study was to evaluate whether the personality trait of *Environmental Sensitivity* measured with the recently developed *Highly Sensitive Child* scale moderates treatment effects of the KiVa anti-bullying program in a large randomized controlled trial. The current study uses data from a recent general evaluation of KiVA (Nocentini & Menesini, 2016) but extends previous findings by testing moderation effects of self-reported sensitivity on bullying and victimization outcomes as well as internalizing and externalizing symptoms. Informed by the *Vantage Sensitivity* framework (Pluess & Belsky, 2013; Pluess, 2015), we hypothesized that highly sensitive children, who tend to be more perceptive and aware of their surroundings, will register treatment-induced changes in peer behavior and classroom atmosphere more easily and more strongly, and therefore report less bullying, victimization, internalizing and externalizing symptoms compared to less sensitive children. Furthermore, given previous findings of gender differences in bullying-related behaviors we expected that these moderating effects may be more pronounced in sensitive boys compared to girls.

Methods

Participants

Children were recruited from 13 comprehensive schools located in three cities of Tuscany, Italy, which have been included in a randomized controlled trial (RCT) aimed at testing the effectiveness of the KiVa anti-bullying program (for a detailed description of the trial design, recruitment and retention of participants, see Nocentini & Menesini, 2016). In short, the regional school board of Tuscany randomly assigned seven schools to the intervention and six to the control condition with a total of 97 classrooms and 2,184 pupils in grades 4 and 6. For recruitment, all parents were sent information letters together with a consent form. A total of 2,050 pupils (94% of the target sample) provided active consent for study participation. Data were collected in two waves: September-October 2013 (T1: pre-treatment) and May-June 2014 (T2: post-treatment). Overall, 2,042 pupils filled out the questionnaires at T1 and 1,910 at T2 (for a flow chart, see Figure 1). Descriptive data of included children are reported in Table 1.

For the present study we included the complete sample for all analyses focused on bullying and victimization outcomes. For internalizing and externalizing symptoms, however, we could only consider the older children given that the Youth Self Report (Achenbach, 1991) was not administered to children in grade 4.

Procedure

Data were collected in classrooms during school hours with paper/pencil questionnaires under the supervision of trained psychologists, researchers, and master students. The intervention took place at schools after baseline data collection.

Measures

Bullying and Victimization. Bullying behaviors were measured with the *Florence Bullying-Victimization* scales (Palladino, Nocentini, and Menesini, 2016). Each of the two scales consists of 14 items asking how often respondents have experienced particular behaviors as perpetrator or victim (e.g., “*I threatened someone*” for bullying, and “*I was threatened*” for victimization) during

the past couple of months. Each item is rated on a 5-point scale ranging from 1 = “never” to 5 = “several times a week”. Children completed these scales after the different constructs were explained to them. Internal reliability for both scales at T1 and T2 ranged from $\alpha = .82-.86$.

Environmental Sensitivity. Environmental Sensitivity was measured at T1 with the *Highly Sensitive Child (HSC) Scale* (Pluess et al., in press). The 12 items (e.g., “I notice when small things have changed in my environment”, “Loud noises make me feel uncomfortable”) were rated by children on a 5-point scale ranging from 1 = “not at all” to 5 = “extremely”. The HSC scale is a relatively new tool but robust psychometric properties and construct validity of the HSC scale have recently been confirmed across four different samples with a total sample size of more than 3,500 children and adolescents [7]. Internal consistency in the current sample was satisfactory with $\alpha = .79$.

Internalizing and Externalizing Symptoms. We used the *Youth Self-Report* (Achenbach, 1991) to measure both internalizing and externalizing symptoms at T1 and T2 in grade 6. The 103 items were rated by children on a three point scale ranging from 0 = “not true” to 2 = “very true or often true”. The two subscales of *Internalizing Symptoms* and *Externalizing symptoms* showed good reliability with α ranging from .85 to .87.

Statistical Analysis

We applied linear mixed-effects models with full-information maximum likelihood estimation (West, 2009) to test our hypotheses. Analyses were conducted in three stages using a three-level (time within individuals within schools) random-intercept model to account for within-subjects, within-school correlations: First, the main treatment effect was tested across the whole KiVa sample (controlling for gender and school grade); Second, it was tested whether HSC, as a continuous variable, moderated the efficacy of the KiVa program. To this end, a multiplicative interaction term was added to the previous regression model (Time * Group * HSC); and third, significant interactions were followed up with simple slopes by investigating change across time for

three distinct groups, high (top 25% of the HSC scale), medium (between top and bottom 25%), and low (bottom 25%) in order to illustrate detected moderation effects for ease of interpretation. In more detail, using the same approach (linear mixed-effects models), we estimated the change between pre and post assessment for each group (i.e., low, medium and high sensitive children) separately for children in KiVa schools versus those in control schools. Effect size of pre-post change in the treatment group was calculated as Standardized Effect Size in a Mixed/Multilevel Model, where standard deviations are derived from the standard errors of the estimated marginal means (Hedges, 2007). All analyses were conducted within SPSS with the significance level set at .05, and with values between .05 and .10 considered marginal.

Results

Preliminary Analyses

Means, standard deviations for all study variables are presented in Tables 1.

[Table 1]

Consistent with previously reported findings (Nocentini, Menesini, 2016) a significant group*time interaction emerged for bullying ($B = -.012$; $ES = .005$; $p = .040$), and victimization ($B = -.026$; $ES = .008$; $p = .004$) with children in the KiVa group displaying a significant decrease between T1 and T2 in bullying ($B = .007$; $ES = .003$; $p = .019$; $d = .07$) and victimization ($B = .020$; $ES = .004$; $p < .001$; $d = .10$). The same result emerged for externalizing symptoms ($B = -.915$; $ES = .269$; $p = .001$) with a significant decrease from T1 to T2 ($B = .701$; $ES = .198$; $p = .000$; $d = .09$) For internalizing symptoms, however, it was the three-way interaction group*time*gender that reached significance ($B = -2.987$; $ES = 1.017$; $p = .003$) with internalizing symptoms decreasing over time in the treatment group but only in boys ($B = 1.44$; $ES = .63$; $p = .020$; $d = .16$) not in girls ($B = .270$; $ES = .718$; $p = .707$; $d = .03$).

Moderation Effects

Findings of the Linear Mixed Models aimed at evaluating the moderation effect of HSC are presented in Table 2. Significant four-way interactions, $\text{group}*\text{time}*\text{gender}*\text{HSC}$, emerged for bullying, victimization and internalizing symptoms, suggesting that the change of bullying, victimization and internalizing symptoms between T1 and T2 in the two groups (treatment and control) is moderated by both HSC and gender. No significant three-way ($\text{group}*\text{time}*\text{HSC}$; $B = .132$; $ES = .424$; $p = .755$) or four-way ($\text{group}*\text{time}*\text{gender}*\text{HSC}$; $B = .245$; $ES = .859$; $p = .775$) interaction emerged for externalizing behaviors.

[Table 2]

[Table 3]

Follow-up Analyses for Bullying

Results for bullying are shown in Table 3. Boys in the Kiva condition, did not show any significant decrease across time, excepting for a marginal effect in the Medium HSC group. Similarly, there was no significant change in any of the HSC groups in the Control condition. However, for girls the level of bullying increased significantly in the Control—but not the Kiva group—for both High and Low HSC.

Follow-up Analyses for Victimization

Results for victimization are shown in Figure 2 and in Table 3. High and Medium HSC boys in the KIVA condition showed a significant reduction in victimization, with an effect size of the High HSC condition double than that of Medium HSC boys. Low HSC boys in the KiVa condition, on the other hand, did not show any significant change. In the control group, no significant change over time was found, whether for high, medium, or low HSC boys. In girls in the KiVa group, victimization did not change in Low HSC, but it decreased significantly in Medium HSC and marginally in High HSC, with a similar effect size. Conversely, in the control group, victimization increased in High HSC girls but not in Medium or Low HSC girls.

Follow-up Analyses for Internalizing Symptoms

Results for Internalizing Symptoms are shown in Figure 2 and in Table 3. High HSC boys in the KIVA condition showed a significant reduction in Internalizing Symptoms, with double the effect size compared to the Medium and Low KiVa HSC boys. In the control group, there was no significant change over time for any of the boys. Similarly, internalizing symptoms did not change in girls, regardless of treatment condition and HSC.

[Fig. 2]

Discussion

The current study aimed at testing whether individual differences in the personality trait of *Environmental Sensitivity* predicted children's treatment response to an established antibullying intervention. Informed by *Differential Susceptibility* (Belsky & Pluess, 2009) and *Vantage Sensitivity* (Pluess & Belsky, 2013; Pluess, 2015), we expected that children who score higher on the *Highly Sensitive Child* questionnaire (Pluess et al., 2018) would benefit more from the intervention in relation to both behavioral and mental health outcomes compared to those scoring low on the same measure.

As reported in a previous study (Nocentini & Menesini, 2016), the KiVa anti-bullying program proved effective in reducing bullying and victimization. In addition, it also significantly reduced externalizing and, in boys only, internalizing problems. Consistent with our hypothesis, several of these main effects were moderated by *Environmental Sensitivity* and gender with effects most pronounced in boys scoring high in sensitivity. Although the intervention significantly reduced bullying behaviors and mental health outcomes across the whole sample, highly sensitive boys seemed particularly responsive to the beneficial effects of the intervention on victimization and internalizing symptoms (i.e., the effect size of the intervention in highly sensitive boys was more than two times the average effect size across the whole sample). Low sensitive boys, on the

other hand, did not benefit from the intervention in relation to victimization and internalizing symptoms. In girls, we found that medium and highly sensitive ones, respectively, were significantly and marginally significantly more likely to report reduced levels of victimization when in the treatment group, with no moderation effects emerging for the other outcomes. A possible explanation for the victimization findings is that highly sensitive children are more likely to be (or perceive to being) victimized, as shown in the bivariate correlations, and therefore also more positively affected by a treatment-induced reduction of bullying behavior in the school context. The significant main effect on externalizing symptoms, however, was moderated neither by sensitivity nor gender, which may be explained by the observation that sensitive children are generally less likely to manifest externalizing behaviors. In summary, low HSC children, boys and girls, seem to be relatively resistant to the program's effects in relation to reducing victimization, and low HSC boys in relation to reducing internalizing behaviors. On the other side, both medium and high HSC children are more sensitive to the antibullying program for victimization, but only high HSC boys are more sensitive to the treatment for internalizing behaviors.

Overall, the average effect sizes for a reduction in bullying ($d=.07$), victimization ($d=.10$), externalizing behaviors ($d=.09$) and internalizing symptoms in boys ($d=.16$) were relatively low, which is consistent with the existing literature (Evans, Frater, & Cotter, 2014; Ferguson et al., 2007; Jimenez-Barbero, Ruiz-Hernandez, Llor-Zaragoza, Perez-Garcia, & Llor-Esteban, 2016; Lee, Kim, & Kim, 2015; Ttofi & Farrington, 2011; Yeager, Fong, Lee, Espelage, 2015). However, for sensitive boys effect size estimates were more than twice of the average estimate (.23 for victimization and .37 for internalizing symptoms).

Why do sensitive children benefit more from anti-bullying intervention? KiVa is a program that targets the social structure of the context in which bullying occurs. Program activities aim at improving children's ability to recognize and deconstruct the typical bullying context. As a result children learn to empathize with the suffering of the victim, to process the features of the bullying

situation, and to find the most appropriate coping solution. According to the predominant theories of *Environmental Sensitivity*, more sensitive individuals may have a more responsive central nervous system on which experiences register more easily and more deeply (Pluess & Belsky, 2013; Belsky & Pluess, 2009). Hence, highly sensitive children may be better at acquiring empathy and also more perceptive of treatment-induced improvements of the school and classroom context.

In line with our hypothesis, the moderating effects of *Environmental Sensitivity* were more pronounced in boys than girls. Boys are generally more likely to get involved in bullying-related behaviors, both actively as bullies or passively as victims (Cook, Williams, Guerra, Kim, Sadek, 2010). Hence, sensitive boys may a) benefit directly from a treatment-induced reduction in being bullied, and b) be generally more perceptive of positive changes in the school and classroom context. This explains both the reduction in reported victimization as well as the significantly reduced internalizing problems in highly sensitive boys.

The strengths of this study include the randomized control trial design, the large sample, and the focus on multiple bullying-related outcomes. However, findings have to be considered in light of several methodological limitations. First, all the measures were based on self-report. Second, the sample was not representative of the Italian population. The reported findings are only generalizable to Italian schools that are willing to implement an anti-bullying program with a medium-level of risk (Nocentini, Menesini, 2016). Third, mental health symptoms were available only for older children. Finally, the study did not focus on investigating the specific processes underlying the heightened treatment response of high HSC children. A better understanding of the specific mechanisms associated with *Environmental Sensitivity* will be crucial for the development of specific intervention components aimed at low sensitive children that seem less likely to benefit from anti-bullying intervention.

Despite these limitations, the present study makes a significant contribution to the literature by demonstrating that the personality trait of *Environmental Sensitivity* represents an important

predictor of the response to school-based anti-bullying intervention (for similar findings regarding depression prevention intervention, see also Pluess & Boniwell, 2015). There is a growing recognition that universal prevention programs fail to equally benefit all individuals and that it is important to better understand differences in treatment response (Bradshaw et al., 2015). The current study provides evidence that individual differences in *Environmental Sensitivity* should be considered as important moderator of treatment response to school-based intervention programs. Not only can it be measured easily with a short questionnaire but the resulting data could be useful for the identification of children most and least likely to benefit from universal school-based interventions, such as anti-bullying programs. Not accounting for individual difference in *Environmental Sensitivity* may lead to mis-estimation of the often small to moderate average treatment effects: Highly sensitive children may be considerably more responsive to treatment than the average effect size suggests while less sensitive individual may not respond at all. This important information is lost when individual differences in *Environmental Sensitivity* are not considered and data from more and less responsive individuals are combined.

In conclusion, the current study provides first evidence that self-reported *Environmental Sensitivity*, measured with a short questionnaire, moderates the positive effects of an established anti-bullying intervention. These moderating effects were particularly strong in boys, with highly sensitive boys benefitting significantly more from the intervention than low sensitive boys regarding victimization and internalizing symptoms.

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All the three authors listed have contributed sufficiently to the project to be included as authors, and all those who are qualified to be authors are listed in the author byline. To the best of our knowledge, we are not aware of any conflict of interest, financial or other.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This article does not contain any studies with animals performed by any of the authors.

Informed consent was obtained from all individual participants included in the study.

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Table 1. Descriptive statistics for the Total sample and differentiated for genders

		Experimental M (SD)			Control M (SD)		
		Males	Females	Total	Males	Females	Total
Bullying	T1 (N=2019)	N= 517; .055 (.089)	N= 500; .034 (.055)	N= 1017; .045 (.075)	N=511; .059 (.099)	N=491; .034 (.046)	N=1002; .047 (.074)
	T2 (N=1890)	N=473; .046 (.077)	N=462; .028 (.046)	N=935; .037 (.064)	N=490; .063 (.085)	N=465; .042 (.054)	N=955; .053 (.072)
Victimization	T1 (N=2024)	N=520; .108 (.125)	N=501; .085 (.104)	N=1021; .097 (.115)	N= 512; .106 (.118)	N= 491; .086 (.102)	N= 1003; .096 (.110)
	T2 (N=1892)	N=474; .082 (.097)	N=463; .071 (.082)	N=937; .077 (.090)	N=490; .110 (.109)	N=465; .103 (.109)	N=955; .107 (.109)
Internalizing symptoms	T1 (N=1047)	N=263; 8.10 (7.29)	N=269; 10.58 (7.81)	N=532; 9.35 (7.65)	N=268; 9.30 (7.51)	N=247; 10.07 (8.27)	N=515; 9.66 (7.88)
	T2 (N=948)	N=233; 6.65 (6.95)	N=247; 10.33 (8.59)	N=480; 8.51 (8.04)	N=249; 9.10 (7.38)	N=219; 9.79 (7.38)	N=468; 9.52 (8.10)
Externalizing symptoms	T1 (N=1047)	N=263; 5.87 (5.54)	N=269; 5.38 (4.82)	N=532; 5.60 (5.18)	N=268; 6.17 (5.06)	N=247; 4.41 (4.16)	N=515; 5.329 (4.72)
	T2 (N=948)	N=233; 5.02 (4.94)	N=247; 4.82 (5.08)	N=480; 4.93 (5.05)	N=249; 6.42 (5.42)	N=219; 4.46 (4.76)	N=468; 5.606 (5.21)
HSC	T1 (N=2020)	N=520; 3.294 (.752)	N=501; 3.527 (.676)	N=1021; 3.397 (.725)	N=508; 3.257 (.728)	N=491; 3.543 (.692)	N=1004; 3.406 (.725)

Age	T1 (N=2028)	N=1024;	N=1004;
		9.92 (1.16)	9.93 (1.13)
Ethnicity	T1 (N=2028)	N=1024;	N=1004;
		Italian (82%)	Italian (83%)

Table 2. Mixed Model predicting bullying, victimization and internalizing symptoms: the moderating role of HSC.

	Bullying		Victimization		Internalizing Symptoms		Externalizing symptoms	
	<i>B (SE)</i>	<i>P</i>	<i>B (SE)</i>	<i>P</i>	<i>B (SE)</i>	<i>P</i>	<i>B(SE)</i>	<i>P</i>
Intercept	.0001 (.016)	.966	.001 (.024)	.982	.810 (2.15)	.706	.929 (.138)	.502
Time	.004 (.022)	.857	-.002 (.032)	.954	-2.95 (2.95)	.318	1.51 (1.18)	.202
Group	.038 (.023)	.097	.028 (.034)	.407	-1.02 (3.02)	.735	2.26 (1.94)	.245
Gender	-.005 (.021)	.816	.028 (.030)	.359	-.23 (3.28)	.944	-.514 (.210)	.807
Grade	.036 (.021)	.091	.095 (.030)	.002				
HSC	.011 (.005)	.026	.017 (.007)	.017	1.91 (.680)	.005	1.33 (.439)	.002
Time BY Group	-.018 (.031)	.555	-.003 (.045)	.953	2.46 (4.15)	.553	-2.71 (1.66)	.103
Time By Gender	.028 (.028)	.330	.036 (.041)	.384	5.12 (4.50)	.256	.045 (2.95)	.988
Time By Grade	-.030 (.029)	.308	-.052 (.042)	.219				
Group By Gender	-.038 (.029)	.198	-.100 (.043)	.018	- 4.31 (4.68)	.357		.357
Group By Grade	-.014 (.030)	.631	-.029 (.043)	.486				
Time*HSC	.000 (.006)	.974	.004 (.010)	.720	1.44 (.940)	.125	-.215(.377)	.569
Group*HSC	-.008 (.007)	.256	.948(.94)	.31	1.09 (.95)	.251		.251

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HSC*gender	-0.004 (.006)	.529	1.05(.98)	.284	.980 (.998)	.326		.326
HSC * Grade	-0.006 (.006)	.335	-0.016 (.009)	.072				
Time*HSC*gender	-0.013 (.006)	.023	-0.025 (.008)	.002	-1.02 (.942)	.277	-.147(.616)	.811
Time*HSC*Grade	.010 (.008)	.218	.021 (.012)	.085				
Time * HSC *Group	-0.006 (.006)	.361	-0.008 (.009)	.371	-.146 (.904)	.871	.225(.591)	.704
Time BY Gender BY Group	-0.033 (.040)	.408	.008(.058)	.896	-7.32 (6.39)	.253	-2.01(2.91)	.491
Time BY Grade BY Group	.068 (.041)	.095	.044(.059)	.458				
Group*Time*HSC*gender	.020 (.008)	.013	.027 (.011)	.022	2.97 (1.32)	.024	.264(.862)	.760
Group*Time*HSC*grade	-0.013 (.008)	.100	-0.001(.011)	.926				
Residual Variance	.002 (.000)	.000	.005 (.000)	.000	21.64 (1.00)	.000	.869 (.40)	.000
Subjects: Random intercept	.002 (.000)	.000	.004 (.000)	.000	34.99 (2.14)	.000	15.18 (.90)	.000
Schools: Random intercept	.000 (.000)	.085	.000 (.000)	.029	.150 (.284)	.598	.139 (.166)	.400

Note. Statistically significant results ($p < .05$) from the deviance tests for the fixed effects and from the Wald tests for the random effects are in boldface.

Figure 1. Flowchart of the recruitment and retention of participants in the evaluation.

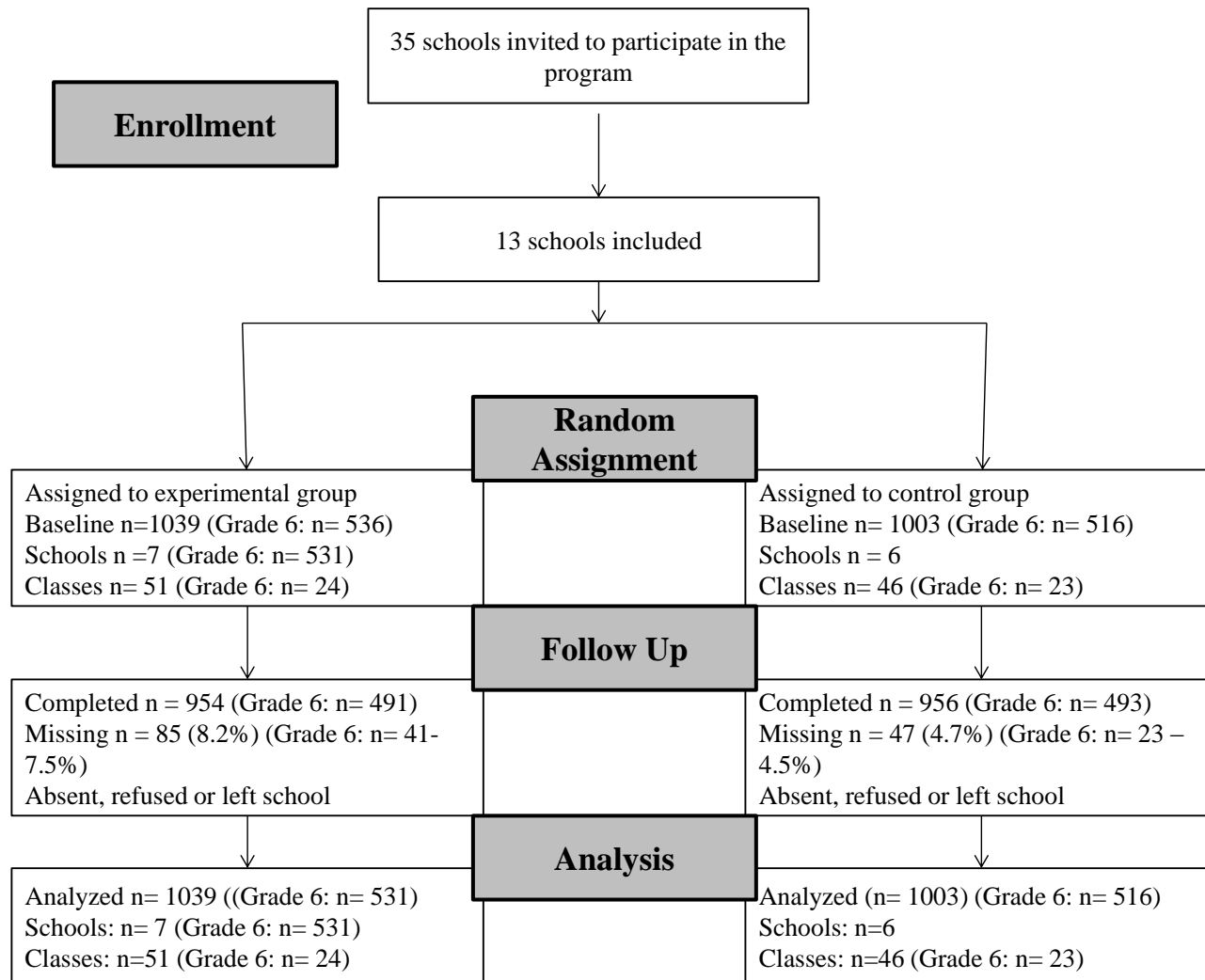


Table 3. Follow-up analyses on HSC groups: Low, Medium and High

VICTIMIZATION							
Males				Females			
KiVa	B (SE)	P	d	KiVa	B (SE)	P	d
HIGH HSC	.048(.016)	.004	.23	HIGH HSC	.018(.009)	.055	.13
MEDIUM HSC	.019(.008)	.02	.13	MEDIUM HSC	.017(.006)	.009	.12
LOW HSC	.014(.010)	.18	.14	LOW HSC	-.007(.016)	.637	.01
Control				Control			
HIGH HSC	.003(.018)	.850	.02	HIGH HSC	-.032(.012)	.011	.23
MEDIUM HSC	-.009(.006)	.108	.06	MEDIUM HSC	-.009(.006)	.108	.07
LOW HSC	-.005(.012)	.668	.03	LOW HSC	-.020(.015)	.176	.19
INTERNALIZATION							
Males				Females			
KiVa	B (SE)	P	d	KiVa	B (SE)	P	d
HIGH HSC	4.156(2.046)	.038	.37	HIGH HSC	.502(.927)	.59	.02
MEDIUM HSC	.798(.624)	.204	.12	MEDIUM HSC	.117(.526)	.824	.03

LOW HSC	1.239(.833)	.139	.17	LOW HSC	.789; (1.48)	.597	.10
Control				Control			
HIGH HSC	.924(1.15)	.669	.10	HIGH HSC	2.49(2.06)	.229	.23
MEDIUM HSC	.413(.597)	.490	.05	MEDIUM HSC	-.453(.592)	.446	.06
LOW HSC	-.495(.82)	.547	.06	LOW HSC	-.352 (.953)	.712	.07
BULLYING							
Males				Females			
KiVa	B (SE)	P	d	KiVa	B (SE)	P	d
HIGH HSC	.006(.014)	.644	.04	HIGH HSC	.004(.013)	.770	.04
MEDIUM HSC	.014(.007)	.060	.11	MEDIUM HSC	.006(.004)	.192	.12
LOW HSC	.001(.008)	.845	.02	LOW HSC	.000(.009)	.979	.19
Control				Control			
HIGH HSC	.004(.013)	.77	.06	HIGH HSC	-.011(.005)	.017	.16
MEDIUM HSC	-.0107(.007)	.153	.13	MEDIUM HSC	-.005(.004)	.203	.11
LOW HSC	.000(.009)	.979	.01	LOW HSC	-.014 (.006)	.014	.24

Note: the positive B indicates a decrease across time, the negative B indicates an increase across time.

Figure 2.

Victimization and Internalizing symptoms across time distinguishing between males and females, control and KiVa groups, and high- and low-HSC

