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**Efficacy of Cyberbullying Prevention on Somatic Symptoms – Randomized Controlled  
Trial applying a Reasoned Action Approach.**

*Running head: Cyberbullying Prevention and Somatic Symptoms*

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## ABSTRACT

The Theory of Reasoned Action (ToRA) has been proposed as a framework for cyberbullying prevention design, targeting attitudes and norms. In this study effects of a long (IG-L; ten weekly sessions) and a short (IG-S; one day, four sessions) cyberbullying-prevention-program based on the ToRA were compared with a control group (CG) over nine months. Longitudinal data from 722 students (mean age = 13.36) on cyberbullying, somatic symptoms, attitudes, and norms were analyzed within a structural equation model. Participation in IG-L significantly reduced cyberbullying ( $d = -0.584$ ) and somatic symptoms ( $d = -0.316$ ). No between-group differences emerged for attitudes and norms. Developmental trajectories and associations were found to be as suggested by ToRA in both cross-sectional and change-score analyses.

*Keywords:* cyberbullying, cyber aggression, prevention, adolescence, Theory of Reasoned Action.

*Abbreviations:* ToRA = Theory of Reasoned Action; IG-L = long intervention group; IG-S = short intervention group; CG = control group

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### Efficacy of Cyberbullying Prevention on Somatic Symptoms – Randomized Controlled Trial applying a Reasoned Action Approach.

Cyberbullying is defined as “any behavior performed through electronic or digital media by individuals or groups that repeatedly communicates hostile or aggressive messages intended to inflict harm or discomfort on others.” (Tokunaga, 2010, p. 278). Cyberbullying becomes increasingly important during adolescence. While the frequency of physical bullying shows a steady downward trend between ages eight and 16 (Smith, Madsen, & Moody, 1999), the frequency of cyberbullying increases from youth to emerging adulthood and declines afterwards (Barlett & Chamberlin, 2017).

A meta-analysis by Hamm et al. (2015) reported median prevalence rates of 23% for cyber-victimization and of 15% for the perpetration of cyberbullying. A recent review (Aboujaoude, Savage, Starcevic, & Salame, 2015) and a meta-synthesis of published cyberbullying research (Tokunaga, 2010) found similar prevalence rates in different developed countries. At the same time meta-analyses linked both perpetration and victimization to a number of detrimental psychosocial outcomes for adolescents (Fisher, Gardella, & Teurbe-Tolon, 2016; Kowalski, Giumetti, Schroeder, & Lattanner, 2014).

Commonly reported correlates of cyberbullying include somatic symptoms, with frequently cybervictimised adolescents being more than twice as likely to experience them in comparison to unaffected peers (Vieno et al., 2015). A recent longitudinal study established causal relationships between both online and offline victimization and somatic symptoms (Herge, La Greca, & Chan, 2016). These unspecific symptoms are mostly headaches, stomachaches, dizziness, heat spells or heart palpitations. They can be caused, in part, by stressful psychological experiences such as cyberbullying, even though they emerge as an interaction of biological, psychological and interpersonal variables (Malas, Ortiz-Aguayo, Giles, & Ibeziako, 2017; Sumter & Baumgartner, 2017).

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Somatic symptoms are especially relevant in the school context because they can lead to absenteeism and profoundly interfere with an adolescent's quality of life and family relationships (Saps et al., 2009; Varni et al., 2015). At the same time, these symptoms are sometimes overlooked as consequences of peer-victimization and are instead associated with biological causes or diseases. They might thus lead to unnecessary medical examinations or procedures (Cozzi et al., 2017; Malas et al., 2017).

Initially, somatic complaints and similar internalizing symptoms were proposed as correlates of victimization (e.g., Gradinger, Strohmeier, & Spiel, 2009). However, recent studies and a meta-analysis demonstrated that perpetrators of cyberbullying also show increased risk for internalizing problems in general (Kelly et al., 2015; Kowalski et al., 2014) and for somatic issues in particular (Kowalski & Limber, 2013) when compared to uninvolved students. All of these studies also highlighted that students who were categorized as both perpetrators and targets of cyberbullying (known as "bully/victims") are most severely affected by internalizing and externalizing problems.

While both bullying offline and online are associated with somatic symptoms, there is some evidence that somatic symptoms might be more prevalent in the case of cyberbullying (Vieno et al., 2015). Possible reasons lie in unique aspects of the phenomenon, which have been identified as a) the omnipresence of modern communication devices that allows perpetrators to attack anyplace and anytime; b) the possibility of staying anonymous; c) the potentially unlimited audience; d) lowered possibility of supervision by adults and e) disinhibition by lacking direct feedback (Sticca & Perren, 2013). Consequently, it is of vital importance to develop preventive interventions and to test their efficacy in reducing cyberbullying and somatic symptoms.

### **Developing Suitable Preventive Models for Cyberbullying**

For several years, studies have singled out risk factors and suggested which variables to target in cyberbullying prevention. Risk factors for cyberbullying perpetration confirmed

through meta-analyses include moral disengagement and normative beliefs or peer pressure favoring aggressive behaviors (Kowalski et al., 2014). Attitudes and morals concerning the problem behavior have also been identified as useful predictors of cyberbullying (Boulton, Lloyd, Down, & Marx, 2012; Heirman & Walrave, 2012). Recently, researchers considered interactions of these variables and proposed more sophisticated explanatory models of cyberaggression (Barlett, 2017; Hawley & Williford, 2015; Schultze-Krumbholz, Schultze, Zagorscak, Wölfer, & Scheithauer, 2016). Multiple studies focused on already established theoretical frameworks, such as the Theory of Planned Behavior (Ajzen, 1991) or the more parsimonious Theory of Reasoned Action (ToRA; Madden, Ellen, & Ajzen, 1992). The ToRA centers on the constructs of *attitudes* and *subjective norms* and suggests that they are interrelated with each other. Attitudes are defined as beliefs about objects and their attributes, that are “determined by the subjective values or evaluations of the attributes associated with the object and by the strength of these associations” (Ajzen, 2012, p. 12), while subjective norms are defined as “a person’s subjective probability that a particular normative referent [...] wants the person to perform a given behavior [...]. The normative beliefs regarding such social referents combine to produce an overall perceived social pressure or subjective norm“ (Ajzen, 2012, p. 17). These variables account for a substantial portion of the variance in behavioral intentions and subsequent behavior (Armitage & Conner, 2001). Consequently, both theories proved to be useful frameworks for understanding and predicting cyberbullying behavior accounting for up to 33% of its variance over shorter periods of time (Doane, Pearson, & Kelley, 2014; Heirman & Walrave, 2012). Doane, Kelley, and Pearson (2016) further showed, that short videos based on the ToRA can positively influence college students’ attitudes and normative beliefs about cyberbullying. As a result, the ToRA is proposed as guiding model when designing and testing cyberbullying prevention programs. Its suggested constructs are particularly relevant in adolescence due to fundamental cognitive and psychosocial changes that occur during this period and affect the development of attitudes

and subjective norms. In line with the “impressionable years hypothesis” (Krosnick & Alwin, 1989), the literature repeatedly demonstrates that attitudes are formed during a period of mental plasticity in adolescence, before they tend to crystallize in adulthood and remain relatively stable afterwards (e.g., Wölfer, Schmid, Hewstone, & van Zalk, 2016). Moreover, adolescence is well-known for the increasing impact of peers on adolescents’ social development (Brechwald & Prinstein, 2011; LaFontana & Cillessen, 2010), whose influence, in turn, increases the salience of social norms. Thus, it seems conceptually meaningful to apply and test ToRA-based cyberbullying prevention programs in adolescence to maximize the theoretically proposed effects.

Despite the fact that the general validity of attitudes and subjective norms as correlates of cyberbullying has been confirmed (Pabian & Vandebosch, 2014), they have not been tested within change models when evaluating existing school-based preventive approaches. Other shortcomings of current strategies against cyberbullying include concerns about low efficacy and limited sustainability of effects. While preventive programs aimed primarily at face-to-face-bullying are thought to be effective in reducing cyberbullying as well (Della Cioppa, O’Neil, & Craig, 2015; Slonje, Smith, & Frisen, 2013), only a few have been put to an empirical test. Approaches that target specific risk and protective factors associated with cyberbullying are rare. A recent review lists 12 interventions targeting cyberbullying among other variables (Della Cioppa et al., 2015), even if most of these programs focus on traditional bullying or internet safety and thus do not report effects on cyberbullying. Cyberbullying-specific prevention programs that achieved significant reductions in cyberbullying include the ConRed-Program (Del Rey, Casas, & Ortega, 2016, 2012; Ortega-Ruiz, Del Rey, & Casas, 2012) and the Arizona Social Networking Safety Promotion and Cyberbullying Prevention (Roberto, Eden, Savage, Ramos-Salazar, & Deiss, 2014). Both interventions were evaluated concerning their short-term effects (up to three months only), even though previous research underlines that effects of aggression prevention programs might grow (Vitaro & Tremblay,

1994), be maintained (Strain & Timm, 2001), or even reverse directions (Dishion & Dodge, 2005) over time.

None of these programs tested for changes in clinically-relevant variables, even though the clinical implications of cyberbullying have been emphasized numerous times. While there is some promising evidence on the reduction of depressive symptoms or anxiety through the participation in *traditional* bullying prevention (Williford et al., 2013), no study on the efficacy of bullying *or* cyberbullying interventions has focused on somatic symptoms as outcomes.

In sum, it remains mostly unclear, which of the variables targeted as prevention mechanisms are reliably changed in cyberbullying prevention for adolescents, with what kind of treatment over what time period and whether the treatment in question has any significant effects on somatic symptoms.

### **The Current Study**

To help close aforementioned knowledge gaps we developed the “Media Heroes” preventive intervention program and evaluated its effects on cyberbullying and somatic symptoms over a more extended period (nine months) while taking into account interrelations with changes in the most important variables from the ToRA (attitudes and normative beliefs).

Based on promising findings from a number of very brief interventions (one to five sessions) on peer aggression and peer victimization (Antonio Jimenez-Barbero, Antonio Ruiz-Hernandez, Llor-Esteban, Llor-Zaragoza, & Perez Garcia, 2013; Cunningham et al., 2012; Walton et al., 2010) apart from a standard long form of “Media Heroes” (10 x 90 minutes; IG-L), we also developed a shortened version (4 x 90 minutes; IG-S). The short version was further devised as a response to some school’s demands for interventions that do not interfere with their curriculum. While previous studies suggest that there is a dose-response-effect in face-to-face bullying interventions (Sapouna et al., 2010), this has not yet been confirmed for



cyberbullying interventions. As a result we tested the effects for both forms (see method section for a detailed description of intervention).

In summary, we hypothesized that

1. There are significant program-intended changes in cyberbullying and somatic symptoms in IG-L and IG-S when compared to a control group (CG) (hypothesized effect on outcome)
2. There are significant program-intended changes in attitudes and subjective norms in IG-L and IG-S when compared to CG (effect on hypothesized mediator)
3. Changes in cyberbullying are correlated with changes in subjective norms and changes in attitudes towards cyberbullying
  - a. In the control group (overall validity of the ToRA)
  - b. In both intervention groups (hypothesized mechanisms of change of “Media Heroes”)
4. Changes in cyberbullying are correlated with changes in somatic symptoms

For other publications that used parts of the dataset at hand to answer different research questions see [omitted for blinded review] (2014) and [omitted for blinded review] (2016).

### **Method**

#### **Sampling and Participants**

The sample was acquired by sending e-mails to a complete list of secondary schools in a large [Western European country; omitted for blinded review] city (>1.000.000 inhabitants) provided by the local governing agencies. Detailed information about the study was included. Subsequently, the schools were contacted by phone and those expressing interest in the study were sent further material together with a school participation agreement form indicating the school's intention to take part in the study. This form was required for the permission of the senate department. Eleven schools initially expressed interest of which five eventually signed

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the participation agreement. Four of the schools were college preparatory high schools, constituting 4.3% of this school type in the city of study location, and one school was a general high school, constituting 0.9% of this school type. This selectiveness may be attributed to administrative strain in general high schools as this school type was only established citywide a few months before the start of the present study.

Parents were sent information letters about the study and were asked for parental consent for students aged 14 and younger. Students' active consent was also collected. Parents and students were assured of their anonymity and reminded that participation in data collection was voluntary and that they could withdraw from the study at any time. Data on missing parental consent or active refusal to take part in the data assessment was available for 21 of the 35 classes, yielding a mean non-participation of 4.8%. Participation in the program itself was compulsory as it was integrated in the school's ethics curriculum.

Due to age-specific materials and reliance on cognitive intervention methods, schools for children with learning disabilities, as well as children below grade seven or above grade ten were excluded from the study.

### **Study Design**

Participating schools decided whether they wanted to participate in IG-L or IG-S and school principals and/or heads of departments randomly assigned the classes to the conditions (see also [omitted for blinded review], 2014). Schools were asked in advance to provide a control group class for every intervention class. Teachers committed themselves to not implement the program in the control group classes for twelve months (waiting control group). IG-S and IG-L interventions were carried out in classes between February and April 2011 (IG-S, April 2011) by their respective teachers. The pretest took place in January 2011 and the posttest nine months later (six months after intervention) in November/ December 2011. The senate department responsible for ethical issues in school-based research approved all procedures and instruments before data collection and intervention started.

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Treatment fidelity was assessed and assured by using lesson protocols, which were completed by the teachers and documented potential deviations from the standardized sessions. Moreover, members of the research team visited the intervention classes during two of the ten sessions (IG-L) or for the entire day (IG-S) to observe and assist with completing the activities in accordance with the manual.

### Measures

Standardized, anonymous questionnaires were used to collect all data during regular school lessons. Trained research assistants (psychologists) accompanied data collection in the classrooms.

**Cyberbullying behavior.** Cyberbullying perpetration was assessed using the European Cyberbullying Intervention Project Questionnaire (ECIPQ) (DAPHNE; Del Rey et al., 2015). It contains eleven items asking students to assess the quantity of their engagement in cyberbullying behaviors in the last two months (e.g., “I say mean things or verbally harass others by using the mobile phone or the computer”). Students responded on five-point scales (0 = “never” to 4 = “more than once a week”). Multiple studies have used the ECIPQ and reported good psychometric properties, including factorial validity, internal consistency as well as its appropriateness for application in different cultural contexts (Del Rey et al., 2015; Del Rey, Lazuras, et al., 2016; Erreygers, Vandebosch, Vranjes, Baillien, & Witte, 2018). The internal consistency of the items assessing bullying in the present study was  $\alpha = .81$  at the first measurement occasion and  $\alpha = .92$  at the second measurement occasion.

**Attitudes towards cyberbullying.** Attitudes were assessed using a measure that was constructed by Lazuras, Barkoukis, Ourda & Tsorbatzoudis (2013) in accordance with guidelines proposed by Ajzen and Fishbein (2008). Students rated cyberbullying on four items, using seven-point evaluative, bipolar semantic-differentials (“1 = bad – 7 = good”, “harmful – harmless”, “not cool – cool”, “immoral - moral”). Consequently, higher scores indicate a more positive attitude towards cyberbullying. There are a large number of studies

applying the same semantic differentials, supporting the reliability and predictive validity of the instrument for assessing attitudes related to health behaviors. Similarly, recent studies demonstrated the appropriateness of the measure for the assessment of attitudes towards cyberbullying (e.g., Doane et al., 2016; Heirman & Walrave, 2012; Lazuras, Barkoukis, Ourda, & Tsorbatzoudis, 2013). In the present study, the internal consistency was  $\alpha = .81$  at the first measurement occasion and  $\alpha = .88$  at the second measurement occasion.

**Normative beliefs about cyberbullying.** Students' normative beliefs about cyberbullying were measured with a questionnaire that was constructed by Lazuras, Barkoukis, Ourda, and Tsorbatzoudis (2013) in accordance with guidelines proposed by Ajzen and Fishbein (2008), asking students to rate their assumptions about how many significant others (e.g., closest friends, classmates, people of their age) perform or condone cyberbullying on a 5-point-scale (1 = "none of them" to 5 = "almost all of them/all of them"). Previous cyberbullying-related studies that used similar (Doane et al., 2016; Heirman & Walrave, 2012) or identical scales (Lazuras et al., 2013), demonstrated the validity of this instrument in this context. In the current study, the internal consistency was  $\alpha = .70$  at the first measurement occasion and  $\alpha = .66$  at the second measurement occasion.

**Somatic symptoms.** The frequency of somatic symptoms was assessed using the somatic complaints subscale of the Bern Well-Being Questionnaire for Adolescents (Grob et al., 1991). The subscale contains eight items assessing the frequency of headaches, stomachaches, sleep problems, lack of appetite, dizziness, hot flashes, palpitations and days of sick leave during the last four weeks. Students rated these symptoms on a four-point Likert-scale with high scores indicating high somatic complaints (1 = never to 4 = often). Several studies have used the questionnaire for characterizing somatic complaints in clinical samples and reported sound psychometric properties (Grob et al., 1991; Kalak, Lemola, Brand, Holsboer-Trachsler, & Grob, 2014; Wagner et al., 2015). In the current study, the internal

consistency was  $\alpha = .76$  at the first measurement occasion and  $\alpha = .82$  at the second measurement occasion.

### **Study Interventions: Long and Short Form of “Media Heroes”**

School classes allocated to IG-L received sessions of 90 minutes per week for ten consecutive weeks within their classroom environment. Classes allocated to IG-S received a single-day version (4 sessions of 90 minutes). Both versions aim at changes in attitudes and normative beliefs through the transfer of knowledge by providing the students with definitions of cyberbullying, online safety strategies as well as the impact of cyberbullying on the victim and promoting empathy with the victim. Students are also made aware that their subjective norms – the beliefs about how others expect them to behave – might not be an adequate representation of the actual norms in the classroom through closer interaction with their classmates in role plays and discussions.

Due to the peak in victimization during adolescence (Barlett & Chamberlin, 2017; Tokunaga, 2010), the program was primarily designed for students aged 12 to 16 (grades seven through ten). Consequently, the intervention utilizes age-appropriate materials that depict social situations common to the targeted age group (e.g., interpersonal conflicts in the classroom environment). “Media Heroes” relies mainly on social learning methods such as role-play or model learning (Bandura, 1978) and the application of well-established cognitive-behavioral techniques (e.g., positive reinforcement, moral reasoning). Both versions cover the same core elements and measures with IG-L further providing the legal background of cyberbullying and providing more time to apply the exercises. In addition to the main focus on the classroom environment the intervention seeks to include both parents and teachers: Teachers attended 8 hour training sessions led by psychologists before the trial began and subsequently carried out Media Heroes in a standardized form using an intervention manual [published as book, omitted for blinded review]. Teacher training also included information on student’s media usage and sought to encourage dialogue between teachers and students

beyond the context of the intervention. In IG-L students prepared a short “workshop” for parents (“parents evening”) where they presented the results they derived from the program in the form of pamphlets, role plays or talks. IG-S did not include measures addressed at parents.

### **Statistical Analysis**

Descriptive analyses were performed using SPSS (Version 21.0; IBM, 2012) while *Mplus* (Version 8; Muthén & Muthén, 2017) was used for structural equation modeling (SEM).

**Modeling of change.** Change was evaluated using latent change score modeling (cf. (Geiser, Eid, Nussbeck, Courvoisier, & Cole, 2010; Steyer, Eid, & Schwenkmezger, 1997). Latent change score models are based on the idea that the state estimate of the second measurement occasion ( $S_2$ ) can be decomposed into two parts, e.g. the state estimate of the first measurement occasion ( $S_1$ ), as well as a rest, reflecting the amount of (latent) change ( $LC_{2-1}$ ) between both measurement occasions:  $S_2 = S_1 + LC_{2-1}$  (Geiser et al., 2010). In summary, this approach computes change scores between pre- and post-assessment on the level of latent variables. With two measurement occasions, LC-models are comparable to computing *t*-tests for repeated measures (Coman et al., 2013). However, a major strength of the latent variable modeling framework in comparison to *t*-tests for repeated measures is that estimated associations are corrected for measurement error.

The mean of the LC score reflects the average change within the specific group, while the variance of the LC score depicts inter-individual difference in intra-individual change to represent that not all individuals change equally. Furthermore, correlations between change scores reflect convergence of change, that is, to what extent change in one construct is associated with change in another construct. Also, a model excluding the change variables was investigated to assess the cross-sectional associations between the constructs at the second measurement occasion.

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The latent change-approach was used in a multi-group framework and therefore allows for differences in variances and co-variances between groups. In order to account for the nested structure of the data, (i.e. students within the same class tend to be more similar than students from different classes), bias-correction of standard error estimates within the model was used (Asparouhov & Muthén, 2006). Equality of means across groups was tested using the DIFFTEST feature as implemented in *Mplus*. In case of significant mean differences between groups, treatment contrasts were computed, reflecting the overall difference in change between IG-S or IG-L and the control group used as reference. Correlations are reported for each group separately. Items measuring attitudes and norms were divided into two test parts per measure (two items each), whereas the items measuring cyberbullying were divided into three parts. Items of each test part were averaged resulting in “parceled” manifest variables for use in subsequent latent modeling. Apart from yielding more parsimonious models, parceling can reduce levels of non-normality found in data distribution (Bandalos, 2002).

Items measuring cyberbullying were skewed and showed ceiling effects (i.e., most individuals no involvement in cyberbullying). These items/parcels were therefore recoded as ordered categorical variables with three categories. The same strategy was applied in a former publication assessing the association between cyberbullying and empathy [omitted for blinded review]. Item-parcels measuring norms and attitudes were treated as continuous. Somatic complaints were included as a single indicator variable representing the overall burden of somatic complaints. Given the ordered-categorical nature of the bullying items, the mean and variance-adjusted weighted least squares estimator (WLSMV) was used. This estimator has been shown to be better suited for datasets with variables with few categories than maximum likelihood estimators (Beauducel & Herzberg, 2006). All available data were used for model estimations. No additional case was excluded from data analysis. The core model and the hypothesized interrelationships of the variables are illustrated in Figure 1.

## Results

### Participant Flow

Participants were initially 897 students from 35 classes and five schools in a large [Western European country, omitted for blinded review] city. Of these,  $n = 722$  provided longitudinal data for the variables of interest here. The students were 52% female and averagely aged 13.4 years ( $SD = 1.0$ ) with the majority of them being in grades seven (32.3%) or eight (45.6%). Most participants were born in [Western European country, omitted for blinded review] (94.3%), but 29.8% indicated that [language omitted for blinded review] is not the (only) language spoken in their home. Details of participant flow can be obtained from the flowchart in Figure 2, while sample characteristics are summarized in Table 1.

### Predictors of Drop-Out

The variables “age”, “norms”, “attitudes” and “somatic symptoms” at baseline as well as “gender” and “intervention group” were included as predictors of drop-out into a logistic regression analysis. Results indicated that only age was a significant predictor of drop-out,  $\beta = 0.367$ ,  $SE = 0.083$ ,  $p < .001$ ,  $OR = 1.444$ . Thus the drop-out was due to age rather than any characteristics of the study or the intervention and is a consequence of the German school system where students finish school after grade nine or ten and cannot participate in the study after that. Consequently, individuals that dropped out of the study did not differ in meaningful ways from those that participated in the study.

### Differences between Conditions

Individuals participating in the intervention did not differ regarding sex  $\chi^2 (df = 2) = 1.225$ ,  $p = .542$ . The groups differed significantly regarding age, Welch’s  $F (2, 325.1) = 3.982$ ,  $p = .020$ . However, the overall difference (4 months on average) between the conditions was low and therefore students were still likely to attend the same grade level. Thus the groups were considered homogenous [same as in previous publication on the intervention’s effect on empathy, omitted for blinded review].



**Overall model fit.** For latent means and covariances to be comparable across groups and measurement occasions, measurement invariance restrictions were imposed. Consequently, the constructs have a comparable meaning across time and groups (Meredith, 1993). The model used in all further analyses with strict measurement invariance restrictions provided a good approximate model fit:  $\chi^2(df = 309) = 405.53$ ,  $p < .001$ ,  $\chi^2/df = 1.31$ , RMSEA = .036, 90% CI [.026, .045], CFI = .954. Therefore, the comparison of means and covariances across groups seems reasonable. Descriptive baseline statistics based on manifest item scores for the four constructs of interest are summarized in Table 2.

**Latent correlations.** The model excluding the change scores indicated that all constructs show a moderate to high rank-order stability as marked by re-test correlations ranging between  $r = .315$  (ATT<sub>CG</sub>) and  $r = .678$  (CYB<sub>IG-L</sub>). Furthermore, there are moderate (SOM<sub>CG</sub>:  $r = -.294$ ) to strong negative correlations (CYB<sub>IG-L</sub>:  $r = -.668$ ) between the initial score and the amount of change for all four constructs, indicating a regression-to-the-mean effect. Individuals with higher pre-scores show a stronger decrease in the corresponding constructs during the intervention. All correlations can be obtained from Table 3.

Regarding the cross-sectional association of bullying with attitudes and norms, the analysis revealed a consistent pattern. Cyberbullying shows significant positive associations with norms and attitudes at each measurement occasion in each group. This indicates that more cyberbullying is associated with more pro-bullying attitudes and higher unfavorable norms. However, the results slightly differ when change scores are included. Changes in cyberbullying are significantly associated with changes in norms and attitudes within the control group ( $r = .544$  and  $r = .412$ ). The same is true for IG-S ( $r = .247$  and  $r = .266$ ). In IG-L the associations of attitudes and norms with cyberbullying fail to reach statistical significance ( $r = .296$  and  $r = .059$ ). Somatic complaints are positively associated with norms and cyberbullying at each measurement occasion in each group. This association is statistically significant in all groups but IG-S. The associations between somatic complaints

and attitudes are small and statistically non-significant in all conditions. Changes in somatic complaints are mostly unrelated to other latent change scores. Only changes in norms in the control group show a significant association with changes in somatic complaints ( $r = .164$ ).

**Latent means.** The estimated within-group mean latent change scores in addition to effect size measures are presented in Table 4 for each group separately. The DIFFTEST revealed that the groups did not differ significantly in their pre-interventional state-scores,  $\Delta\chi^2 (df = 8) = 7.307, p = .504$ . However, the amount of change within the different constructs differed significantly between groups,  $\Delta\chi^2 (df = 8) = 26.219, p < .001$ .

In addition, Table 4 summarizes the estimated treatment contrasts in addition to within-group effect estimates. Regarding changes in attitudes, IG-L and IG-S did not differ significantly from the control condition (all  $ps > .05$ ).

A lack of between-group differences resulted for subjective norms as well (all  $ps > .05$ ). Regarding changes in somatic complaints, there was a significant difference between IG-L and control,  $D_{IG-L-CG} = -1.403, p = .001, d = -0.316$ . Participants in IG-L experienced significantly larger reductions in somatic complaints compared to students in CG. No significant differences between IG-S and CG emerged ( $p > .05$ ).

Regarding changes in cyberbullying, the long-term intervention differed significantly from the control group,  $D_{IG-L-CG} = -0.455, p = .003, d = -0.584$ . Participants in IG-L reported significantly larger reductions in cyberbullying behavior when compared to students in CG. No significant difference emerged between control group and short-term intervention,  $D_{IG-S-CG} = -0.223, p = .120$ .

## Discussion

The goal of this study was to evaluate a cyberbullying prevention program ("Media Heroes") provided in two different intensities targeting adolescents. These two forms of the intervention were tested regarding their efficacy at six-month follow-up taking the Theory of Reasoned Action (ToRA) as an underlying theoretical framework into account. Also, the

associations between intervention-induced changes in cyberbullying and somatic symptoms were explored.

### **Significant Intervention Effects on Cyberbullying and Somatic Symptoms**

Regarding the overall efficacy of the program on the main outcomes of cyberbullying perpetration and somatic symptoms (hypothesis 1), this study demonstrated that the long-term form of Media Heroes is an effective preventive approach for adolescents. Students that completed the long intervention form reported significantly fewer cyberbullying-behaviors and fewer somatic symptoms than the control group students six months after intervention. Together with findings supporting the interventions' long-term effects on cognitive and affective empathy [previous publication (2016); omitted for blinded review], this study suggests that Media Heroes is a suitable preventive approach not only for cyberbullying and related social competencies but with additional beneficial effects on somatic complaints.

In contrast, the short version of Media Heroes was not found to achieve significant changes in any of the variables under research. Overall, this finding is in line with previous research on dose-response-relationships in preventive interventions. While no "gold standard" regarding the length of programs is available based on prevention literature, there is some evidence for the plausible conclusion that shorter interventions are less effective (Greenberg, Domitrovich, & Bumbarger, 2000; SAMHSA, 2002). For traditional school bullying specifically, Ttofi and Farrington (2011) found in their meta-analysis that duration and intensity of school-based programs were significantly associated with decreases in bullying and victimization. The results of the current study replicate these findings for cyberbullying and are in accordance with a study by [previous publication; omitted for blinded review] (2013) that also showed a gradually increasing efficacy of Media Heroes as a function of program length.

While our findings may not generalize to all kinds of brief interventions and over different target groups, the low number of published studies that support the efficacy of brief

interventions for peer aggression in adolescence is discouraging. Most of the effective brief interventions were targeted at individuals instead of groups and might thus have offered a more personalized and intense approach than the short form of Media Heroes (Cunningham et al., 2012; Walton et al., 2010). In those cases where group-based interventions of similar intensity showed positive effects on school violence, they were offered as weekly sessions instead of a one-day intervention, perhaps preventing fatigue and allowing more time for training effects to take place (Antonio Jimenez-Barbero et al., 2013). These features could explain the few successful evaluation studies on brief interventions. However, it is important to note that the evidence for the efficacy of brief interventions targeted at externalizing problem behaviors is of poor quality overall (e.g., Carney, Myers, Louw, & Okwundu, 2016). In summary, based on the present results, it does not seem reasonable to utilize the short intervention in its current one-day form targeted at the whole classroom, when long-term effects on cyberbullying and somatic symptoms are intended. Brief interventions should be researched much more extensively before they can be recommended for use in applied settings (such as schools).

**No Intervention Effects on Attitudes and Subjective Norms**

With regard to the hypothesized mechanisms of change (hypothesis 2), neither participation in the short nor in the long form of the intervention lead to significant changes in cyberbullying-related attitudes and subjective norms when compared to the control group. The most straightforward explanation for this lack of significant results might be that the intervention did not target norms and attitudes effectively. Media Heroes included some intervention elements that were directly targeted at influencing norms and attitudes by providing knowledge and uncovering the objective norms in the classroom. However, these variables were only explicitly targeted in two out of the eight modules of the long form and in one out of four modules of the short form, which might have been insufficient to achieve viable change on these variables. Alternative explanations for the lack of significant results in this trial are that effects were present initially, but not sustainable over a longer period or that

they could not be detected with the present sample size. In this context, it should be noted that some between-group effects pointed in the intended direction, but failed to reach statistical significance (norms:  $d_{CG-IGL} = -0.316$ ,  $p = .086$ ).

Consequently, future studies should explore short and long-term benefits of cyberbullying prevention using larger sample sizes. This is especially important, given the low base rate of cyberbullying in our study, which prevented reliable sub-group analyses based on participant roles in the current sample.

### **Latent Correlations Support the Validity of the Theory of Reasoned Action**

Regarding the overall validity of the Theory of Reasoned Action (hypothesis 3) in the context of cyberbullying, it is important to stress that our results confirm the value of this theory for designing cyberbullying prevention programs regardless of the intervention's effect on the suggested variables. Similar to findings from Heirman and Walrave (2012) as well as Doane, Pearson, and Kelley (2014), the current trial yielded correlations between attitudes, norms and cyberbullying at both measurement occasions and in all three experimental groups. These correlations indicate that more favorable attitudes and norms are associated with less self-reported cyberbullying perpetration cross-sectionally.

However, a major contribution of this study to the current body of literature lies in the replication of these findings in longitudinal analyses using change scores. All change score variables were significantly interrelated in the control group. On average, this means that if students reported beneficial changes in their attitudes and subjective norms over time, they also reported reductions in cyberbullying perpetration and vice versa. On a descriptive level, the same is true in the intervention groups, but some change score correlations (IG-S: attitude change with norm change; IG-L: cyberbullying change with norm change and attitude change) failed to reach statistical significance. One explanation for these slight inconsistencies lies in the intervention effect itself: IG-L has significant influences on cyberbullying, but not on the other two variables, which might weaken intercorrelations.

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However, the found discrepancies between cross-sectional and change score correlations also support the cautionary notes detailed/outlined by Weinstein (Weinstein, 2007); in that the common practice of evaluating the utility of behavior change models through cross-sectional studies is limited. For example, this trial yielded highly significant correlations between attitudes at the first measurement occasion and cyberbullying at the second measurement occasion in the long intervention group. However, this does not necessarily support the conclusion that individuals experiencing reductions in pro-cyberbullying attitudes over time concurrently show reductions in cyberbullying perpetration. This is evident from the lack of significant correlations in the respective change score variables. The results of this trial thus emphasize the importance for future studies to move beyond cross-sectional analyses when they test supposed contributing factors to cyberbullying change – both in basic and applied research settings.

### **Somatic Symptoms and Cyberbullying Show Cross-Sectional Correlations Only**

Regarding the associations between changes in cyberbullying perpetration and somatic symptoms (hypothesis 4) this study replicated the findings of other researchers (e.g., Kowalski & Limber, 2013) by identifying significant positive correlations at each measurement occasion and between measurement occasions. This means that on average, individuals that report heightened levels of cyberbullying perpetration also report heightened levels of somatic symptoms and vice versa.

Surprisingly, our study indicates that these constructs do not change simultaneously: Changes in somatic symptoms are not related to changes in cyberbullying perpetration in any of the experimental groups. This result might support the hypothesis that while perpetrators do suffer from internalizing problems such as somatic symptoms, these problems are not causally related to their cyberbullying behavior. Given significant cross-sectional correlations, a lack of concurrent changes in these two variables indicates that there might be other risk factors that are relevant in the causation and maintenance of both aggressive behavior and

somatic symptoms. For example, Chen, Ho and Lwin (2017) identified negative parental interactions as a significant predictor of cyberbullying perpetration in a recent meta-analysis. At the same time several forms of negative familial interactions (abuse, neglect, negative parenting style) have been linked to internalizing symptoms in general (see Pinquart, 2017 for a meta-analysis) and somatic symptoms in particular (Austin & Shanahan, 2018; Hart, Hodgkinson, Belcher, Hyman, & Cooley-Strickland, 2013; López-Soler, Alcántara-López, Castro, Sánchez-Meca, & Fernández, 2017; Pinquart, 2017). Consequently, refraining from cyberbullying perpetration (or intensifying it) over time might not lead to changes in somatic symptoms since other critical contributing factors remain unchanged. It is important to stress that this is just one illustrative example out of a large number of the possible individual or environmental factors that contribute to cyberbullying and somatic symptoms concurrently. Such factors are mostly unexplored. Consequently, a challenge for future trials is the identification of variables explaining the correlation between somatic symptoms and cyberbullying without assuming direct causal relationships.

### **Limitations**

A main shortcoming of this study is the exclusive use of self-reports. However, it remains the most appropriate way to assess the phenomenon, due to the covert nature that often prevents other possible sources (parents, teachers, peers) to become aware of it knowing about it (Kowalski, Limber, & Agatston, 2007).

Additionally, although no pretest differences occurred between the different treatment groups, instructor effects were not taken into account due to the small number of classes participating in the intervention. Further research should address this issue by investigating a larger number of classes in reference to differences in the instructors' enthusiasm for and commitment to the program.

Another limitation concerns the investigated sample. All participating schools were from one large [Western European country, omitted for blinded review] city, and other school

forms (e.g., for adolescents with learning disabilities) were excluded. This imposes certain limits on generalizing the results to all students in [Western European country, omitted for blinded review] – or even to other countries. Additionally, while allocation to active treatment arm or control was random, the schools themselves chose between long and short interventions beforehand, which might have led to some bias in the comparison of IG-L and IG-S resulting from differences in the level of commitment towards the intervention. Nonetheless, as was evident in the baseline statistics, there were no significant differences between IG-L, IG-S and CG regarding the core variables under investigation in this study.

As the first results are auspicious regarding the program's efficacy, future research will focus on applying Media Heroes – in adapted forms – to more diverse settings, to disseminate its benefits broadly.

### **Conclusion**

The current study has added to the body of evidence suggesting that attitudes and subjective norms are important correlates of cyberbullying. Nonetheless the intervention presented in this paper failed to influence them significantly. Developing effective interventions or additional modules, that consider attitudes and subjective norms more explicitly is a challenge for future prevention research. While the ToRA is a useful framework for behavior prediction, it is not specifically tailored to the prediction of cyberbullying. As such it does not account for other possibly relevant change mechanisms and influential factors beyond attitudes and norms. While the ToRA is one of the most researched change models in this context, research on moderators and mediators of cyberbullying perpetration and victimization is still in its infancy. It might be a fruitful direction for future research to compare different models directly, including additional variables (e.g., perceived behavioral control, intentions as suggested by the Theory of Planned Behavior; Madden et al., 1992) or cyberbullying-specific risk- and protective factors within larger samples.



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In sum, the overall goal of future research should be to find the most appropriate yet efficient approach that will help to describe, predict and change cyberbullying-behaviors – and consequently inform prevention development strategies. This study made a valuable contribution in this regard by yielding first insights about interrelationships and developmental processes that contribute to preventive programs against cyberbullying, which effectively help practitioners, students, and parents in coping with this problem.

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# CYBERBULLYING PREVENTION AND SOMATIC SYMPTOMS

Table 1

*Baseline sample characteristics.*

Category	% or <i>M</i>	<i>N</i> or <i>SD</i>
Age (years, range 11-17)	13.36	1.00
Grade level		
7 <sup>th</sup> grade	32.3	233
8 <sup>th</sup> grade	45.6	329
9 <sup>th</sup> grade	17.3	125
10 <sup>th</sup> grade	4.8	35
Sex		
Male	46.3	334
Female	51.8	374
Not indicated	1.9	14
Country of birth		
[Western European country; omitted for blinded review]	94.3	681
Poland	0.7	5
Turkey	0.3	2
Russia	0.3	2
Other country	2.9	21
Not indicated	1.5	11
School Type		
College Preparatory	78.7	568
General High School	21.3	154

## CYBERBULLYING PREVENTION AND SOMATIC SYMPTOMS

Table 2

*Descriptive statistics regarding the mean score over all items of the four constructs at baseline*

	CG			IG-S			IG-L		
	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>n</i>
Attitudes	1.74	1.03	353	1.74	0.98	134	1.83	1.02	232
Norms	2.10	0.78	345	2.11	0.63	130	2.25	0.76	224
Cyberbullying	0.08	0.22	350	0.08	0.18	136	0.10	0.29	228
Somatic Complaints	1.79	0.57	348	1.85	0.56	130	1.99	0.63	227

*Note.* IG-L = long intervention group. IG-S = short intervention group. CG = control group.

# CYBERBULLYING PREVENTION AND SOMATIC SYMPTOMS

Table 3

*Latent correlations of cross-sectional constructs and change scores.*

control group									
	ATT <sub>1</sub>	NRM <sub>1</sub>	CYB <sub>1</sub>	SOM <sub>1</sub>	ATT <sub>2</sub>	NRM <sub>2</sub>	CYB <sub>2</sub>	SOM <sub>2</sub>	
ATT <sub>1</sub>	ATT <sub>1</sub>	.159***	.362***	-.074	.315***	.065	.277***	-.005	ATT <sub>1</sub>
NRM <sub>1</sub>	.159***	NRM <sub>1</sub>	.596***	.224***	.095	.553***	.294***	.201**	NRM <sub>1</sub>
CYB <sub>1</sub>	.362***	.596***	CYB <sub>1</sub>	.222***	.087	.325***	.569***	.183**	CYB <sub>1</sub>
SOM <sub>1</sub>	-.074	.224***	.222***	SOM <sub>1</sub>	-.126**	.159***	.011	.605***	SOM <sub>1</sub>
LC <sub>ATT</sub>	-.523***	-.043	-.214**	-.053	LC <sub>ATT</sub>	.287***	.444***	-.029	ATT <sub>2</sub>
LC <sub>NRM</sub>	-.078	-.332***	-.203***	-.034	.273***	LC <sub>NRM</sub>	.513***	.265***	NRM <sub>2</sub>
LC <sub>CYB</sub>	-.045	-.259*	-.349***	-.208***	.412***	.544***	LC <sub>CYB</sub>	.076	CYB <sub>2</sub>
LC <sub>SOM</sub>	.069	.012	-.006	-.294***	.028	.164*	.097	LC <sub>SOM</sub>	
short intervention									
	ATT <sub>1</sub>	NRM <sub>1</sub>	CYB <sub>1</sub>	SOM <sub>1</sub>	ATT <sub>2</sub>	NRM <sub>2</sub>	CYB <sub>2</sub>	SOM <sub>2</sub>	
ATT <sub>1</sub>	ATT <sub>1</sub>	0.323***	0.597***	0.043	.370***	.196	.499***	.258***	ATT <sub>1</sub>
NRM <sub>1</sub>	.323***	NRM <sub>1</sub>	0.354***	0.255*	.180*	.421***	.179	.150	NRM <sub>1</sub>
CYB <sub>1</sub>	.597***	.354*	CYB <sub>1</sub>	0.227	.321***	.293***	.658***	.466***	CYB <sub>1</sub>
SOM <sub>1</sub>	.043	.255	.227	SOM <sub>1</sub>	-.049	.276***	.252*	.592***	SOM <sub>1</sub>
LC <sub>ATT</sub>	-.510***	-.109	-.212***	-.082	LC <sub>ATT</sub>	.230***	.459***	.087	ATT <sub>2</sub>
LC <sub>NRM</sub>	-.078	-.426***	-.007	.060	.138	LC <sub>NRM</sub>	.359***	.349***	NRM <sub>2</sub>
LC <sub>CYB</sub>	-.077	-.191	-.350***	.048	.247*	.266**	LC <sub>CYB</sub>	.475 ***	CYB <sub>2</sub>
LC <sub>SOM</sub>	.252	-.096	.296***	-.375**	-.074	.190	.003	LC <sub>SOM</sub>	
long intervention									
	ATT <sub>1</sub>	NRM <sub>1</sub>	CYB <sub>1</sub>	SOM <sub>1</sub>	ATT <sub>2</sub>	NRM <sub>2</sub>	CYB <sub>2</sub>	SOM <sub>2</sub>	
ATT <sub>1</sub>	ATT <sub>1</sub>	.356***	.465***	.047	.589***	.151	.225***	.077	ATT <sub>1</sub>
NRM <sub>1</sub>	.356***	NRM <sub>1</sub>	.540***	.404***	.071	.509***	.434***	.377***	NRM <sub>1</sub>
CYB <sub>1</sub>	.465***	.540***	CYB <sub>1</sub>	.378***	.232**	.434***	.678***	.161*	CYB <sub>1</sub>
SOM <sub>1</sub>	.047	.404***	.379***	SOM <sub>1</sub>	.021	.324***	.461***	.610***	SOM <sub>1</sub>
LC <sub>ATT</sub>	-.484***	-.322***	-.270**	-.030	LC <sub>ATT</sub>	.162**	.199**	.077	ATT <sub>2</sub>
LC <sub>NRM</sub>	-.263**	-.668***	-.223*	-.168***	.361***	LC <sub>NRM</sub>	.346***	.382***	NRM <sub>2</sub>
LC <sub>CYB</sub>	-.312***	-.150	-.432***	.087	.296	.059	LC <sub>CYB</sub>	.266**	CYB <sub>2</sub>
LC <sub>SOM</sub>	.036	-.012	-.233*	-.400***	.030	.084	.045	LC <sub>SOM</sub>	

*Note.* Correlations indicating stability within one construct over time are highlighted in light grey; correlations between change scores are highlighted in dark grey. Correlations between the estimated traits at each measurement occasion are displayed above the diagonal while correlations between the initial trait scores and the change are displayed below. ATT<sub>1</sub>/ ATT<sub>2</sub> = attitudes; CYB<sub>1</sub>/ CYB<sub>2</sub> = cyberbullying; NRM<sub>1</sub>/ NRM<sub>2</sub> = subjective norms; SOM<sub>1</sub>/ SOM<sub>2</sub> = somatic complaints; indexed numbers indicating first/second measurement occasion, respectively; LC = latent change score. \*  $p < .050$ , \*\*  $p \leq .010$ , \*\*\*  $p \leq .001$

# CYBERBULLYING PREVENTION AND SOMATIC SYMPTOMS

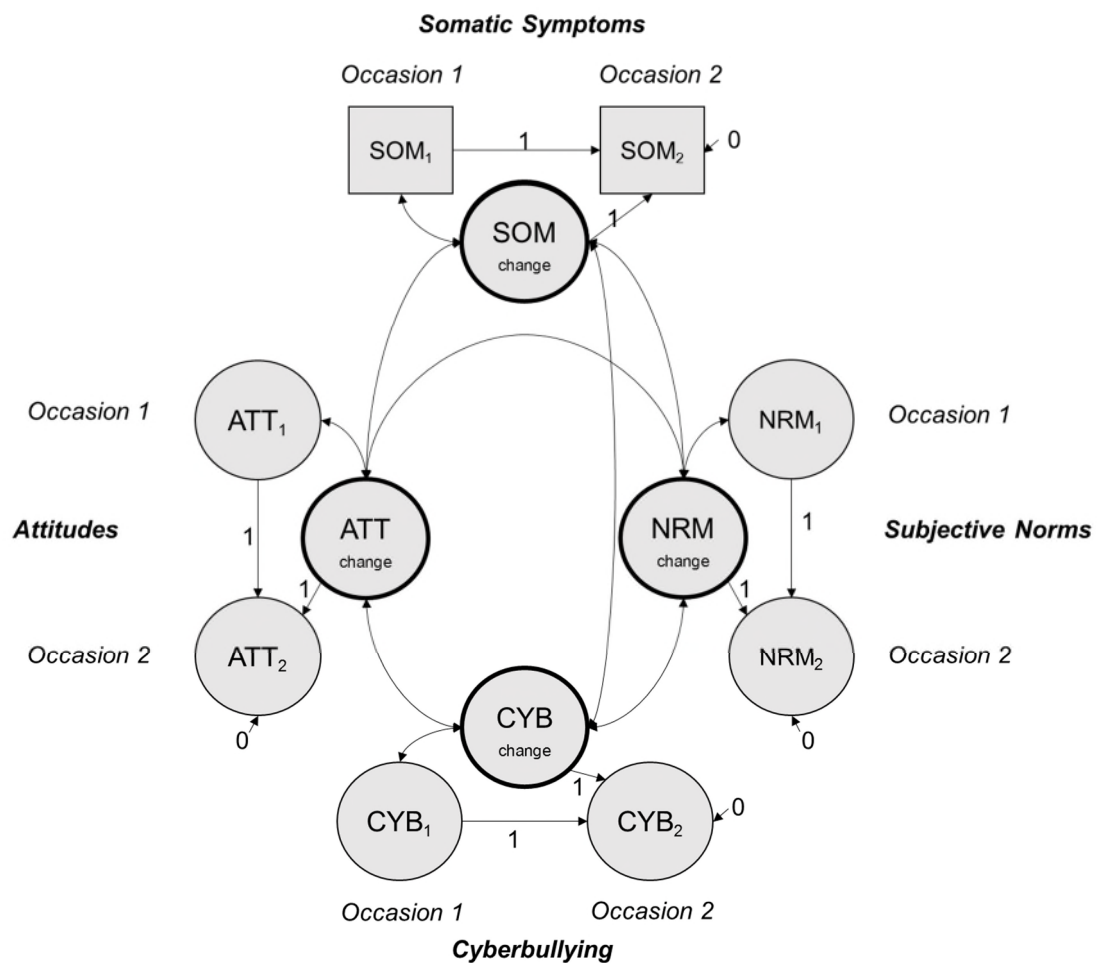
Table 4

*Latent changes in the variables of interest, within-group effect sizes and between-group effect sizes (in contrast to the control group).*

	Within Group Effects				Contrasts with Control Condition			
	$M_{LC}$	SE	$P$	d	$\Delta$	SE	$p$	d
Attitudes								
CG	-0.025	0.121	.837	-0.029	-	-	-	-
IG-S	-0.150	0.226	.506	-0.201	-0.125	0.260	.629	-0.107
IG-L	-0.176	0.155	.255	-0.278	-0.151	0.198	.446	-0.138
Subjective Norms								
CG	0.078	0.049	.112	0.232	-	-	-	-
IG-S	0.076	0.033	.022	0.234	-0.002	0.058	.975	-0.004
IG-L	-0.086	0.080	.282	-0.249	0.164	0.096	.086	-0.341
Somatic Complaints								
CG	0.395	0.323	.221	0.125	-	-	-	-
IG-S	-0.290	0.220	.187	-0.097	-0.685	0.391	.080	-0.156
IG-L	-1.007	0.296	.001	-0.324	-1.403	0.438	.001	-0.316
Cyberbullying								
CG	0.112	0.086	.194	0.199	-	-	-	-
IG-S	-0.109	0.114	.335	-0.199	-0.223	0.142	.120	-0.280
IG-L	-0.342	0.128	.007	-0.646	-0.455	0.156	.003	-0.584

*Note.* IG-L = long intervention group. IG-S = short intervention group. CG = control group.  $\Delta$  = Treatment Contrast using the control condition as reference.





*Figure 1.* Hypothesized structural model. CYB = Cyberbullying, NRM = subjective norms, ATT = attitudes, SOM = somatic symptoms. Indexed numbers represent measurement occasions. Correlations with NRM<sub>1</sub>, ATT<sub>1</sub>, CYB<sub>1</sub> and SOM<sub>1</sub> are omitted in the figure, but present in the model. NRM<sub>2</sub>, ATT<sub>2</sub>, CYB<sub>2</sub> and SOM<sub>2</sub> are uncorrelated with all other variables.

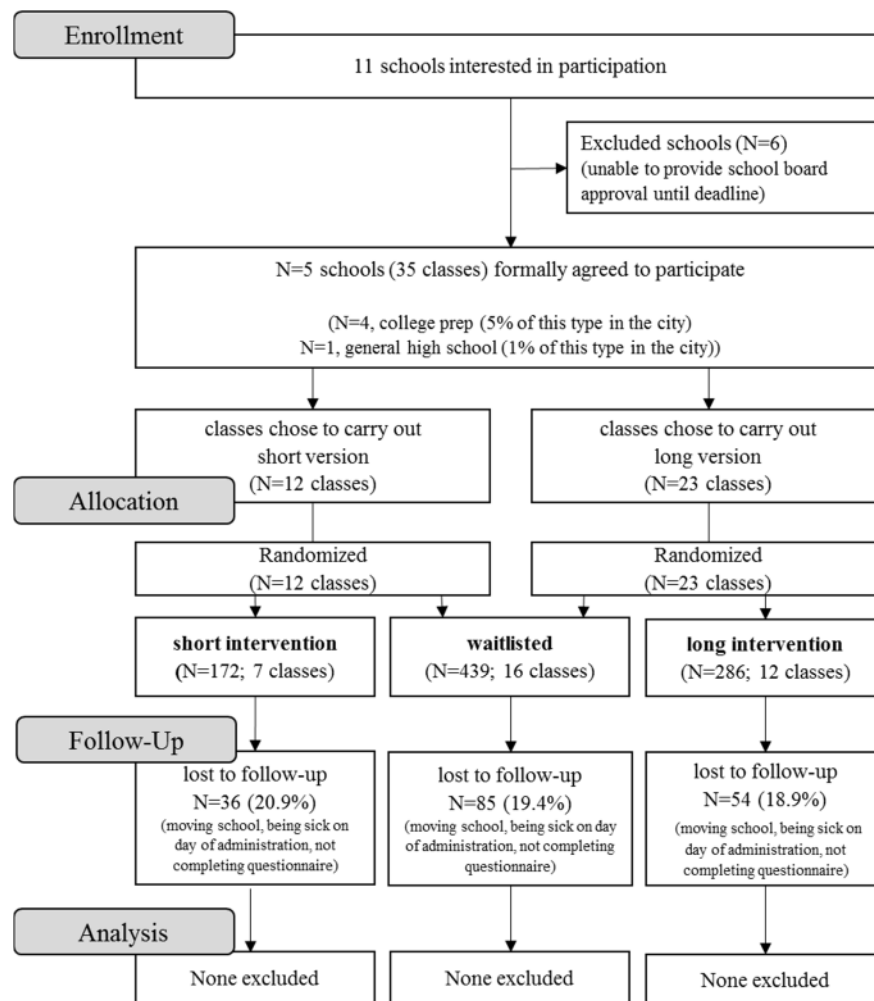


Figure 2. Details of enrollment and allocation of participants and their flow through the study.