



Which healthy lifestyle factors are associated with a lower risk of suicidal ideation among adolescents faced with cyberbullying?



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ABSTRACT

Cyberbullying is associated with negative mental health outcomes including adolescent suicidal ideation. This requires effective and accessible preventive efforts. Healthy lifestyles are factors adolescents themselves can modify that may lower their risk of suicidal ideation. The aim of this study was to examine associations between physical activity, (outdoor) sport participation, a healthy diet, higher sleep duration and low levels of smoking and alcohol use, and suicidal ideation when faced with cyberbullying. A cross-sectional survey was administered in 2014–2015 to 1037 adolescents (12–18 years, M age = 15; 50% girls) in Flanders, Belgium. Logistic regression analyses were conducted to assess direct effects of cyberbullying involvement (victim, perpetrator, bystander) on suicidal ideation, and interaction effects between cyberbullying involvement, healthy lifestyles and suicidal ideation. Results showed that cyberbullying victimization, perpetration and bystanding were associated with higher suicidal ideation, but that the association with cyberbullying perpetration disappeared when corrected for other cyberbullying involvement forms. More physical activity, sleeping longer, more often taking a healthy diet and lower levels of smoking were associated with lower suicidal ideation. Some associations of healthy lifestyles with suicidal ideation disappeared at higher levels of cyberbullying involvement. Low alcohol consumption and (outdoor) sport participation were not associated with suicidal ideation, and sport participation was even associated with higher suicidal ideation at low levels of cyberbullying involvement. These findings suggest a novel approach to suicide prevention may be warranted, by strengthening healthy lifestyles as factors that adolescents themselves can modify to increase their resilience and reduce suicidal ideation.

1. Introduction

Cyberbullying is commonly defined as bullying that takes place via digital media. A meta-analysis of 80 studies showed that cyberbullying affected 15% to 16% of study participants that mainly included youth (Modecki et al., 2014). Studies moreover showed that cyberbullying peaks in 12–15 year olds (Tokunaga, 2010). Although less prevalent than traditional, offline bullying, it may have a stronger impact on certain psychosocial outcomes than traditional bullying (Campbell et al., 2012; Schneider et al., 2012; Sourander, 2010; Van Geel et al., 2014). Especially regarding suicidal ideation, cyberbullying involvement was a stronger predictor than traditional bullying involvement (Van Geel et al., 2014; DeSmet et al., 2014). Both cyberbullying victimization and perpetration were positively associated with suicidal

ideation and behavior (Schneider et al., 2012; Bauman et al., 2013; Hinduja and Patchin, 2010; Kowalski et al., 2014; Litwiller and Brausch, 2013). To our knowledge, no studies have investigated suicidal ideation among bystanders of cyberbullying. Research on traditional bullying, however, showed higher suicidal ideation among bystanders than non-bystanders (Rivers and Noret, 2010; Rivers et al., 2009), possibly due to indirect co-victimization; cognitive dissonance from not helping a person in need; or worrying about being victimized next (Rivers and Noret, 2010; Rivers et al., 2009). Similar mechanisms and results may be expected for suicidal ideation among bystanders of cyberbullying.

Suicide is the second most important cause of adolescent mortality after traffic accidents (Dumon and Portzky, 2014), with a lifetime prevalence of self-reported suicide attempts of 10.5% among European

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adolescents (Kokkevi et al., 2012). Suicidal behavior is a complex process, starting with suicidal ideation ('thinking about ending one's life'), planning suicide ('thinking about methods, places, timeframe'), to attempting and possibly ending in suicide (Dumon and Portzky, 2014). The Stress-Diathesis Model of Suicidal Behaviour posits that suicidal behavior results from an interplay between proximal stress factors and a distal personal vulnerability or diathesis (van Heeringen, 2012). Peer victimization, such as cyberbullying, is a proximal risk factor and is considered neither necessary nor sufficient to move from suicidal ideation to enactment (Mościcki, 2001). Cyberbullying involvement can increase the risk of suicidal ideation by feelings of loneliness and hopelessness (Hinduja and Patchin, 2010; Luxton et al., 2012), and a lack of effective coping skills to address cyberbullying (Völlink et al., 2013). Healthy lifestyles, such as diet, sleep, physical activity, and absence of addictive behaviors, may reduce adolescents' vulnerability to stress and help youngsters to cope with cyberbullying. Healthy lifestyles can increase youngsters' resilience and mental well-being (Cairns et al., 2014). Educating and supporting youngsters in managing their own mental health is empowering, destigmatizing, and can have a large impact at population level (Kessler et al., 2005). Research showed that healthy lifestyles, such as sport participation and vigorous physical activity (Taliaferro et al., 2008), a healthy diet (Eisenberg et al., 2004), and sufficient sleep duration (Fitzgerald et al., 2011; Goldstein et al., 2008; Lee et al., 2012; Liu, 2004) were associated with lower youth suicidal ideation. Conversely, unhealthy lifestyles such as alcohol consumption (Swahn and Bossarte, 2007; Schilling et al., 2009) and smoking (Riala et al., 2007; Riala et al., 2009) showed an increased risk of youth suicidal ideation. Daily physical activity (PA) related to lower suicidal ideation and behavior, but not significantly so for victims of traditional bullying (Sibold et al., 2015). Whereas cyberbullying involvement may create a stress factor, healthy lifestyles may decrease adolescents' vulnerability to stress or diathesis. From the perspective of the Stress-Diathesis Model of Suicidal Behaviour, adolescents with healthy lifestyles may face cyberbullying involvement and experience a lower risk of suicidal behavior, whereas youngsters with unhealthy lifestyles may show higher risks of suicidal behavior when involved in cyberbullying.

To our knowledge, no research has investigated whether this positive role of healthy lifestyles also applies to those involved in cyberbullying. The aim of this study was to examine: 1) associations between cyberbullying involvement (as perpetrator, victim, or bystander) and suicidal ideation (research question RQ1); and 2) the moderating role of healthy lifestyles, such as sleep duration, lower levels of smoking or alcohol use, PA and sports, and a healthy diet, against suicidal ideation (RQ2–3). We hypothesized that all forms of cyberbullying involvement will be associated with higher suicidal ideation (H1); that less smoking (H2) and alcohol (H3); and sleeping longer (H4), PA and sports (H5), and a healthy diet (H6), will be associated with a lower suicidal ideation when involved in cyberbullying. Our results may support youngsters in strengthening factors they can modify themselves to protect their mental health, and may encourage health professionals in designing prevention programs to lower suicide risk in adolescents involved in cyberbullying.

2. Material and methods

2.1. Participants and data-collection

A random sample of secondary schools was selected from a government database of schools in Flanders. Twenty-six schools were contacted, eight agreed to participate between November 2014–May 2015. The study aimed to collect data among all grades 7–12 (aged 12–18) in each school, which was not always feasible. Adolescents gave active informed consent, parents provided passive informed consent. Participants completed an anonymous survey at school during one class hour, supervised by researchers. The study received approval from the

Ethics Committee of the Ghent University Hospital.

2.2. Measures

2.2.1. Socio-demographic information

Socio-demographic variables included age, gender, type of education, country of birth, sexual orientation, family living situation, self-reported weight and height (used to calculate Body Mass Index, BMI), and family affluence (Boyce et al., 2006). All demographic variables were derived from the HBSC questionnaire (Currie et al., 2013), except for sexual orientation. *Sexual orientation* was measured by examining the gender of each participant in relation to their sexual attraction (Toomey and Russell, 2016) (attracted to 'girls', 'boys', 'both girls or boys' or 'I am not sure').

2.2.2. Cyberbullying involvement

Questions on cyberbullying involvement were preceded by a definition of bullying, distinguishing it from unintentional acts or arguments between children of equal power, and were rated on a 5-point frequency scale reflecting involvement in the past six months (Solberg and Olweus, 2003). Questions for cyberbullying involvement included experiences as a victim, perpetrator and bystander (1 item each). The items that measured cyberbullying involvement are available in Supplementary material.

2.2.3. Healthy lifestyles

All healthy lifestyle items, except sleep duration, were taken from the HBSC survey (see Supplementary material). Several health-related lifestyles among adolescents are interrelated. Previous studies found that energy-balance related behaviors, such as PA, sedentary behavior and healthy diet, formed one group of health-related lifestyles among adolescents (Alamian and Paradis, 2009; Keller et al., 2008; Mistry et al., 2009), whereas addictive behaviors such as alcohol consumption and smoking formed a second group (Alamian and Paradis, 2009; Keller et al., 2008; Mistry et al., 2009). In previous research, sleep duration was included with (low) addictive behaviors in some adolescent samples, and with health-promoting behaviors in other adolescent samples (van Nieuwenhuijzen et al., 2009). Prior to our main analyses, we conducted a Principal Component analysis (Varimax rotation) on healthy lifestyles, resulting in two factors (Table 1). The purpose of this analysis was to find lifestyles that were highly related to each other, and to avoid that an association between one of these lifestyles and suicidal ideation may be due to a third variable, i.e. another healthy lifestyle that is highly associated with the healthy lifestyle under analysis and the dependent variable. For this reason, highly related lifestyles that were part of one factor were jointly entered into the regression model.

2.3. Addictive behaviors and perceived sleep duration

An index was made combining several questions on *tobacco use frequency*, ranging from never smoked to smoking ≥ 11 cigarettes per

Table 1
Principal Component analysis results for healthy lifestyle variables.

	Factor 1 'Addictive behaviors and sleep duration'	Factor 2 'Energy-balance related behaviors'
Rotated factor loadings		
Alcohol consumption	0.81	
Smoking	0.76	
Perceived sleep duration	-0.62	
Physical activity		0.83
Healthy diet		0.63

Model adjusted $R^2 = 57.6$.

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