# SUMMARY

Cyberbullying entails bullying, an intentional act to cause repeated harm or distress to the victim, using electronic or digital media. Cyberbullying among adolescents can be considered a public health problem that warrants specific research attention and interventions. The quality-of-life and health problems youngsters who are involved in cyberbullying experience, may be reduced by promoting positive bystander behavior. Positive bystander behavior includes comforting the victim or giving advice, reporting it to adults or assertively defending the victim. Passive bystanding, reinforcing or joining the bully is considered negative bystander behavior that can sustain or aggravate the cyberbullying and its harm. Serious digital games are interventions which are both engaging and educational, and may hold promise to address cyberbullying, since the appeal of this medium to adolescents. This doctoral thesis aims to contribute to literature by addressing the development of interventions to end cyberbullying and reduce its harm. The aims of the original research included in the thesis were threefold. A first aim was to improve the understanding of health problems related to cyberbullying in adolescents, and to understanding cyberbullying bystander behavior. A second aim related to the potential of serious digital games to improve social behavior and other healthy lifestyles. A third aim was to describe the development of a serious digital game to promote positive bystander behavior among adolescents.

The results of studies addressing the first aim showed that cyberbullying relates to some different health problems than traditional bullying and warrants specific attention in research and interventions. Bystander behavior plays a role in cyberbullying, and is a context-dependent form of behavior determined by several factors, such as intentions, attitudes, self-efficacy, skills and environmental facilitators. These findings support the use of a behavior change and socio-ecological theoretical perspective. Using peer nominations resulting in fixed, stable roles of bystander behavior across several incidents in determining bystander behavior may be less recommended. Adolescents need support from educators and parents to act as a positive bystander, whereas this support is currently largely lacking. Educators, especially teachers, are in need of training on how to handle cyberbullying.

The studies addressing the second aim showed that serious digital games are on average effective in promoting social behavior and other healthy lifestyles. Several moderators exist that can increase their effectiveness: a theoretical foundation in gaming theory, or gaming theory and behavioral prediction theory; individual tailoring to user characteristics; using fewer immersive features, simpler challenges and fewer levels; and not using personal goal-setting or planning techniques. Some game characteristics related to higher effectiveness only for certain outcomes (e.g. knowledge, skills) but not for others, emphasizing that game design should be specific for a certain health behavior or behavioral determinant in mind. Active involvement of users in the game design, which may be important to ensure reach and adoption during implementation of the intervention, was associated with less effective games. Based on the research findings, some recommendations were made for active user involvement that can improve

effectiveness: involving users as informants instead of in co-design, involving them in decisions on the challenge, levels, rewards, game dynamics, and not involving them in game aesthetics.

The research addressing the third aim described the development of a serious digital game to promote positive bystander behavior. Although no effectiveness data are yet available, the evidence- and theory-based intervention development increases the chances of reaching the desired effects on the program outcomes, and may serve as a starting point for the design of other anti-cyberbullying programs.

# SAMENVATTING

Pesten is een doelbewust gedrag waarbij een pester het slachtoffer herhaaldelijk wil kwetsen. Als dit pesten via digitale of elektronische media gebeurt, wordt het cyberpesten genoemd. Bij adolescenten is cyberpesten een maatschappelijk gezondheidsprobleem dat specifieke aandacht vereist in onderzoek en interventies. De gezondheids- en levenskwaliteitsproblemen die jongeren ervaren als ze betrokken zijn bij cyberpesten, kunnen mogelijk begrensd worden door het positieve gedrag van toeschouwers. Positief toeschouwersgedrag kan bestaan uit het slachtoffer te troosten of advies te geven, het cyberpesten te melden aan volwassenen, of uit het assertief verdedigen van het slachtoffer. Passief toeschouwersgedrag, de pester aanmoedigen of met het cyberpesten meedoen, wordt beschouwd als negatief gedrag dat het cyberpesten en de problemen die er mee samengaan in stand kan houden of kan verergeren. 'Serious digital games', of serieuze digitale spelletjes, zijn interventies die zowel educatief als onderhoudend zijn, en hebben als interventievorm veel potentieel om cyberpesten aan te pakken, aangezien 'serious digital games' adolescenten bijzonder aanspreken. Dit doctoraat wil een bijdrage leveren aan de literatuur, door de ontwikkeling te bespreken van interventies die het cyberpesten en zijn gerelateerde problemen willen verminderen. Het onderzoek dat in het kader van dit doctoraat werd uitgevoerd, heeft drie doelstellingen. Een eerste doelstelling was een beter inzicht te verkrijgen in de gezondheidsproblemen die samenhangen met cyberpesten bij adolescenten en in het toeschouwersgedrag van cyberpesten. Een tweede doelstelling bestond uit het vaststellen van het potentieel van 'serious digital games' om sociaal gedrag en andere gezonde levensstijlen te verhogen. Als derde doelstelling had dit doctoraat de ontwikkeling van een 'serious digital game' te beschrijven dat positief toeschouwersgedrag in cyberpesten bij adolescenten wil verhogen.

De resultaten van het onderzoek dat aan de eerste doelstelling wou tegemoet komen, toonden aan dat sommige gezondheidsproblemen die met cyberpesten samenhangen anders zijn dan diegene die met klassiek pesten samenhangen. Cyberpesten vereist dus specifieke aandacht in onderzoek en interventies. Het onderzoek toonde verder aan dat toeschouwersgedrag een rol speelt in cyberpesten, en dat dit gedrag afhangt van de context waarin het cyberpesten optreedt. Bovendien wordt het toeschouwersgedrag bepaald door verscheidene factoren, zoals intenties, attitudes, eigen-effectiviteit, vaardigheden en faciliterende omgevingsfactoren. Deze bevindingen benadrukken dat het belangrijk is om dit gedrag te bestuderen vanuit gedragsveranderingstheorieën en vanuit een socio-ecologisch theoretisch kader. Het toewijzen van toeschouwers aan vaststaande, stabiele rollen die ze in elk cyberpest-incident zouden aannemen, op basis van informatie van leeftijdsgenoten ('peer nominations') is mogelijk minder aangewezen, gezien het gedrag context-afhankelijk is. Adolescenten hebben steun nodig van hun ouders en van onderwijzend en opvoedkundig schoolpersoneel om positief toeschouwersgedrag te vertonen. Deze steun ontbreekt momenteel grotendeels. Er is een nood aan opleiding voor schoolpersoneel, en vooral voor leerkrachten, om cyberpesten aan te pakken.

Het onderzoek naar de tweede doelstelling toonde aan dat 'serious digital games' globaal gezien effectief zijn in het bevorderen van sociaal gedrag en andere gezonde levensstijlen. Verscheidene moderatoren kunnen deze effectiviteit verhogen, namelijk: een theoretische onderbouwing in 'gaming' theorieën, al dan niet aangevuld met gedragsveranderingstheorieën; het aanpassen van de interventie op maat van de gebruiker; het gebruiken van minder kenmerken die de game-ervaring verhogen, met eenvoudigere uitdagingen en minder niveaus; en het niet toepassen van technieken waarin gebruikers persoonlijke doelen stellen en plannen opmaken om deze doelen te bereiken. Sommige kenmerken hielden enkel verband met een hogere effectiviteit op bepaalde uitkomsten (bijv. kennis, vaardigheden) maar niet voor andere. Het is daarom belangrijk dat de keuzes in het ontwerp en de ontwikkeling van het spel specifiek gemaakt worden met het oog op het gezondheidsgedrag of gedragsdeterminant dat men wil beïnvloeden. Actieve betrokkenheid van de gebruiker in het ontwerp en de ontwikkeling van het spel, wat tijdens de implementatie belangrijk kan zijn om het bereik en adoptie van de interventie te verhogen, hing samen met een lagere effectiviteit van het spel. Op basis van de onderzoeksbevindingen werden aanbevelingen gemaakt over hoe gebruikers actief kunnen betrokken worden op een manier die met een hogere effectiviteit gepaard gaat, namelijk: het betrekken van gebruikers als informanten en niet als mede-ontwikkelaars; hen betrekken in beslissingen over de uitdaging, beloningen, speldynamiek; en hen niet betrekken in de uiterlijke, esthetische kenmerken van het spel.

Het onderzoek in verband met de derde doelstelling van het doctoraat, beschreef de ontwikkeling van een 'serious digital game' om positief toeschouwersgedrag te bevorderen. Hoewel hiervoor nog geen effectiviteitsdata beschikbaar zijn, kan de fundering van de interventie-ontwikkeling in evidentie en theorieën de kans verhogen dat de interventie zijn doelen en –uitkomsten bereikt, en kan dit een basis vormen voor de ontwikkeling van andere interventies tegen cyberpesten.

# PART 1: GENERAL INTRODUCTION

The overall aim of this doctoral dissertation is to contribute to the development of evidence-based interventions to change bystander behavior in cyberbullying among adolescents, and to the development of evidence-based serious digital game interventions to promote social behavior and healthy lifestyles.

A need for more research on cyberbullying founded in behavior change theories was recently recognized, to increase the effectiveness of cyberbullying prevention and intervention programs (Tokunaga, 2010). The precise application of theories in behavior change programs is, however, often problematic (Michie et al., 2011). The Intervention Mapping protocol aids in the theory- and evidence-based development of health promotion programs (Bartholomew, Parcel, Kok, Gottlieb, & Fernàndez, 2011). The protocol consists of six steps, of which the first four will be addressed in this dissertation. These four steps (1. needs assessment; 2. determinants and change objectives; 3. change methods and practical applications, and 4. program development), also structured the introduction and provided the rationale for the research aims stated at the end of the introduction.

As this dissertation is framed within the objective to design a serious digital game to promote positive bystander behavior in cyberbullying among adolescents, the introduction first presents an overview of current literature on cyberbullying and serious digital games. This comprises definitions, current prevalence data, risk factors and health consequences related to cyberbullying, the role of bystanders, current evidence on cyberbullying intervention programs and the potential of serious games to promote social behavior and healthy lifestyles (part 1). A second part describes original research conducted within this dissertation. A first chapter in this second part further explores the needs assessment and change objectives, by describing at-risk groups, negative health and behavioral outcomes of cyberbullying, and individual and environmental behavioral determinants of bystander behavior in cyberbullying. The potential of serious digital games to promote social behavior and other healthy lifestyles, and moderators of serious game effectiveness are discussed in chapter 2. Chapter 3 presents the development of an evidence-based serious game to change bystander behavior in cyberbullying among adolescents. A final part addresses the need for theory- and evidence-based intervention development in cyberbullying research and serious health games, and provides a synthesis of the literatures on programs aiming to reduce cyberbullying and its harm, and on serious digital games to promote healthy lifestyles.

# General introduction

## 1. Bullying and cyberbullying among adolescents

### 1.1. Definition of bullying

Bullying is commonly considered as an intentional and repeated act to hurt, socially isolate or cause distress to a victim. The victim is perceived to have less power than the perpetrator(s) and to have difficulties in defending him- or herself (Olweus, 1997). These criteria of intentionality, repetition and power imbalance are used to distinguish bullying from other forms of social interactions or aggressive acts. First, intentionality reflects a persistence in negative acts on behalf of the perpetrator, despite being aware that these acts cause distress to the victim. The offensive and hurtful nature of bullying differentiates it from teasing, which is relatively friendly and not intended to hurt (Olweus, 1997). Second, the criterion of power imbalance between perpetrator and victim is used to set aside bullying from other forms of peer aggression, such as having an argument or conflict (Olweus, 1997). Furthermore, the power imbalance creates a fear among victims to react, and exacerbates their defenseless position. Their lack of response thus enables the bullying to continue (Smith & Brain, 2000). Third, the criterion of repetition is imposed to indicate a level of psychosocial harm which may result from the bullying incident. Both repetition and differential power, indeed, related to higher psychosocial harm for victims of bullying (Ybarra, Espelage, & Mitchell, 2014). A number of studies have, moreover, documented a dose-response relationship between the frequency of being bullied and psychosocial harm: when a victim was bullied more frequently, psychosocial functioning was more impaired (Evans, Smokowski, & Cotter, 2014; Gámez-Guadix, Orue, Smith, & Calvete, 2013; Natvig, Albreksten, & Qvarnstrom, 2001). These studies, however, also showed that even infrequent victimization related to a certain level of psychosocial harm. Some have, therefore, advocated not to apply the criterion of repetition too strictly when defining bullying (Gámez-Guadix et al., 2013).

Several participants can be involved in bullying: those who are bullied (victims), those who bully (perpetrators), those who are both bullied and bully others themselves (victim-bullies, or 'aggressive victims') and bystanders. Bystanders can further be identified by the role they take in the bullying incident: passive bystanders or outsiders (who have witnessed the incident but take no action, or withdraw from the bullying incident), assertive defenders (who support the victim, report the incident or confront the bully), joiners and assistants (who join, help or assist the bully), or reinforcers (who reinforce the bullying, e.g. by laughing) (Gini, Albiero, Benelli, & Altoè, 2008; Salmivalli, 2010).

Bullying has generally been classified in one of the following types: physical (e.g. hitting), verbal (e.g. threatening), or relational (e.g. social exclusion) (Stassen Berger, 2007). Apart from classification by type, bullying can also be described by its contact or 'attack' mode. Direct bullying refers to a face-to-face contact between perpetrator and victim that is directly observable, whereas indirect bullying

involves contact with a third party via whom the bullying occurs (Marini, Dane, Bosacki, & YLC-CURA, 2006; Rivers & Smith, 1994). Connections between these classifications exist. Physical bullying is often direct, whereas verbal bullying may be direct (e.g. threatening) or indirect (e.g. gossiping) (Rivers & Smith, 1994). Relational bullying is usually performed via an indirect or covert mode of contact (e.g. excluding someone from groups) (Marini et al., 2006). Although relational bullying is often used as a synonym for indirect bullying (Dukes, Stein, & Zane, 2009; Scheithauer, Hayer, Petermann, & Jugert, 2006; Woods & Wolke, 2004), it is imaginable that relational bullying could also be directly observable to the victim, e.g. when a bully tells a victim he or she is not allowed to stand or sit with them. These categorizations have proven useful, since the bullying categories related to different risk factors (Marini et al., 2006; Rivers & Smith, 1994; Wang, Iannotti, & Nansel, 2009) and several types of emotional (Ortega, Elipe, Mora-Merchan, Calmaestra, & Vega, 2009) or psychosocial harm (van der Wal, de Wit, & Hirasing, 2003). These categorizations mainly stem from descriptions of bullying involving face-to-face contact with a victim, or with a third party (e.g. in case of indirect bullying).

The rise of new digital media, such as social networking sites and mobile phones, created the opportunity to conduct bullying via other means than face-to-face communication, i.e. cyberbullying. Since the arrival of cyberbullying, the earlier form of bullying conducted in face-to-face contact has commonly been referred to as ‘traditional’ or ‘offline’ bullying.

### 1.2. Definition of cyberbullying

Cyberbullying is generally defined as a form of bullying performed via electronic or digital media, such as e-mail, cell phone, or social network sites, although variations in definitions exist (Tokunaga, 2010). Some examples of cyberbullying are provided below, in comparison to traditional bullying forms (Feinberg & Robey, 2009; Nocentini et al., 2010; Smith et al., 2008; Vandebosch & Van Cleemput, 2009):

**Table 1.** Examples of traditional bullying and cyberbullying

| | Traditional bullying examples | Cyberbullying examples |
|---|---|---|
| **Direct forms** | | |
| **Physical / property** | Hitting, kicking, damaging property | Purposively sending computer viruses |
| **Relational** | Telling a victim directly he/she is not welcome to join | Visibly removing someone from an online group |
| **Verbal** | Insulting (e.g. calling names) or threatening | Sending insults or threats via Internet or mobile phone |
| **Non-verbal** | Making obscene gestures | Sending threatening or obscene images, using nasty emoticons |
| **Indirect forms** | | |
| **Physical / property** | Inciting others to physically bully a victim; involving others to secretly hide objects belonging to the victim; placing stolen objects in the possession of the victim | Hacking the victim's social media profile; posting images online of physical bullying ('happy slapping') |
| **Relational** | Excluding from groups, not inviting to events; spreading rumors and gossip | Excluding someone from an online group, asking others not to invite someone; spreading gossip or rumors via Internet or mobile phone |
| **Verbal** | Creating nicknames for a victim in group | Outing of confidential email information; creating a fake profile for the victim with unfriendly or deceitful content; masquerading, pretending to be someone else |
| **Non-verbal** | Making insulting, denigrating or obscene drawings of the victim visible to others (e.g. paper, board, graffiti) | Taking part in a voting on a defamatory polling website ; sending embarrassing (naked) images of the victim to others without the victim's consent ('sexting') |

How cyberbullying relates to traditional bullying, has been a topic of much debate. Some have considered cyberbullying as an entirely new type of bullying, that shares certain characteristics with

traditional bullying, but substantially differs on some defining elements, and they mainly emphasize cyberbullying's uniqueness (Patchin & Hinduja, 2010; Patchin & Hinduja, 2011). Others have mostly considered it as form of indirect bullying, and classified cyberbullying as another, but distinct, category next to traditional forms of verbal, physical and relational bullying (Wang et al., 2009; Wang, Iannotti, Luk, & Nansel, 2010). Some studies emphasized generic bullying that may take place in several locations, for example, at school (traditional bullying) or from behind the computer at home (cyberbullying). In this case, cyberbullying is viewed as just an electronic extension of school bullying, which may take place in a different location (Juvonen & Gross, 2008; Olweus, 2012).

*Defining elements*

Multiple definitions of cyberbullying exist, which mostly differ in their specification of repetition and power imbalance (Tokunaga, 2010). There appears to be a consensus on the need for cyberbullying to be an intentional act (Kiriakidis & Kavoura, 2010; Tokunaga, 2010), although one study reports adolescents judged cyberbullying also by the impact it had on the victim, and not only by the intentions of the bully (Nocentini et al., 2010).

Several authors argued that the victim does not need to be targeted in repeated incidents of cyberbullying to qualify as bullying, since cyberbullying can result in repeated harm without re-occurring incidents (Dooley, Pyzalski, & Cross, 2009; Grigg, 2010; Kowalski & Limber, 2007; Vandebosch & Van Cleemput, 2008). In some forms of cyberbullying, such as when posting content online, a single act can result in exposure that is repeated, and can reach a large audience, leading to significant psychosocial harm (Slonje & Smith, 2008). For example, posting an embarrassing picture online, which is a single act with a large audience, was considered to be most harmful by youngsters (Smith et al., 2008). Repeated exposure resulting from a single cyberbullying incident may furthermore occur when a message is shared by others (Grigg, 2010), or when traditional bullying preceded or followed the single act of cyberbullying (Vandebosch & Van Cleemput, 2008). Repetition could thus arise from several forms of bullying. Victimization from several forms of bullying was, indeed, more harmful than victimization by only one form (Wang et al., 2010). Since the notion of repetition is mainly included in a bullying definition as a predictor of psychosocial harm, using a more lenient definition on repetition and frequency can be defended given the potential for serious harm from a single act of cyberbullying. In adolescents' views, however, the repeated nature also helps to distinguish between a joke and a bully's intention to hurt (Nocentini et al., 2010).

Next, the power differential between perpetrator and victim may be harder to detect in cyberbullying. In bullying, power differences may relate to physical, psychological or social characteristics. The perpetrator may be bigger or stronger than the victim (Ybarra et al., 2014), may be older (Arseneault, Bowes, & Shakoor, 2010), may be perceived as mentally more resilient (Olweus, 1997), may be more popular, have more friends (Ybarra et al., 2014), or as a group of perpetrators may outnumber the victim

(Smith & Brain, 2000). This defining criterion of power imbalance has been questioned in cyberbullying, since physical superiority would be harder to detect (Kiriakidis & Kavoura, 2010). However, youngsters themselves indicated that most bullies are known by victims in real-life and their physical power is determined offline (Vandebosch & Van Cleemput, 2009). Power imbalance in cyberbullying may also stem from other differences than physical power between bullies and victims. First, victims may be less popular than bullies. Research showed that victims of cyberbullying were significantly less popular online than those non-victimized, but this was not significantly different for their social popularity at school (Katzer, Fetchenhauer, & Belschak, 2009). Second, bullies may be older than their victims. Perpetrators of cyberbullying were on average found to be slightly older than victims of cyberbullying (Van Cleemput et al., 2013). When the perpetrator was an adult, cyberbullying was especially distressing for the victim (Ybarra, Mitchell, Wolak, & Finkelhor, 2006). Third, the bully exerts some power from being able to remain anonymous in cyberbullying (Dooley et al., 2009), which may increase the victim's fear and insecurity (Nocentini et al., 2010). Most perpetrators, however, choose not to remain anonymous, since only 35% of victims did not know the identity of the bully (Dehue, Bolman, & Völlink, 2008). Public cyberbullying, visible to a large number of people, may also provide more power to the bully (Nocentini et al., 2010). While anonymity and visibility may support power differences between bully and victim, these were not considered to be key defining elements necessary for all types of cyberbullying (Nocentini et al., 2010). Some suggested perpetrators of cyberbullying may derive their power from having more technological skills, also named 'the revenge of the nerds' (Ybarra & Mitchell, 2004a). While in one study adolescents who perceived their Internet skills to be excellent were more often perpetrators of cyberbullying (Ybarra & Mitchell, 2004b), other research did not support this hypothesis (Vandebosch & Van Cleemput, 2009). Many cyberbullying acts indeed do not require advanced technological skills (Dooley et al., 2009). In sum, regardless of physical power imbalances, there may still be a power differential between perpetrators and victims of cyberbullying based on other criteria, such as online popularity (Katzer et al., 2009), age (Van Cleemput et al., 2013), numbers (Nocentini et al., 2010), anonymity (Dooley et al., 2009; Nocentini et al., 2010), or mental resilience (Gámez-Guadix et al., 2013; Yang et al., 2013). Adolescents themselves, indeed, considered power imbalance as a crucial criterion to define cyberbullying (Menesini et al., 2012).

To conclude, both intentionality, repetition, and power imbalance may be present in cyberbullying as in traditional bullying, but can manifest themselves in different ways than in traditional bullying.

*Bullying types and contact modes*

Not all categories of the previously mentioned categorization by bullying type were considered applicable to cyberbullying. Cyberbullying conducted on the Internet has been linked to verbal and psychological bullying, whereas physical bullying was considered impossible online (Katzer et al., 2009). Both perpetration and victimization in cyberbullying were strongest correlated with the relational

form of traditional bullying, compared to other forms of bullying (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014).

Also not all contact modes were considered applicable to cyberbullying. Cyberbullying may seem to be a form of covert, indirect bullying, but examples of bullying clearly intended as direct, overt communication, such as hate mail, also exist (Spears, Slee, Owens, & Johnson, 2009). Vandebosch & Van Cleemput (2009) provided a comparison of direct and indirect bullying types in traditional bullying and cyberbullying, and concluded both direct and indirect bullying can take place in cyberbullying, in similar ways as in traditional bullying (Vandebosch & Van Cleemput, 2009). Examples of cyberbullying incidents (both Internet and mobile phone devices) could be found for all abovementioned types and contact models. In spite of earlier mentions of cyberbullying as non-physical and as indirect (Katzer et al., 2009), this overview also included examples of physical-direct cyberbullying (e.g. by damaging the victims' property when deliberately sending a computer virus).

Categorizing cyberbullying as a distinct form, next to physical, relational and verbal bullying, or as only an indirect contact mode of bullying, does therefore not appear to be supported by research evidence.

Specifically for cyberbullying, the electronic device through which the bullying takes place, may also be used as a way to describe bullying by contact mode (Smith et al., 2008). Harm related to cyberbullying, indeed, differed by electronic contact mode (Smith et al., 2008). But when defining cyberbullying, a definition should not restrict to certain electronic contact modes, since these modes may evolve quickly due to technological innovations (Slonje & Smith, 2008).

*Location where bullying takes place*

Traditional bullying may happen in several places, such as school, family or leisure context. Bullying in family life is, however, more often referred to as 'abuse' (Smith & Brain, 2000). The most frequent location for traditional bullying among youngsters is school bullying, taking place between peers at school (Smith et al., 2008). Cyberbullying is also assumed to occur mostly among peers who know each other from school, since electronic communication is conducted mostly with schoolmates (Juvonen & Gross, 2008). Although victimization of cyberbullying often occurred outside of school (Slonje & Smith, 2008), 72% of victims who knew their bullies, knew them from school (Smith et al., 2008). In these cases, it has been considered by some as 'the cyberspace extension of school bullying' (Kubiszewski, Fontaine, Potard, & Auzoult, 2015). Support for this view is drawn from the substantial overlap in involvement in school bullying and cyberbullying: 85% of those who were cyberbullied, were also victims of school bullying (Juvonen & Gross, 2008; Raskauskas & Stoltz, 2007). Inconsistent results have, however, been reported in this overlap between traditional and cyberbullying victimization, with much smaller percentages of overlap (i.c. 38%-40%) reported in other studies (Kowalski & Limber, 2013; Ybarra, Diener-West, & Leaf, 2007). It is furthermore possible that adolescents do not fulfill the same participant roles in traditional bullying and cyberbullying, and that victims from traditional

bullying show an increased risk of being a perpetrator from cyberbullying (Jang, Song, & Kim, 2014; Kubiszewski et al., 2015). Other counterarguments for considering cyberbullying as an extension of school bullying are, for example, also found in differences between traditional bullying and cyberbullying related to their harm and to communication-technology related motives for perpetration (e.g. lack of moral inhibition due to anonymity and low emotional reactivity) (Kubiszewski et al., 2015).

In sum, traditional (school) bullying and cyberbullying share common defining elements (i.c. intentionality, repetition and power imbalance), which may manifest themselves in different ways in traditional bullying or cyberbullying. A substantial group of adolescents is involved in both types of bullying, although the size of overlap is as yet unclear and may differ between participant roles. As related phenomena, they should be studied jointly, to allow a detailed assessment of causes and consequences for separate and combined roles. Current cyberbullying research, indeed, appears to recognize the importance of studying cyberbullying together with traditional bullying, while also paying attention to the specificities afforded by the electronic means, such as anonymity and lack of adult supervision, visibility, and specific (electronic) contact mode (Kowalski, Giumetti, Schroeder, & Lattaner, 2014).

### 1.3. Prevalence of cyberbullying

Systematic reviews reported that around 9-49% of youngsters experienced cyberbullying as victims (Kiriakidis & Kavoura, 2010; Tokunaga, 2010; Hinduja & Patchin, 2012), and that around 4-21% of youngsters were involved in cyberbullying as perpetrators (Hinduja & Patchin, 2012; Kiriakidis & Kavoura, 2010). These figures indicate that wide variations exist in the rates of cyberbullying involvement among youngsters. Variations may firstly stem from sample differences, for example in the age of participants, since older adolescents report less cyberbullying involvement than younger adolescents (Tokunaga, 2010). Secondly, variations can result from measurement differences (Vivolo-Kantor, Martell, Holland, & Westby, 2014), such as 1) divergences in using single-item or multiple-item scales (Gradinger, Strohmeier, & Spiel, 2010); 2) whether or not a definition of cyberbullying was provided to participants (Kiriakidis & Kavoura, 2010; Tokunaga, 2010; Olweus, 2012); 3) whether the definition related to all potential electronic means, or restricted these to just one or some (Juvonen & Gross, 2008; Kubiszewski et al., 2015); and 4) differences in the timeframe provided to participants when asking about their cyberbullying involvement (e.g. lifetime experience, experience in past 6 months) (Olweus, 2012; Tokunaga, 2010).

These varying prevalence rates were summarized in a recent meta-analysis across 80 studies in adolescents (aged 12-18 years), to a rate of 15% for victimization and to 16% for perpetration of cyberbullying (Modecki et al., 2014). With prevalence rates of 36% for victimization of traditional bullying, and of 35% for traditional bullying perpetration, it is clear that cyberbullying is a less common

phenomenon than traditional, offline bullying. These prevalence rates for cyberbullying involvement have furthermore been relatively stable in recent years (since 2007). Reporting of cyberbullying incidents may have increased over the years, but in recent years, no increase in cyberbullying incidents has been noted when assessed with a consistent measure and in similar populations (Olweus, 2012; Hinduja & Patchin, 2012).

In Flanders, the most recent prevalence rates come from a longitudinal survey conducted over 2 years (2011-2013), among 10-14 year old children. The reported prevalence of cyberbullying perpetration at least once in the past 6 months, ranged from 5% to 8% between the 4 time points, and from 8% to 22% for traditional bullying perpetration (Pabian & Vandebosch, 2014a). Victimization rates were reported in another paper on the same study, only including the first two time points. Victimization rates of traditional bullying ranged from 22% to 28% between these time points, and from 10% to 11% for cyberbullying victimization. In comparison, between 15% to 23% of adolescents reported perpetration of traditional bullying for these first two time points, and 10% reported cyberbullying perpetration (Pabian & Vandebosch, 2015).

As mentioned above, a degree of overlap between victimization rates of cyberbullying and traditional bullying exists, which ranges from 38 to 85% (Juvonen & Gross, 2008; Kowalski & Limber, 2013; Raskauskas & Stoltz, 2007; Ybarra et al., 2007). A meta-analysis of 80 studies indicated that correlations for involvement as perpetrators of traditional bullying and cyberbullying were stronger (average r=0.47, 95% CI 0.47;0.47) than the correlations between victimization of traditional bullying and of cyberbullying (average r=0.40, 95% CI 0.40;0.41) (Modecki et al., 2014). A recent study surveyed samples large enough to distinguish between pure victims and victim-bullies (or aggressive victims) for traditional bullying and/or cyberbullying (Campbell, Spears, Slee, Butler, & Kift, 2012). Of the 3112 adolescents surveyed, 58% was not involved in any type of bullying as victim or victim-bully; 5% were victim-bullies of both cyber- and traditional bullying; 5% were pure victims of both cyber- and traditional bullying; 5% were victim-bullies only of traditional bullying; 16% were pure victims only of traditional bullying; 2% were victim-bullies only of cyberbullying; and 5% were pure victims only of cyberbullying. Unfortunately, no data were available in this study on the pure perpetrator role.

### 1.4. Theoretical foundation in cyberbullying studies

Reviews on cyberbullying have remarked a general lack of theoretical foundation when studying this phenomenon (Kowalski et al., 2014; Tokunaga, 2010). Where theories are used, these can be roughly classified in five types: 1) behavior prediction theories that explain cyberbullying behavior from a personal deficit perspective; 2) behavior prediction theories that explain cyberbullying or –victimization behavior from a personal reaction to experiencing stress; 3) behavior prediction theories that predict cyberbullying or –victimization behavior from individual and social influences; and 4) behavior change

theories that explain cyberbullying or –victimization behavior from individual and social influences, driven by evidence-base on how to change behavior. 5) theories of computer-mediated communication, that examine communication-specific characteristics that explain how social media are used.

First, an example of a personal deficit theory is the theory on Social-Cognitive Information Processing (see e.g. Ang, Tan, & Mansor, 2011; Dooley et al., 2009). This theory states that five social-cognitive processes are needed for appropriate social behavior (i.c. encoding of stimuli, interpreting and attributing intent and causality, generating a social goal, generating responses in line with this goal, and choosing the response with the highest value). People who tend to react aggressively to neutral situations, show deficits in one or more of these social-cognitive processes. Applied to cyberbullying, approval of aggression as an acceptable response to situations was higher among perpetrators compared to other adolescents (Ang et al., 2011). Social intelligence was not found to be lower among perpetrators of cyberbullying. On the contrary, they had significantly higher levels of social intelligence than non-cyberbullies (Pabian & Vandebosch, 2014a). Another example of a deficit theory applied to cyberbullying is the self-control theory. This posits that cyberbullying is a form of externalizing behavior, characterized by a lack of self-regulating capacity, which entails a search for immediate gratification without considering long-term consequences, and low adherence to social norms (Vazsonyi, Machackova, Sevcikova, Smahel, & Cerna, 2012).

Second, a theoretical framework used to study risk factors for cyberbullying involvement, is the General Strain Theory. This theory is used to explain both externalizing (i.e. reacting to negative emotions with harming others) behavior in perpetrators, as well as psychosocial problems among victims of cyberbullying (Jang et al., 2014). In the first case, the strain or source of stress may relate to factors external to the peer victimization (e.g. parental divorce) that contribute to cyberbullying behavior. In the second case, the victimization of cyberbullying is considered as the strain or source of stress, which can lead to additional psychosocial problems for the victim (e.g. depression, suicidal ideation). This is sometimes also labeled the Stress Generation Model (Gámez-Guadix et al., 2013; Hammen, 1991). Applied to cyberbullying, cyberbullying victimization was significantly related to problem behaviors (e.g. substance abuse), but this relationship was fully mediated by the strain they experienced (Hinduja & Patchin, 2007). Other examples are the Risk and Resilience framework (Tynes, Umaña-Taylor, Rose, & Lin, 2012) and Stress Coping models (Völlink, Bolman, Dehue, & Jacobs, 2013), which mainly explain mediators in the harm that is experienced related to cyberbullying.

Third, some theories have integrated personal factors as well as social influences in predicting cyberbullying involvement or related harm, such as the Social Ecological framework (Bauman, 2010; Hemphill et al., 2012), the Interpersonal Theory of Suicide (Bauman, Toomey, & Walker, 2013; Litwiller & Brausch, 2013), and the General Aggression Model (Kowalski et al., 2014). For example, the Interpersonal Theory of Suicide states that thwarted belongingness and perceived burdensomeness

cause suicidal desire, which only translates into suicidal behavior if the person becomes habituated to self-harming behavior. Cyberbullying is considered one possible environmental cause of thwarted belongingness and perceived burdensomeness (Litwiller & Brausch, 2013). The General Aggression Model was used to summarize findings on predictors and psychosocial outcomes of cyberbullying perpetration and victimization across 131 studies (Kowalski et al., 2014). This model identifies an 'input', such as personal factors (e.g. gender, age), and situational factors (e.g. perceived support, school climate) which can predict cybervictimization or -perpetration. Routes (e.g. cognition) and proximal processes (e.g. decision-making on how to act), will lead to coping and psychosocial health outcomes for victims, and to cyberbullying perpetration and psychosocial health outcomes for bullies. It relies heavily on Social-Cognitive Information Processing theories. This model was used as a framework for summarizing currently available research evidence on perpetration and victimization from cyberbullying.

Fourth, behavior change theories have been used not only to predict cyberbullying and –victimization behavior, but also to provide levers for changing this behavior. Examples of these theories are Social Cognitive Theory, Theory of Planned Behavior and Reasoned Action Approach. These theories not only look for factors which predict the behavior, but for predictors that are both important and can be changed (Bartholomew et al., 2011). In general, they recognize eight core determinants of behavior: cognitive and affective attitudes, social and personal norm, perceived capability to perform the behavior, skills, environmental constraints, and behavioral intention (Bartholomew et al., 2011). Most theories recognize both individual and environmental determinants of behavior, in an ecological model of behavior (Bartholomew et al., 2011). These have been applied to explain cyberbullying perpetrator behavior, investigating changeable determinants of behavior that can be addressed with behavior change methods (Doane, Pearson, & Kelley, 2014; Heirman & Walrave, 2012; Pabian & Vandebosch, 2013; Pabian & Vandebosch, 2014b). Research on cyberbullying perpetration indicated that 29% of behavioral intentions to cyberbully others were predicted by attitudes (e.g. considering cyberbullying others as exciting, as a good way to vent emotions), social norms (e.g. social pressure, perceiving that others would approve of cyberbullying) and perceived behavioral control (e.g. finding it easy to cyberbully ) (Pabian & Vandebosch, 2014b). The authors conclude by recommending specific behavior change strategies (e.g. anticipated regret) for the main behavioral determinants, to achieve the desired change in behavior.

Fifth, some studies in cyberbullying have specifically focused on characteristics of information and communication technologies (ICT), that can contribute to adolescents' involvement in cyberbullying, whereas they may otherwise not be involved in bullying without these technologies (Tokunaga, 2010). Examples of these theories are the Affordances Theory, focusing on ICT features such as connectivity, visibility, accessibility, persistence and social feedback (Bastiaensens et al., 2015a; Fox & Moreland, 2015); Routine Activities Theory (Navarro & Jasinski, 2013), suggesting that ICT habits may put

adolescents at risk for cyberbullying involvement; and Media Richness Theory (Brandtzæg, Staksrud, Hagen, & Wold, 2009), which posits that richer, more personal media allow for a higher psychological presence and less rich media can lead to de-individuation and misunderstandings. The use of these theories is advocated to better understand differences between traditional bullying and cyberbullying (Tokunaga, 2010).

In sum, although many studies on cyberbullying may be conducted without a theoretical foundation, studies founded on theories also exist. These theories mostly vary in their breadth (individual, environmental factors), and their purpose of understanding behavior versus being action-oriented to inform future behavior change interventions. In designing evidence-based behavior change programs, the latter theories may be more functional.

### 1.5. Risk factors for cyberbullying and –victimization

Several risk factors have been identified for involvement in cyberbullying as perpetrator or victim, grouped below, in accordance to existing reviews, as individual or social/situational factors.

#### 1.5.1. Individual factors

*Involvement in other forms or other roles of bullying*

A meta-analysis indicated that involvement in traditional bullying was a significant predictor of involvement in cyberbullying. Being a perpetrator of traditional bullying moderately predicted cyberperpetration, whereas being a victim of traditional bullying was a weak predictor of cyberperpetration. Similarly, being a victim of traditional bullying moderately predicted cybervictimization, whereas being a perpetrator of traditional bullying was a weak predictor of cybervictimization. Furthermore, cybervictimization was a strong predictor of cyberperpetration (Kowalski et al., 2014).

*Age*

A systematic review of research data showed a curvilinear relation between cyberbullying victimization and age, with a peak in 7$^{th}$ and 8$^{th}$ grade (12-15 year olds), and decreasing towards later adolescence (Tokunaga, 2010). With an increased use of new digital media at a younger age, the question arose whether cyberbullying would peak in a younger population since this last review (2010). Prevalence rates of cyberbullying among elementary school children are, however, not often studied (Kowalski & Limber, 2007; Lee, 2015; Vandebosch & Van Cleemput, 2009; Williams & Guerra, 2007; Dehue et al., 2008). One study found no significant differences between cyberbullying or –victimization rates between elementary and secondary school children (Dehue et al., 2008), whereas another study found significantly lower rates of cyberbullying perpetration in elementary school than in secondary school (Williams & Guerra, 2007). In other research dated from before 2010, 6$^{th}$ graders were less often involved in cyberbullying than 7$^{th}$-8$^{th}$ graders, and more specifically, were less often victims or

aggressive victims (Kowalski & Limber, 2007). Another study from the same time period, also reported lower prevalence rates in 4-6th graders (3%) compared to 7th graders (11%) (Slonje, Smith, & Frisén, 2012).

A recent study showed prevalence of cyberbullying perpetration to be similar in 6th graders (11-12 year olds) and 7th graders (12-13 year olds), but lower among 5th graders (10-11 year olds) (Lee, 2015). This lower prevalence despite having the technological means to do so, may relate to a maturation effect in cyberbullying. A maturation effect has been reported for perpetration of indirect bullying, but to our knowledge, no research has yet been conducted on this regarding cyberbullying. The use of indirect bullying was reported to depend on maturation, and was only developed at the age of 11 (in comparison to 8-year olds) (Björkvist, Lagerspetz, & Kaukiainen, 1992). If cyberbullying indeed requires a certain maturation only taking place towards the end of elementary school, an increased use of electronic media among younger age children may not result in cyberbullying perpetration at a younger age. It may, however, relate to victimization at a younger age. Perpetrators of cyberbullying have indeed been reported to be older than their victims (Slonje, Smith, & Frisén, 2013). This warrants further investigation.

*Gender*

In traditional bullying, boys are generally more often perpetrators, although girls are more often perpetrators of indirect types of traditional bullying (Dooley et al., 2009). Expectations for cyberbullying were that prevalence rates would also be higher among girls, when assuming a similarity between indirect bullying and cyberbullying (Dooley et al., 2009). This was, however, not supported in systematic reviews of research evidence (Dooley et al., 2009; Kowalski et al., 2014; Slonje et al., 2013). While some research reported higher perpetration of cyberbullying among girls than boys (see e.g. Kowalski & Limber, 2007), others reported the opposite trend (see e.g. Jang et al., 2014), and yet others found no difference (Slonje & Smith, 2008). Also for victimization, findings on gender differences remain inconclusive (Dooley et al., 2009; Kowalski et al., 2014; Slonje et al., 2013; Tokunaga, 2010). Inconsistent findings are assumed to relate to different types of cyberbullying being measured (e.g. e-mail bullying targets more girls, whereas boys are more often bullied via mobile phone text messages) (Kowalski et al., 2014).

*Physical appearance*

In traditional bullying, obese adolescents are especially prone to being bullied for their appearance (Brixval, Rayce, Rasmussen, Holstein, & Due, 2011; Eisenberg, Neumark-Sztainer, Haines, & Wall, 2006; Eisenberg, Neumark-Sztainer, & Story, 2003; Gray, Kahhan, & Janicke, 2009; Kukaswadia, Craig, Janssen, & Pickett, 2011; Lunde, Frisén, & Hwang, 2006; Wardle & Cooke, 2005). This risk factor, however, has not been studied in any of the current systematic reviews on cyberbullying (Dooley et al., 2009; Kowalski et al., 2014; Slonje et al., 2013; Tokunaga, 2010).

Qualitative research on appearance-related cyberbullying indicated that being cyberbullied for their higher weight (e.g. 'being fat') was common among girls, who received more body-related comments. Boys were more often bullied online for their style, e.g. for 'looking gay' (Berne, Frisén, & Kling, 2014). Cybervictimization was examined in the US Health Behaviour in School-Aged Children (HBSC) study in 2005-2006 (Wang, Iannotti, & Luk, 2010). They found no association between cybervictimization and weight group. Differences between boys and girls were found for victimization from traditional bullying, but not for cyberbullying victimization. In total, 10% of the teenagers were cyberbullied, this was 12% among obese teens. A more recent study in the US investigated cybervictimization among adolescents attending a weight-loss program (Puhl, Peterson, & Luedicke, 2013). They reported very high cybervictimization rates among those ever victimized (59% to 61% of those ever victimized were cyber-victimized in the past year), but when estimating the prevalence in the total surveyed sample, cyberbullying represented only between 10 to 12%, similar to the rates found in the US HBSC survey. They did not compare these results with a general population sample and therefore do not provide further insight in cyberbullying prevalence rates among obese youth compared to adolescents who have not experienced weight problems. Further research is needed to assess the relative risk of obese youth in cyberbullying compared to normal-weight adolescents.

*Sexual orientation*

Lesbian, gay, bisexual and transgendered youth (LGBT) were expected to be at higher risk of victimization from cyberbullying, as they are also more often targeted in other forms of aggression (Hinduja & Patchin, 2011). The little research on this topic, indeed, shows LGBT youth are more often the victim of cyberbullying (Hinduja & Patchin, 2011; Priebe & Svedin, 2012; Schneider, O'Donnell, Stueve, & Coulter, 2012; Wiederhold, 2014), but are also more often perpetrators of cyberbullying than non-LGBT adolescents (Hinduja & Patchin, 2011).

*Psychological factors*

Psychological risk factors for cyberbullying have been grouped as factors related to personality and motives, and to psychological states, in accordance with a recent review (Kowalski et al., 2014).

Perpetrators' motives for cyberbullying have been suggested as more intrapersonal (e.g. to relieve negative emotions), than as interpersonal (e.g. to gain popularity), since the effects of the perpetrators' actions are less visible to them than in traditional bullying (Kowalski et al., 2014).

More specifically, cyberperpetration was thought to be driven by intrapersonal motives of retaliation and anger relief, narcissism, or impulsivity. A meta-analysis indicated that anger and narcissism were weakly but significantly correlated as predictors of cyberperpetration (Kowalski et al., 2014). This meta-analysis, however, only assessed correlations and not causal relations. Neither narcissism nor impulsivity were predictors of cyberperpetration in a longitudinal study with a one-year follow-up

(Fanti, Demetriou, & Hawa, 2012). Callous-unemotional traits (e.g. lack of remorse and empathy) did significantly predict cyberperpetration at one-year follow-up (Fanti et al., 2012). Other studies confirm low empathic skills to be related to cyberbullying perpetration (Ang & Goh, 2010; Steffgen, König, Pfetsch, & Melzer, 2011).

Other potential intrapersonal factors for perpetrators of cyberbullying relate to moral values and moral disengagement. Moral values (i.c. normative beliefs about aggression) and moral disengagement (i.c. attitudes to justify aggressive behavior in spite of holding non-aggressive moral values) were moderately correlated as predictors of cyberperpetration in the same meta-analysis as mentioned above. This contradicts findings from some studies that perpetrators of cyberbullying used less moral disengagement attitudes than in traditional bullying (Perren & Gutzwiller-Helfenfinger, 2012; Pornari & Wood, 2010), since the anonymity and little confrontation with the caused harm created less need for using disengaged justifications.

Some studies also showed the importance of interpersonal motives for cyberperpetration. As in traditional bullying, bullies and bully-victims were perceived as more popular (but not necessarily liked) (Festl & Quandt, 2013; Vanden Abeele & De Cock, 2013), and may use the cyberbullying as a strategy to maintain their social status, especially the girls (Vanden Abeele & De Cock, 2013). Longitudinal studies showed that perceived popularity of cyberbullying perpetrators indeed increased over time (Wegge, Vandebosch, Eggermont, & Pabian, 2014; Wright, 2014), for both boys and girls (Wegge et al., 2014). Also in longitudinal research, intrapersonal factors, such as moral disengagement, empathy and self-esteem, did not contribute independently to predict cyberperpetration, when interpersonal factors, such as involvement in traditional bullying or other antisocial behavior, were taken into account (Sticca, Ruggieri, Alsaker, & Perren, 2013). Adolescents themselves reported they cyberbully others to get attention, feel better about themselves, get their way, pick on someone who is different, and to be able to behave as someone else (Wilton & Campbell, 2011).

In sum, there is little support so far for the statement that cyberbullying perpetration would be driven mostly by intrapersonal motives, and less so by interpersonal motives.

Cyberbullying perpetration also correlated with several psychological states. In a longitudinal study, depressive symptoms, anxiety and low self-esteem were predictive of cyberbullying perpetration (Yang et al., 2013). It is, however, possible that much of these associations were due to internalizing problems that victim-bullies experience. While pure cyberbullies did not experience more emotional problems than non-involved youth, victim-bullies were 3 times more likely to experience emotional problems compared to non-involved youth (Sourander, 2010). Other research confirmed that victims and victim-bullies of cyberbullying experienced lower self-esteem, but that this was not the case for pure cyberbullies (Chang et al., 2013). In line with the earlier reported finding that impulsivity did not predict cyberbullying, a longitudinal study also found no predictive association between Attention Deficit

Hyperactivity Disorder (ADHD) symptoms and cybervictimization or –perpetration at two-year follow-up (Yang et al., 2013). Substance abuse was higher among perpetrators of cyberbullying than among other youngsters, but it was unclear from the associations whether this could predict perpetration (Sourander, 2010; Vieno, Gini, & Santinello, 2011).

Less research is available on motives, personalities and psychological states as predictors of victimization in cyberbullying. Victims' personalities were characterized by higher neuroticism and openness compared to adolescents who were not victimized by cyberbullying (Festl & Quandt, 2013). Victim-bullies were less agreeable than others, and more extravert than pure victims (Festl & Quandt, 2013). They were also more connected with peers, both within their own circle of friends as outside of this circle, giving them a central position in peer communication (Festl & Quandt, 2013). Cyberbullying victimization was weakly but significantly correlated with predictors of anger, social anxiety, moral disengagement and hyperactivity (Kowalski et al., 2014). A bidirectional relationship between cybervictimization and depressive symptoms has been noted: cybervictimization increased depressive symptoms, which in turn increased the risk of being cyberbullied (Gámez-Guadix et al., 2013).

Longitudinal data showed that lower self-esteem (Yang et al., 2013), more anxiety (van den Eijnden, Vermulst, van Rooij, Scholte, & van de Mheen, 2013; Yang et al., 2013) and more substance abuse (Gámez-Guadix et al., 2013) at baseline, were associated with cybervictimization at follow-up. Substance abuse and anxiety were only predictors, and not consequences of cybervictimization. The relations between these problems and cybervictimization were considered to be mediated by stressful life events (Hinduja & Patchin, 2007; Yang et al., 2013). Online victimization was also significantly but not very strongly related to ADHD symptoms (Helwig-Larsen, Schütt, & Larsen, 2012).

*Internet use*

Victims and perpetrators of cyberbullying use the Internet more intensively than those not involved in cyberbullying as victims or bullies (Kowalski et al., 2014; Vandebosch, Van Cleemput, Mortelmans, & Walrave, 2006). One study found that time spent on the Internet was a significant predictor of performing negative online behaviors such as cyberbullying. However, dependency on Social Networking Services (SNS) (e.g. SNS use having a negative impact on their life balance) and the use of advanced social networking features (e.g. creating video clips) were stronger predictors of perpetration of negative online behaviors such as cyberbullying (Lee, 2015). Similarly for victimization of cyberbullying, both time spent online and Internet dependency were significant predictors, but Internet dependency explained more variance (Leung & Lee, 2011). A longitudinal study, however, reported that problematic Internet use was a consequence of being cybervictimized, instead of a predictor. Victims of cyberbullying may turn to increased use of social media to reduce feelings of isolation and anxiety (Gámez-Guadix et al., 2013). This was the case for both victims and victim-bullies, but was not investigated for pure perpetrators.

### 1.5.2. Social factors

*Socio-economic status*

International studies showed victims (Leung & Lee, 2011; Wang et al., 2009) and perpetrators were more represented in high-income families than in lower-income families (Ybarra & Mitchell, 2004b). In Flanders, an opposite trend was observed. Cyberbullying perpetration and victimization was more prevalent among adolescents in the vocational and technical education track, than in the general academic track (Vandebosch & Van Cleemput, 2009). The first two educational tracks show a considerable overlap with a lower to medium socio-economic family background, whereas children in the general academic track come more from families with a medium to high socio-economic status (Hublet, Vereecken, & Maes, 2012).

*School and class climate*

School safety and a positive school climate correlated as weak but significant protective factors against both perpetration and victimization from cyberbullying in a meta-analysis (Kowalski et al., 2014). Among all those involved in cyberbullying (victims, perpetrators, victim-bullies), there was a significantly lower perception that their teachers cared about them compared to those non-involved (Sourander, 2010).

A high degree of bullying in class also related to a higher degree of cyberbullying (Festl & Quandt, 2013). A class where most adolescents were liked, with little clique-forming, related to a lower degree of cyberbullying (Festl & Quandt, 2013). Similarly, classes with less centralization of friendships online and offline (friendships are distributed among many class members) and higher clustering online (connected with your friends' friends) related to less cyberbullying in this class (Heirman et al., 2015).

*Family support*

Perceived social support correlated to both perpetration and victimization of cyberbullying (Kowalski et al., 2014).

Parental monitoring, but not parental control of technology, was a weak protective factor against both perpetration and victimization from cyberbullying in a meta-analysis (Kowalski et al., 2014). One study showed that both a strict, mediating or involved approach all related to lower cybervictimization (Leung & Lee, 2011), whereas another study showed higher parental disciplining related to higher perpetration, and higher parental monitoring to lower perpetration of cyberbullying (Ybarra & Mitchell, 2004b). In a longitudinal study with a 2-year follow-up period, poor family management and high family conflict was related to cyberbullying perpetration, but not when involvement in traditional bullying was taken into account. These family factors, in other words, mainly explained why someone was more likely to be a traditional bully, which in turn predicted involvement in cyberbullying perpetration (Hemphill et al., 2012).

Rates of cybervictimization, but not perpetration of cyberbullying, were higher for adolescents living in single-parent households (Fanti et al., 2012). Receiving social support from their family was a protective factor, both for perpetration and victimization at one-year follow-up (Fanti et al., 2012). This protective effect on victimization was especially high among adolescents living in one-parent households with little support from their friends (Fanti et al., 2012). Receiving social support from friends did not protect against cybervictimization at one-year follow-up, but did show an interaction with family support: adolescents with the lowest support from both family and friends, were at the highest risk of being victimized in cyberbullying (Fanti et al., 2012).

*Peer support*

Higher perceived peer support was associated with a significant decline in cyberbullying perpetration in one longitudinal study. This decline was strongest for online bullying compared to other forms (verbal, physical) of perpetration (Williams & Guerra, 2007). Another longitudinal study, however, reported no effect from peer support on cyberbullying perpetration at one-year follow-up (Fanti et al., 2012).

The self-reported number of friends was found to be a protective factor for victimization from traditional bullying, but not for victimization from cyberbullying. There were no significant differences in the number of friends adolescents reported to have by their participant role in cyberbullying (Wang et al., 2009). This may, nonetheless, relate to the self-reported nature of the friendship network size in this study. A study using peer-nominations, on the other hand, showed cybervictims were the least often mentioned by their classmates as their friend, whereas victims themselves indicated having the highest number of friends in their class, and thus overestimated their circle of friends (Festl & Quandt, 2013). This was confirmed in a social network analysis, showing that cybervictims have fewer 'reciprocal' friends than non-victims. There was, however, no significant difference for 'reciprocal best friends' (Wegge, Vandebosch, & Eggermont, 2013). Furthermore, in traditional bullying, it mattered who their friends were. If these friends were also victimized or had internalizing problems (e.g. depression, anxiety), or if they were perceived as not supportive, the protective effect against victimization was much weaker (Hodges, Boivin, Vitaro, & Bukowski, 1999). No information is yet available on this for victimization from cyberbullying. Specifically for cyberbullying, there may be a protective effect of online friends. This can be assumed, since 65% of adolescents had at least one online friend whom they had never met offline, 27% felt more comfortable discussing emotions online than offline (Heirman & Walrave, 2015), and the online friendship quality was positively associated with psychosocial functioning, after controlling for their involvement in traditional or cyberbullying (Leung & McBride-Chang, 2013). Whether these positive effects of online friends also act as a buffer against cyberbullying involvement, however, to our knowledge remains unexplored.

*Culture and ethnicity*

Country differences may exist in how cyberbullying occurs or is perceived (Kowalski et al., 2014). Relationships between cyberbullying involvement (as victim or perpetrator), with certain measures of psychosocial harm (i.c. self-esteem, loneliness) were indeed weaker in European countries and Australia than in North-American countries (Kowalski et al., 2014). Also the relation between cyberbullying involvement and involvement in traditional bullying was weaker in Europe and Australia, than in North America (Kowalski et al., 2014). Cross-country differences may reflect methodological differences, but could also be associated with cultural differences, e.g. a distinction between collectivistic cultures and individualistic cultures (Kowalski et al., 2014). Other cross-country differences have been explained by cultural variances in the importance attached to social relations online, and to differences in awareness campaigns that would raise other sensitivities to cyberbullying between countries (Ortega et al., 2012). Further investigation of cultural issues is needed to clarify these differences.
Some studies showed that cybervictimization was more prevalent among ethnic minorities (Wang et al., 2009; Ybarra & Mitchell, 2004b). In Flanders, adolescents in a family with a non-Belgian background had a higher risk to be cybervictimized than adolescents whose parents were born in Belgium, in a study with a small sample (Wegge et al., 2013). This finding could, nevertheless, not be replicated when considering the relation between ethnic composition of classes and the degree of cyberbullying in these classes, in a larger sample of Flemish adolescents (Heirman et al., 2015).

In sum, risk factors for perpetration and victimization of cyberbullying are diverse. This supports the importance of investigating this phenomenon from a socio-ecological perspective, taking both individual and environmental factors into account. Some risk or protective factors were, furthermore, shared between victims and perpetrators of cyberbullying. Several factors are currently somewhat understudied, such as the role of appearance and obesity, sexual orientation, socio-economic status, ethnicity and culture, psychological risk factors for victimization, and examination of risk factors (e.g. gender) by specific type of cyberbullying or electronic contact mode.

### 1.6. Associated harm with cyberbullying

Cyberbullying tends to persist after school hours and can reach victims 24 hours per day and 7 days per week, remain visible for a long time, may reach a larger audience, and may be more intimidating when cyberbullies remain ‘virtually’ unknown by the victim (Slonje et al., 2013; Tokunaga, 2010). It has therefore been suggested that its psychosocial effects may be more severe than those of traditional bullying (Slonje et al., 2013). A meta-analysis of 131 studies showed cyberbullying was related to several mental, physical or social health problems. Cyberbullying victimization was significantly correlated with stress, suicidal ideation, depression, anxiety, loneliness, reduced life satisfaction, conduct problems, somatic symptoms, emotional problems, reduced self-esteem, substance abuse, and

lower prosocial behavior (in decreasing order of strength of correlation) (Kowalski et al., 2014). Cyberperpetration significantly related to substance abuse, anxiety, depression, reduced life satisfaction, reduced self-esteem, lower academic achievement, and loneliness (in decreasing order of strength of correlation) (Kowalski et al., 2014). As all of the studies included in the meta-analysis were cross-sectional (Kowalski et al., 2014), some of the abovementioned problems may be antecedents rather than outcomes of cyberbullying involvement. Some nuances to these findings need to be made based on longitudinal data.

*Longitudinal studies*

Longitudinal studies showed that both anxiety (van den Eijnden et al., 2013), self-esteem (Yang et al., 2013), and substance abuse (Gámez-Guadix et al., 2013) were not outcomes, but predictors of victimization of cyberbullying. A bidirectional relationship was found for depression: depressed adolescents had higher odds of being victimized by cyberbullying, but being cybervictimized also increased depressive symptoms at follow-up (Gámez-Guadix et al., 2013). Also for perpetrators of cyberbullying, certain mental health problems were antecedents rather than outcomes: depressive symptoms, low self-esteem and anxiety were stable predictors of cyberbullying perpetration (Yang et al., 2013).

*Comparison with traditional bullying*

Furthermore, given the strong overlap between traditional and cyberbullying, it is often unclear which of these outcomes can be attributed to the experience of cyberbullying, and which are due to involvement of traditional bullying. Some studies have measured both involvement in traditional bullying and cyberbullying, in sufficiently large samples which allow to single out their respective effects.

Studies comparing cyber victims to victims of traditional bullying on the negative outcomes related to mental health, such as depressive symptoms, stress and anxiety, concurred in their findings: the relationship between victimization and these negative outcomes was indeed strongest for the combined victim group (cyber and traditional victimization) (Campbell et al., 2012; Gradinger, Strohmeier, & Spiel, 2009; Raskauskas, 2010; Schneider, O'Donnell, Stueve, & Coulter, 2012). Victims who were bullied both in traditional bullying and cyberbullying, were more likely to suffer from psychological problems than adolescents not involved, followed by pure cyber victims, and finally pure traditional victims (Campbell et al., 2012; Gradinger, Strohmeier, & Spiel, 2009; Raskauskas, 2010; Schneider, O'Donnell, Stueve, & Coulter, 2012). Moreover, victims had a two- to threefold increased risk for psychosomatic problems, and victim-bullies experienced all problems that either pure victims and pure bullies suffered from (Sourander, 2010). Especially victim-bullies of cyberbullying were more likely to feel depressed, anxious and stressed compared to non-involved youth (Campbell et al., 2012; Sourander, 2010) and other participant roles in cyberbullying (Chang et al., 2013; Gámez-Guadix et al., 2013).

When examining studies controlling for traditional forms of victimization, one study showed that online victimization was significantly related to a high substance use, even after adjusting for these victims' involvement in traditional victimization (Mitchell, Ybarra, & Finkelhor, 2007). Furthermore, victim-bullies of cyberbullying showed the greatest behavioral or health problems, such as using aggression (Gradinger et al., 2009), and suicidal ideation (Bonanno & Hymel, 2013), also after taking their involvement in traditional bullying into account. In a recent large-scale study of adolescents, cyber victimization remained associated with poorer physical health when controlling for traditional bullying (Låftman, Modin, & Östberg, 2013). Most cross-sectional studies have shown that cyber victimization was a significant predictor for several mental health outcomes above and beyond the influence of traditional victimization (Bonanno & Hymel, 2013; Campbell et al., 2012; Dempsey, Sulkowski, Nichols, & Storch, 2009; Fredstrom, Adams, & Gilman, 2011; Juvonen & Gross, 2008; Machmutow, Perren, Sticca, & Alsaker, 2012; Perren, Dooley, Shaw, & Cross, 2010; Wang, Nansel, & Iannotti, 2011). A longitudinal study indicated that cyber victimization is predictive of an increase in later depressive symptoms in adolescents, also when taking traditional victimization into account (Machmutow et al., 2012).

A cross-sectional study of Olweus (2012) came to the tentative conclusion that when a youngster is exposed to both traditional and cyberbullying, the additional impact of cyber victimization on poor self-esteem may be negligible (Olweus, 2012). Olweus' finding, however, only related to one type of psychosocial outcome (i.e. poor self-esteem), which several studies also found to be poorly related to cyberbullying.

*Mediators and moderators*

Lastly, given large heterogeneity in the meta-analytic findings for most outcomes, some mediators and moderators need to be examined.

The electronic contact mode of cyberbullying related to different health outcomes: computer-based cyber victimization was a significant predictor of negative mental health outcomes, such as depressive symptoms, anxiety and self-esteem, whereas phone-based cyber victimization was not (Fredstrom et al., 2011).

Coping strategies played a role in the relation between cybervictimization and health problems: support seeking form peers and family related to lower depressive symptoms, whereas helpless reactions related to higher feelings of depression (Machmutow et al., 2012). Others, however, reported that peer support did not protect against depressive feelings (Aoyama, Saxon, & Fearon, 2011). Additionally, victims appeared to use more emotion-focused coping than not-involved youth, while emotion-focused coping was regarded as not effective in reducing depressive feelings (Völlink et al., 2013).

A longitudinal study suggested that the relationship between anxiety and cyber victimization may be explained by environmental factors, such as stressful life events, cyber perpetration, family situation, social life, gender, or poor academic achievement (Yang et al., 2013). The relationship between cyber victimization and problem behaviors was found to be fully mediated by the strain youngsters experienced from various stressful life events (Hinduja & Patchin, 2007). Several mediators were also reported in the relationship between cyber victimization and suicide, such as the level of depressive symptoms (only among girls (Bauman et al., 2013)), and substance abuse and violent behavior (Litwiller & Brausch, 2013). The relation between being a victim, self-harm (e.g., cutting, burning, deliberately hurting yourself) and suicidal ideation was partially mediated by negative emotions (anxiety, depression and low self-esteem), and partially moderated by highly authoritative parenting and high self-control (Hay & Meldrum, 2010). However, depression did not mediate the relationship between cyber-perpetration and suicide attempts for either girls or boys (Bauman et al., 2013).

In sum, cyberbullying relates to several mental, social or physical health problems for both victims and perpetrators, although fewer studies are available that examined these for perpetrators. Victim-bullies experience the most mental, social or physical problems, as do victims who are bullied both via traditional bullying and cyberbullying. There is a need for more longitudinal studies, as well as studies with large sample sizes, which allow to assess a causal relationship, and distinguish the harm specifically related to unique or combined traditional bullying and cyberbullying experiences.

## 1.7. Role of bystanders in cyberbullying

### 1.7.1. Importance of bystanders

So far, most cyberbullying research has focused on the roles of perpetrators and victims. In traditional bullying, witnesses or bystanders are, nonetheless, considered to play an important role in ending or sustaining bullying (Salmivalli, 2010). Firstly, their social support can attenuate the harm (e.g. depressive symptoms, lower academic achievement) caused to the victim (Rothon, Head, Klineberg, & Stansfeld, 2011; Tu, Erath, & Flanagan, 2012). Secondly, schools where bystanders defend rather than stand-by passively are experienced as safer (Gini, Pozzoli, Borghi, & Franzoni, 2008), and benefit the well-being of all adolescents at school. Furthermore, defending the victim and not reinforcing the bully has been successful in reducing traditional bullying (Hawkins, Pepler, & Craig, 2001; Salmivalli, Voeten, & Poskiparta, 2011). Defended victims were bullied less frequently than undefended victims (Sainio, Veenstra, Huitsing, & Salmivalli, 2011). Further evidence on the advantages of positive bystander behavior is found in anti-bullying intervention programs that targeted bystander behavior. These were effective in reducing traditional bullying perpetration and victimization (Menesini, Nocentini, & Palladino, 2012; Palladino, Nocentini, & Menesini, 2012; Salmivalli, Kärnä, & Poskiparta,

2011), and some traditional bullying interventions using bystander support showed effects on cyberbullying victimization as well (Menesini et al., 2012; Palladino et al., 2012; Salmivalli et al., 2011). It is, however, important that peer and bystander involvement is integrated in a whole-school approach, since a meta-analysis of traditional bullying interventions indicated that only working with peers related to an increase in bullying victimization instead of the desired decrease (Ttofi & Farrington, 2011).

Bystander action and general perceived peer support are considered distinct concepts, since general perceived peer support may not relate specifically to help provided during a bullying incident (Sainio et al., 2011).

Bystander behavior in bullying incidents that consists of reporting to adults, defending or comforting the victim is considered to be helpful or positive bystander behavior. By reporting, defending or comforting the victim, the bystander challenges the bully's power, which results in negative reinforcement for the bully's actions (Salmivalli, 2010). These actions also strengthen the victim's mental resilience (Sainio et al., 2011), which may further decrease the power differential between victim and bully.

Joining and assisting (e.g. forwarding, adding nasty comments), reinforcing (e.g. laughing), and passive bystanding (e.g. doing nothing) are considered negative bystander behavior, since they sustain or aggravate the bullying (Salmivalli, 2010; Salmivalli et al., 2011). Joining, assisting, and even subtle signs of reinforcing, such as smiling, provide positive feedback, and encouragement to continue to the bully (Salmivalli, 2010). Even passive bystanding provides positive feedback to the bully, since the bully and victim may consider this as a silent form of approval of the bullying (Kowalski et al., 2012).

### 1.7.2. Theoretical foundation in studying bystander behavior

That some witness aggression and yet do nothing, has been reported in other contexts than bullying, such as public violence (see e.g. Laner, Benin, & Ventrone, 2001). The Bystander Intervention Model was designed after an early case of public violence that was witnessed by a substantial group of people who did not intervene (Latane & Darley, 1970). This model states that a bystander experiences five phases in the decision-making process on whether or not to intervene as a bystander: 1) awareness of the incident; 2) interpretation of the incident as an emergency; 3) accepting the responsibility to intervene; 4) knowledge and belief in the ability to intervene; and 5) performing the intervention. The decision-process can moreover be influenced by contextual factors, often labeled as the bystander effect, which are described in four mechanisms: self-awareness (e.g. who else is present), social cues (e.g. what others are doing), blocking (e.g. others' actions making their actions impossible) and diffusion of responsibility (e.g. their actions are dependent on the size of bystander population) (Wong-Lo & Bullock, 2014).

This model was previously applied to traditional bullying (Pozzoli & Gini, 2013; Nickerson, Aloe, Livingston, & Feeley, 2014). Other theoretical frameworks used to study bystander behavior in

traditional bullying, are behavior change theories as Social Cognitive Theory (Espelage, Green, & Polanin, 2012; Gini et al., 2008; Pöyhönen, Juvonen, & Salmivalli, 2012; Thornberg & Jungert, 2013) and Social Learning Theory (O'Connell, Pepler, & Craig, 1999; Rigby & Johnson, 2006), or the Attachment Theory (Nickerson, Mele, & Princiotta, 2008).

In cyberbullying, bystander studies have focused on elements of the Bystander Intervention Model and the bystander effect (Bastiaensens et al., 2014; Bastiaensens et al., 2015a; Machackova, Dedkova, Sevcikova, & Cerna, 2013; Obermaier, Fawzi, & Koch, 2014), or they have used Social Cognitive Theory as a framework (Price et al., 2014; Van Cleemput, Vandebosch, & Pabian, 2014), and some applied other theories such as Social Identity Approach (Jones, Manstead, & Livingstone, 2011) or Attribution Theory (Holfeld, 2014).

Pozzoli and Gini mapped the Bystander Intervention Model on elements from Social Cognitive Theory, such as attitudes, skills and self-efficacy to explain bystander behavior in traditional bullying (Pozzoli & Gini, 2013). This approach combines the most often used theories in understanding and predicting bystander behavior in bullying. Applying behavior change theories to this phenomenon, moreover, not only explains what influences this behavior, but approaches it from where and how changes in this behavior are most likely to occur. This is especially valuable when aiming to design interventions to change bystander behavior. Behavior change programs which were founded on these behavior change theories, recognizing both individual and environmental determinants, were indeed more effective than those not applying these theories (Glanz & Bishop, 2010).

In their mapping of elements from Social Cognitive Theory on the Bystander Intervention Model, Pozzoli and Gini considered ‘attitudes’ to be related to step 2 of ‘interpreting severity of the situation’, ‘moral disengagement attitudes’ to step 3 of ’taking responsibility’, and ‘self-efficacy’ and ‘coping skills’ to step 4 of ‘deciding how to help’. They added perceived norm to this model, but did not test for self-efficacy. The model explained 40% of the variance in defending behavior and 28% of passive bystanding behavior.

Some determinants of bystander behavior, are, however still not captured in this combined model. We therefore propose to extend this model by applying both the Reasoned Action Approach (TRA²) and other elements from Social Cognitive Theory (SCT) (Bandura, 2007) to the Bystander Intervention Model. Reasoned Action Approach (TRA²) merges the former Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and Theory of Planned Behavior (TPB) (Ajzen, 1991) and states that behavior is determined by behavioral intention, on the condition that there is a facilitating environmental context, and that sufficient personal skills are available to translate this intention into behavior. Intention is in its turn influenced by attitudes, perceived norms and self-efficacy to perform the behavior (Fishbein & Ajzen, 2010). This model also recognizes the importance of background variables, which may not be changeable, but can influence beliefs and can therefore provide crucial information for a more targeted

approach to at-risk groups (Bartholomew et al., 2011). Compared to SCT, TRA² pays more attention to affective attitudes (e.g. liking), in addition to cognitive attitudes (e.g. outcome expectancies) (Bartholomew et al., 2011). Perceived norms in TRA² extend the concept in SCT of perceived behavior of others, by assuming that not only seeing others perform a certain behavior will affect personal behavior, but also whether people think others expect them to perform this behavior (Bartholomew et al., 2011).

Several core determinants, such as self-efficacy, (cognitive) attitudes, skills and environmental context are shared between SCT and TRA². SCT pays more attention to moral values, and adds to this model the concept of moral disengagement attitudes (Bandura, 2002). Moral disengagement attitudes are used by people to avoid self-condemnation, when their behavior is not in accordance with their moral values (Bandura, 2004) and can, for example, consist of blaming the victim, minimizing the harm or by displacing the responsibility to someone else. Furthermore, SCT directly connects determinants (e.g. observing behavior of others) to methods to change this behavior (e.g. modeling) (Bartholomew et al., 2011). Combining theories is encouraged in health promotion to grasp the complexity of behavior change (Bartholomew et al., 2011; Lustria, Cortese, Noar, & Glueckauf, 2009).

Figure 1 proposes a model to study bystander behavior in cyberbullying, based on the Reasoned Action Approach (Fishbein, 2008), Social Cognitive Theory (Bandura, 2007) and Bystander Intervention Model (Latane & Darley, 1970). As suggested by Pozzoli and Gini (Pozzoli & Gini, 2013), attitudes towards bullying may relate to step 2 ‘interpreting severity of the situation’ of the Bystander Intervention Model. These differ from attitudes towards the bystander behavior, part of step 3 ’taking responsibility’, together with moral disengagement attitudes and perceived norms. Self-efficacy, skills and environmental factors may be associated with step 4 ‘deciding how to help’. The translation from intention to behavior may represent step 5 ‘performing the behavior’. The Reasoned Action Approach forms the backbone of this model. The Bystander Intervention Model steps are indicated in red circles. Elements from SCT (moral disengagement attitudes, potential change methods) are indicated in grey boxes.

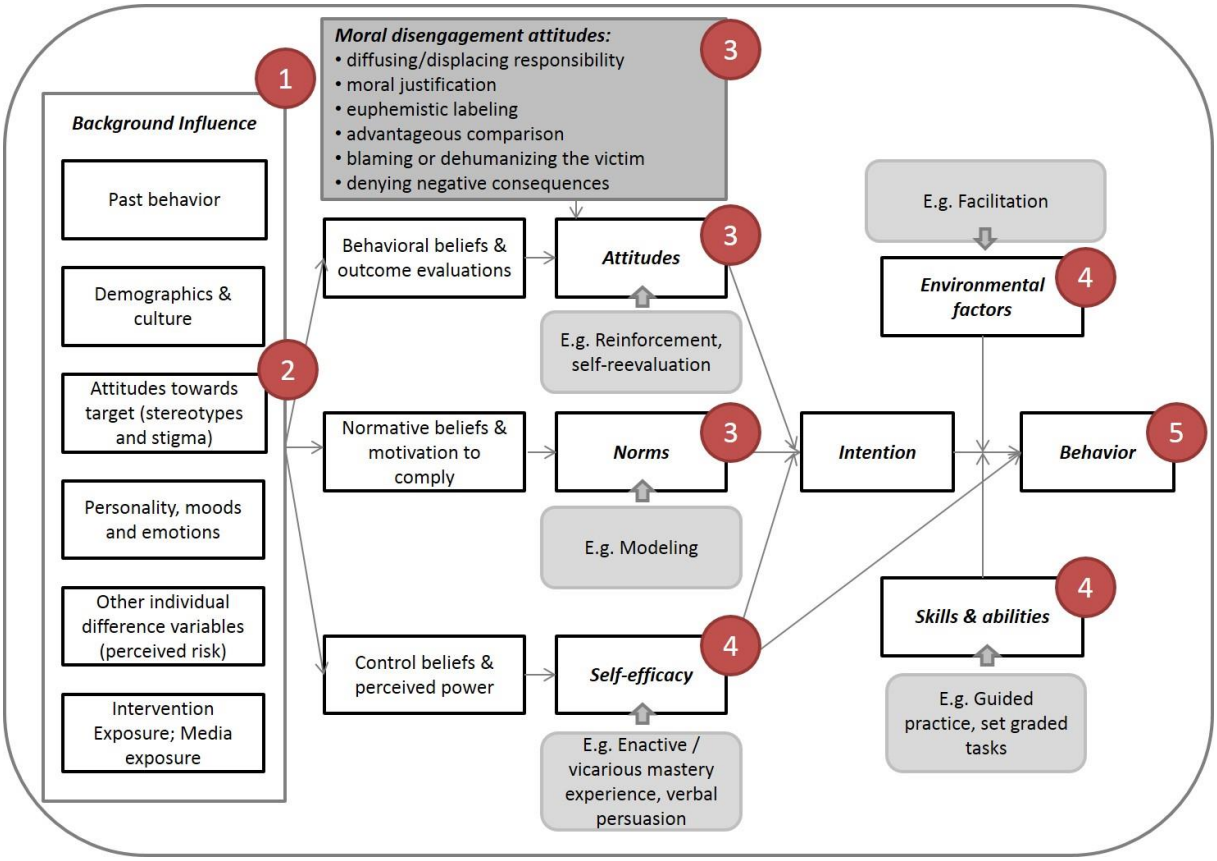


Fig. 1. Proposed theoretical model for studying bystander behavior in cyberbullying.

Legend: White boxes represent elements from Reasoned Action Approach (Fishbein, 2008). Grey boxes are additions from Social Cognitive Theory (Bandura, 2007). The red circles represent the stages in the Bystander Intervention Model (Latane & Darley, 1970).

Theory of Planned Behavior and Theory of Reasoned Action have previously been applied to cyberbullying research, when explaining cyberbullying perpetrator behavior (Doane, Pearson, & Kelley, 2014; Heirman & Walrave, 2012; Pabian & Vandebosch, 2013; Pabian & Vandebosch, 2014b). Social Cognitive Theory has been used in examining moral disengagement attitudes in cyberbullying (Perren & Gutzwiller-Helfenfinger, 2012; Pornari & Wood, 2010; Renati, Berrone, & Zanetti, 2012).

### 1.7.3. Bystander behavior in cyberbullying

The question was raised whether bystander interventions would be important in cyberbullying as well. First, it has been suggested that the motives of perpetrators are more related to the act itself than to having bystanders witness the bullying (Kowalski et al., 2014). Evidence on interpersonal motives listed above, however, does not support this and showed the peer group is important, also in cyberbullying (Festl & Quandt, 2013; Sticca et al., 2013; Vanden Abeele & De Cock, 2013; Wegge et al., 2014). Second, the role of bystanders may be more limited in cyberbullying, if bystanders are not present in certain forms of cyberbullying, e.g. bullying via text messages. A study conducted in Flanders, however,

showed that according to victims, bystanders were present in 64% of the cyberbullying incidents (Wegge, Pabian, & Vandebosch, 2012), which was similar to the rate of bystanding in traditional bullying (Vandebosch et al., 2006). Bystanders were present for cyberbullying both via the Internet and text messages, presumably since bullies can forward text messages or show them to others (Wegge et al., 2012).

The nature of bystander behavior in traditional bullying may, nevertheless, differ from that in cyberbullying. Due to a reduced visibility of social cues online, bystanders may not see the harm for the victim. They are also not able to provide small non-verbal feedback to a bully as in traditional bullying, and a more determined action may be needed to show positive bystander behavior in cyberbullying. This could reduce the likelihood of positive bystander behavior taking place (Obermaier et al., 2014). On the other hand, precisely due to a larger physical distance from the bully in cyberbullying, bystanders may be more willing to perform positive bystander behavior, since they fear less physical retaliation (Obermaier et al., 2014).

In sum, as in traditional bullying, targeting bystanders may be a successful approach to end cyberbullying and its harm. Some programs that used bystander or peer support were effective in reducing victimization from cyberbullying (Menesini et al., 2012; Palladino et al., 2012; Salmivalli et al., 2011). No research to date has, however, investigated the effect of specific bystander actions in cyberbullying on the harm for the cybervictim or on the frequency of cyberbullying. Furthermore, few studies have investigated the behavior of bystanders in cyberbullying, and what determines this behavior. These will be summarized below.

*Prevalence rates of bystander behavior in cyberbullying*

Similarly to traditional bullying, high rates of passive bystanding were noted for cyberbullying: in Flanders, 59% of adolescents who had witnessed cyberbullying did nothing, 9% joined the bully and 32% helped the victim (Vandebosch et al., 2006). Comparable rates were found in a more recent study in Flanders (Van Cleemput et al., 2014). In a Facebook simulation of cyberbullying, a majority of (young adult) participants (91%) had noticed the cyberbullying, but 52%-69% did nothing (Shultz, Heilman, & Hart, 2014). Negative bystander behavior (e.g. forwarding) was, moreover, more prevalent when adolescents were provided with an online bullying situation, than with a face-to-face (paper) situation (Barliñska, Szuster, & Winiewski, 2013). A study among secondary school-aged adolescents showed that 76% had provided at least one type of support to the victim of cyberbullying, with as the least chosen option giving technical advice (35%) and the most often form of support coming from telling them to ignore it (55%) and trying to comfort the victim (54%) (Machackova et al., 2013).

*Behavioral determinants*

Behavioral determinants are discussed in the chronological steps of the proposed theoretical model in Figure 1.

A first requirement for bystander action is considered the awareness of the incident taking place. An experimental study among college students showed that the majority (between 53% and 75%) of the participants had noticed the cyberbullying incident. But only 10% chose to intervene. This gap between awareness and action suggests that, although awareness is a necessary step, the most important barriers towards performing positive bystander behavior are not related to a lack of awareness (Dillon & Bushman, 2015).

Several background variables, such as socio-demographics, attitudes towards the target (e.g. stereotypes and stigma) and past behavior, were assessed in relation to bystander behavior in cyberbullying. While these may influence several steps of the Bystander Intervention Model, they will be discussed here, to follow the layout of the model in Fig. 1.

Age was not associated with bystander behavior among secondary school-aged adolescents (Machackova et al., 2013), but was a significant predictor in another study among primary and secondary school-aged children: bystanders who were standing by passively or who joined, were older, whereas those helping the victim were younger (Olenik-Shemesh, Heiman, & Eden, 2015; Van Cleemput et al., 2014).

Gender was not associated with negative bystander behavior in some studies (Barliñska et al., 2013; Machackova et al., 2013; Van Cleemput et al., 2014), but correlated with positive bystander behavior in other research: girls showed more positive bystander behavior than boys (Bastiaensens et al., 2014; Olenik-Shemesh et al., 2015). This gender effect, however, disappeared in one study when the general tendency for prosocial behavior was added as predictor (Machackova et al., 2013). Boys used more moral disengagement attitudes, but the study did not assess how this related to their bystander behavior (Holfeld, 2014).

How the bystanders' involvement in other cyberbullying roles (e.g. victim, perpetrator) related to bystander behavior was investigated in two studies. One study among elementary and secondary school-aged children found that perpetrators of either traditional or cyberbullying were more likely to join in with the perpetrator. Victims of either forms of bullying were more likely to help the victim, whereas victims of traditional bullying only, also more often responded to witnessing cyberbullying with passive bystanding (Van Cleemput et al., 2014). Similarly, a study among secondary-school aged adolescents only found a relation between involvement as a cyberperpetrator, which was a predictor of negative bystander behavior (forwarding, posting), but involvement as a cybervictim was not related to negative bystander behavior (Barliñska et al., 2013).

The relation of the bystander with the bully or the victim did not affect positive bystander behavior in one study among secondary school-aged adolescents, when adolescent's general prosocial behavior was taken into account (Machackova et al., 2013). Social anxiety was studied in relation to cyberbullying bystander behavior, but was found not to predict any type of bystander behavior (Van Cleemput et al., 2014). Similarly, social self-efficacy did not distinguish between active and passive bystander behavior in another study, whereas social support did: active bystanders experienced more social support from friends and family than passive bystanders (Olenik-Shemesh et al., 2015). Passive bystanders experienced more emotional loneliness (Olenik-Shemesh et al., 2015).

Next, how the situation is interpreted may affect bystander intervention. For bystanders to act, the incident would need to be perceived as an emergency. An experimental study among 8$^{th}$ graders showed that witnesses of more severe cyberbullying incidents had higher intentions to intervene in a positive way, compared to witnesses of a less severe incident (Bastiaensens et al., 2014). This study also manipulated mechanisms of the bystander effect that may influence the intentions of youngsters to intervene. The identity of other bystanders played a role: if other bystanders were good friends, adolescents were more inclined to positively intervene. These bystander effect mechanisms, moreover, interacted with each other: when bullying was not severe, bystanders more often intended to intervene by using positive bystander behavior when other bystanders were acquaintances. But when bullying was severe, they were more inclined to positively intervene when other bystanders were good friends. How other bystanders reacted (e.g. reinforce, defend), only affected bystander behavior if these other bystanders were good friends, in which case the bystander would copy this behavior. The variance explained by these variables in how bystanders behaved was, however, quite low, ranging from $R^2$=3% (defending the victim), $R^2$=5% (giving advice); $R^2$=9% (reporting to adults) and $R^2$=10% (comforting the victim). No information on explained variance was available for negative bystander behavior. Bystanders, furthermore, had higher intentions to defend the victim in private, electronic ways (e.g. sending message) compared to addressing the bully face-to-face, but only in severe cases of cyberbullying. This preference was especially apparent when other bystanders reinforced the bully, and even more so when these other bystanders were good friends (Bastiaensens et al., 2015a). This preference to respond privately, was only noticed when bystanders were showing negative bystander behavior (e.g. forwarding the message) (Barliñska et al., 2013).

Attitudes are the tendencies to respond positively or negatively to someone, something, or towards performing a behavior (Bartholomew et al., 2011). Attitudes can be affective (e.g. anxiety towards the behavior) or cognitive (e.g. expected instrumental outcomes of the behavior) (Lawton, Conner, & McEachan, 2009). In deciding on the severity of a cyberbullying incident, the bystander's attitudes towards cyberbullying play a role. Feeling upset after watching the cyberbullying incident was the strongest predictor for positive bystander behavior (supporting the victim) in a study (Machackova et al., 2013) among secondary-school adolescents that examined both socio-demographic, psychological

variables (self-esteem, prosocial behavior, problems with peers) and some contextual factors (e.g. relation with victim and bully). They found that a substantial part of supportive behavior ($R^2$=39%) could be explained by prosocial behavior, relationship with the bully or victim, affective attitudes to bullying (feeling upset), and being asked by the victim for help (Machackova et al., 2013). Emotions related to group membership (perpetrator, victim, non-involved), were investigated as a driver of bystander behavior in an experimental study on text-message bullying among elementary school children (Jones et al., 2011). Children were assigned to a scenario in which they belonged to a group which had kind or unkind group norms, and this group played a role as perpetrator, victim or uninvolved party in a cyberbullying case. The group norms and the children's identification with these norms, were expected to have an effect on bystander behavior through emotions, or affective attitudes, towards cyberbullying. Anger and guilt related to the group's involvement predicted saying sorry to victim ($R^2$=20%), and anger predicted telling an adult ($R^2$=37%). Shame and anger predicted staying away from the perpetrator and his group ($R^2$=32%), whereas pride ($R^2$=5%) predicted telling friends about what the bully and his group did.

When the bystander is aware of the cyberbullying situation and interprets this as severe, the bystander subsequently needs to accept the responsibility to intervene. This concept of acceptance is similar to that of attitudes towards performing the behavior in behavior change theories. Three steps in the Bystander Intervention Model, following the stage of awareness, were studied jointly in a study among college students (excluding step 1-awareness, and step 4-belief and knowledge on how to act) (Obermaier et al., 2014). There was no evidence for a direct influence of the Bystander effect (i.c. number of bystanders) on the intention to intervene. The number of other bystanders negatively affected the perceived responsibility to intervene, which in its turn positively related to the intention to intervene. The severity of the situation and interpreting it as an emergency, also showed no direct effects with the intention to intervene, but did positively affect their perceived responsibility to intervene. This suggests that the incident severity and contextual factors of other bystanders do not influence the intention to perform positive or negative bystander behavior directly, but that this is mediated by their attitudes (e.g. perception of responsibility) on how to respond as bystander. Obermaier et al. (2014) conclude that these attitudes are the key elements in predicting cyberbullying bystander behavior.

One other type of attitudes studied in the context of bullying are moral disengagement attitudes. These are ways to avoid self-condemnation when behavior is not in accordance with an individual's moral values (Bandura, 2004). Literature documents the following moral disengagement attitudes: diffusion (e.g. spread thinly across group members) and displacement (e.g. placed onto others) of responsibility, moral justification (e.g. serving a higher purpose), euphemistic labeling (e.g. using terms that make it sound better), advantageous comparisons (e.g. referring to other situations that are even worse), blaming (e.g. considering the victim provoked it) or dehumanizing the victim (e.g. belief that they don't deserve any better), and denying negative consequences (e.g. no harm results from bullying) (Bandura, 2002).

An experimental study among middle school adolescents examined attitudes of blaming the victim in cyberbullying, and how these were influenced by the victim's response. Male adolescents more often blamed the victim and held the victim responsible for the incident, regardless of the victim's response. Furthermore, when victims responded by ignoring instead of reporting it to someone, they were perceived as having more control over the situation and more to blame, regardless of the participants gender. These moral disengagement attitudes were considered to reduce the willingness of the participant to act as a bystander, but this was not investigated in the study (Holfeld, 2014). Moral disengagement attitudes in cyberbullying bystander behavior were also examined in a qualitative study among adolescents (Price et al., 2014). Several themes confirmed the presence of moral disengagement attitudes (victim blaming, minimizing agency, cognitive restructuring of harmful behavior, diffusion of responsibility to adults) and showed the importance of friendship, a link between offline and online bystanding, and empathy in the use of moral disengagement attitudes.

Perceived responsibility to intervene may also be affected by bystanders' perceived norm on how to react (i.c. the perception of what others expect you to do). Perceived norm of parents approving of cyberbullying positively influenced bystanders' behavior of joining the bully. Perceived norm of friends approving of cyberbullying influenced peer pressure, which in turn positively influenced joining behavior (Bastiaensens et al., 2015b). Two types of information may also be related to this concept, and provide further insights. Firstly, how their friends behave (see e.g. Bastiaensens et al., 2014), may influence their perception of how their peers expect them to act. This indicates observational learning, a main concept in SCT, whereas perceived norm in TRA[2] reflects a personal appreciation of norms and intentions to comply to these norms. Secondly, perceived norms are related to the norms on bullying imposed by the group to which the adolescent belongs (e.g. social or group norms). Social norms and emotions towards group membership and their actions, were investigated as a driver of bystander behavior in an experimental study on text-message bullying among elementary school children (Jones et al., 2011). These emotions about the group's involvement in bullying were influenced by the level of identification with the group, the group norms as unkind or kind, and the perceived degree of group responsibility for the cyberbullying case.

A next step in the Bystander Intervention Model is the knowledge on how to respond and the person's own belief in their abilities to intervene using positive bystander behavior. This is associated with skills, self-efficacy, and environmental constraints. To our knowledge, no study yet exists that has explored self-efficacy or environmental constraints regarding cyberbullying bystander behavior. Some studies did assess the role of skills in bystander behavior, more specifically, empathic skills.

Empathy is defined as being able to share another person's emotions. It is generally considered to have a cognitive component, 'perspective taking' (e.g. understanding others' emotions) and an affective component, 'empathic concern' (feeling sympathy with others' emotions) (Davis, 1983; Gini, Albiero,

Benelli, & Altoè, 2007). Empathy with the victim was found to be associated with more positive bystander behavior in one study among secondary-school adolescents (Barliñska et al., 2013), but not in another study among young adults (Shultz et al., 2014). In this last study, empathy was significantly associated with identifying with the victim, which in turn related significantly to supporting the victim, but no direct relations between empathy and positive bystander behavior were found (Shultz et al., 2014). Showing a video to secondary school adolescents, that increases empathy for the victim was significantly associated with lower reinforcing behavior immediately after, but not at one-week follow-up (Barliñska, Szuster, & Winiewski, 2015). Affective empathy was found a significant predictor also in a Flemish study: lower levels of affective empathy related to more joining in with the bully and more passive bystanding, whereas higher levels of affective empathy predicted more helping the victim (Van Cleemput et al., 2014).

Summarized, compared to literature on bystander behavior in traditional bullying, some determinants remain largely unexplored. These are, for example, the relation between self-efficacy towards performing positive bystander behavior and adolescents' actions when they witness cyberbullying. Next, quantitative studies are needed to establish the relation between other moral disengagement attitudes (e.g. blaming the victim, minimizing the harm, rationalizing) apart from diffusing of responsibility, and bystander behavior. Perceived norms have not yet been studied as such. As skills, coping skills played a role in traditional bullying, and research is needed to assess whether these may be relevant in cyberbullying bystander behavior as well. Furthermore, in traditional bullying, teacher and parental support for positive bystander behavior played a role. Information on the role of these aspects in cyberbullying bystander behavior is also still lacking.

From limited research currently available, it appears that those determinants often considered core predictors of behavior, such as affective and cognitive attitudes, and skills (Bartholomew et al., 2011), result in models which explain more of the bystander behavior, than studies which have focused mostly on mechanisms of the bystander effect. This underlines the need to further explore determinants from the perspective of behavior change theories, and to establish the core predictors of positive and negative bystander behavior. Current research is, moreover, fragmented across studies each examining just a couple of predictors. A study investigating a larger set of determinants and assessing the relative weight of each predictor, can provide recommendations on where change is most needed, and can lead to the highest gain in behavior change. These insights are required as building blocks for effective interventions to promote positive bystander behavior in cyberbullying.

### 1.8. Interventions against cyberbullying

A recent systematic review showed the existence of 15 cyberbullying programs, published in scientific or grey literature literatures since 2003, and aimed at reducing cyberbullying victimization or perpetration among youth aged 10-18 years (Van Cleemput et al., in preparation). Most programs were

aimed at 11-13 year olds. Unlike traditional bullying where most programs are multi-component interventions, most intervention programs on cyberbullying only consisted of one or two components. The most often used component was curriculum materials, to be used in school (n=11 programs). Six programs included material for teachers, whereas only four included a component on bystander behavior or working with peers. Only one whole-school approach was found among cyberbullying programs.

A meta-analysis of cyberbullying interventions was performed, but only eight studies could be included here, of which a small majority were multicomponent programs (five included several components, one used two components, and two programs used only one component). This meta-analysis showed small, significant effects on reducing victimization (g=0.135, n=9453, k=6, 95% CI 0.079; 0.190, p<.001), and very small yet significant effects on reducing cyber perpetration (g=0.065, n=6373, k=6, CI 0.019;0.112, p<0.001) (Van Cleemput et al, in preparation). The elements identified in traditional bullying prevention programs as effective (Ttofi & Farrington, 2011), were not frequently incorporated in existing cyberbullying prevention and intervention programs (i.e. whole school programs, programs which lasted longer and consisted of more sessions, interventions using videos and devoting attention to environmental factors, e.g. by providing teacher and parent training). With many elements shared between cyberbullying and traditional bullying, it may be worthwhile to translate guidelines for handling traditional bullying to managing cyberbullying, until more evidence becomes available (Cross, Monks, Campbell, Spears, & Slee, 2011; Pearce, Cross, Monks, Waters, & Falconer, 2011).

In traditional bullying, it was reported that working with peers should be integrated in a broader approach, since the component itself related to adverse effects on victimization (Ttofi & Farrington, 2011). This component 'working with peers' included several types of peer involvement such as peer mediation, peer mentoring or changing bystander behavior. It is unclear if interventions only focusing on bystander behavior, and not on peer mediation or peer mentoring, would be associated with less intervention effectiveness. A meta-analysis on programs aimed at changing bystander behavior in traditional bullying, showed that these interventions were indeed successful at increasing bystander intervention (Polanin, Espelage, & Pigott, 2012).

In sum, insights from traditional bullying suggest that bystander behavior in bullying can indeed be changed. Higher positive bystander intervention was associated with lower mental health problems for victims and lower rates of bullying. Programs may need to integrate components on increasing bystander intervention within a broader approach, such as whole-school programs.

Although it is yet unclear if this also applies to cyberbullying, these insights might guide the design of cyberbullying programs until more evidence becomes available. None of the interventions included in the meta-analysis on cyberbullying, of which several used the component of 'working with peers', reported negative effects.

### 1.9. Need for evidence-based cyberbullying interventions founded in behavior science

For cyberbullying prevention and intervention programs, no clear key success factors have yet been established. One potential success factor that was suggested, was underpinning cyberbullying intervention and prevention programs by behavior change theories (Tokunaga, 2010). Behavioral change theories have, indeed, shown to be a lever in increasing intervention effectiveness in other health promotion programs (Glanz & Bishop, 2010). Very few cyberbullying prevention and intervention programs, included in a recent review, were founded in behavioral change theories (e.g. Social Cognitive Theory, Theory of Planned Behavior), while a variety of other theoretical models were used by most programs, such as peer support models, cooperative and constructive learning theories (Van Cleemput et al, in preparation).

Apart from a theoretical underpinning, theories should be implemented using standardized definitions. Indeed, the precise application of theories in behavior change programs has often shown to be problematic, causing wide diversity in intervention effectiveness (Michie et al., 2011). Following standardized definitions of theories (e.g. Social Cognitive Theory) and standardized applications of theoretical concepts (e.g. guided practice), allows to assess the accurate implementation of scientific evidence and allows a reliable linking of mechanisms of action to the intervention effectiveness (Michie et al., 2011).

### 1.10. Intervention Mapping protocol

The Intervention Mapping Protocol (IMP) was designed by leading behavior change experts (Bartholomew et al., 2011) to aid in the systematic and stepwise application of theory to behavioral change programs. The systematic approach of the IMP necessitates a detailed description of intervention content, which meets recent demands for more thorough reporting (Michie, Fixsen, Grimshaw, & Eccles, 2009). It aims to increase both efficacy and effectiveness, by a reiterative process of evidence review, application of theory-based strategies, and stakeholder consultation in six well-defined steps (Bartholomew et al., 2011). The six different steps in the Intervention Mapping Protocol are: 1) needs assessment, 2) preparing matrices of change objectives, 3) selection of theory-informed intervention methods and practical strategies, 4) development of the intervention program, 5) planning for adoption, implementation and sustainability, and 6) development of an evaluation design. These steps are often described consecutively, although the process is in fact iterative.

The pillars of IMP are that intervention development should be evidence- and theory based, that users and stakeholders should be involved throughout the development process, and that professionals should apply an ecological approach to health problems (Bartholomew et al., 2011). The IMP recognizes both individual and environmental, bi-directional, influences of behavior (e.g. peers, family relations, school policy), in line with an ecological model of health behavior (Sallis, Owen, & Fisher, 2008). An

ecological model has also been acknowledged as important for studying bullying and peer victimization, and for designing appropriate bullying prevention and intervention strategies (Hong & Espelage, 2012). This protocol has been applied to several health behaviors, such as healthy diet and physical activity (e.g.(Verbestel et al., 2011), sexual health (e.g.(Brown, Bayley, & Newby, 2013), mental health promotion (e.g.(Kraag, Kok, Abu-Saad, Lamberts, & Fekkes, 2005), and recently also to cyberbullying (Jacobs, Völlink, Dehue, & Lechner, 2014). The latter intervention transformed an existing intervention into an online tool, and aimed to enhance victim's coping strategies. It was founded in Rational, Emotional (Behavioral) Therapy. The program focused on improving individual coping behavior; environmental level influences were not included (Jacobs et al., 2014).

## 2. Serious digital games

### 2.1. Introducing the Friendly Attac project

In 2012, The Flemish Agency for Innovation through Science and Technology (IWT, www.iwt.be) commissioned a project to a consortium of researchers at the University of Antwerp, Ghent University, Vrije Universiteit Brussel and the university college of HOWEST, to design a serious digital game against cyberbullying. This project was named "Friendly ATTAC" (Adaptive Technological Tools Against Cyberbullying, www.friendlyattac.be). Our project applied the IMP to design a serious digital game against cyberbullying among young adolescents (12-14y). In line with the ecological model, this game was intended as part of a wider school approach that would also address educator and parental behavior. Its development was guided by the Reasoned Action Approach (Fishbein & Ajzen, 2010) and by Social Cognitive Theory (Bandura, 2007).

### 2.2. Serious digital games to promote social behavior and other healthy lifestyles

Serious digital games are a form of organized play, using a digital device, and are intended to be both entertaining and educational (Prensky, 2007). As they are designed to achieve both entertainment and educational goals, they also derive methods from both entertainment theories (e.g. methods to create immersion or transportation, and flow) (Annetta, 2010; Boyle, Connolly, Hainey, & Boyle, 2012; Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; Kapp, 2012; Lu, Baranowski, Thompson, & Buday, 2012), and from educational or behavior change theories (e.g. meeting self-determination needs, applying tailoring, modeling, reinforcement and feedback, guided practice and goal-setting) (Baranowski, Buday, Thompson, & Baranowski, 2008; Kato, 2010; Thompson et al., 2012; Thompson et al., 2010).

Games differ from computer-delivered interventions by aspiring to be highly enjoyable, attention-captivating and intrinsically motivating (Graesser, Chipman, Leeming, & Biedenbach, 2009; Prensky, 2007). Serious games differ from mere entertainment games in their aim to educate or promote behavior

change. In the context of health promotion programs, this may be achieved via the provision of health-related information, modeling of positive health behaviors, the creation of opportunities to practice healthy lifestyle skills (Kato, 2010), by changing mediators (e.g. self-regulatory skill development), and by applying change procedures (e.g. tailoring and goal-setting) (Thompson et al., 2012; Thompson et al., 2010). Serious games may furthermore create sustained effects by being intrinsically motivating to play longer and repeatedly (Sitzmann, 2011; Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013).

Serious digital games have shown promising effects in promoting healthy lifestyles (Baranowski et al., 2008; DeShazo, Harris, & Pratt, 2010; Gamberini, Barresi, Majer, & Scarpetta, 2008; Guse et al., 2012; Guy, Ratzki-Leewing, & Gwadry-Sridhar, 2011; Kato, 2010; Kharrazi, Lu, Gharghabi, & Coleman, 2012; Lu et al., 2012; Papastergiou, 2009; Primack et al., 2012; Rahmani & Boren, 2012; Wilkinson, Ang, & Goh, 2008), which can potentially modify a person's risk to a wide range of diseases, such as some cancers, cardiovascular diseases, stroke, dementia, mental illness, and diabetes (Fratiglioni, Paillard-Borg, & Winblad, 2004; Kim et al., 2012; Lopez, Mathers, Ezzati, Jamison, & Murray, 2006; Peel, McClure, & Bartlett, 2005).

These comprised health games relating to diverse behaviors and populations, including games for treatment, prevention, and professional education (Rahmani & Boren, 2012). Reviews on healthy lifestyles mostly focused on a single health behavior (e.g.(Guy et al., 2011), on obesity prevention) or focused on one specific age group (e.g.(Guse et al., 2012), on sexual health among adolescents). An exception was the review of Baranowski et al. which included games for healthy diet, physical activity and illness self-management (Baranowski et al., 2008).

Healthy lifestyle adoption and maintenance are often hindered by motivational issues, lack of time to participate in health promotion programs, and the interventions' low reach into the target group (Baert, Gorus, Mets, Geerts, & Bautmans, 2011; McGuire, Anderson, & Fulbrook, 2013; Toobert, Strycker, Glasgow, & Bagdade, 2002). Computer-delivered and computer-tailored interventions have been successfully designed to overcome these obstacles by individual tailoring, being accessible whenever the individual has time, and ensuring high availability at lower cost (Krebs, Prochaska, & Rossi, 2010; Portnoy, Scott-Sheldon, Johnson, & Carey, 2008). Users have reported to prefer serious games above a traditional educational approach (Vogel et al., 2006). Being highly enjoyable, attention-captivating and intrinsically motivating (Graesser et al., 2009; Prensky, 2007), serious games may thus overcome motivational barriers that many health promotion programs currently face (Baert et al., 2011; McGuire et al., 2013; Toobert et al., 2002).

Serious games are theorized to derive their learning effects from at least three sources: 1) by creating immersion or transportation, a state in which the player becomes absorbed in the play without disbelief, while creating personally relevant experiences and deep affection for the characters; 2) by establishing

flow, a state of high concentration in which the player experiences a balance between skills and challenge; and 3) by meeting the individuals' needs for mastery, autonomy, connectedness, arousal, diversion, fantasy, or challenge (Annetta, 2010; Boyle et al., 2012; Connolly et al., 2012; Kapp, 2012; Lu et al., 2012).

### 2.3. Potential of serious digital games

With a growing interest in using serious health games in recent years (Kharrazi et al., 2012), professionals have called for more evidence on how to create effective serious games (Ritterfeld, Cody, & Vorderer, 2009). Positive effects of health-promoting games have been reported by several systematic reviews (Baranowski et al., 2008; DeShazo et al., 2010; Gamberini et al., 2008; Guse et al., 2012; Guy et al., 2011; Kato, 2010; Kharrazi et al., 2012; Lu et al., 2012; Papastergiou, 2009; Primack et al., 2012; Rahmani & Boren, 2012; Wilkinson et al., 2008), which, however, also noted large differences in these games' effectiveness. Although several hypotheses have been put forward to explain this heterogeneity, these differences largely remain unexplained (Baranowski et al., 2008; DeShazo et al., 2010; Gamberini et al., 2008; Guse et al., 2012; Guy et al., 2011; Kato, 2010; Kharrazi et al., 2012; Lu et al., 2012; Papastergiou, 2009; Primack et al., 2012; Rahmani & Boren, 2012; Wilkinson et al., 2008).

First, several reviews suggest that a good theoretical blending of the 'fun' and 'educational' element is critical in game effectiveness (Baranowski, Baranowski, Thompson, & Buday, 2011; DeShazo et al., 2010; Kato, 2012; Kharrazi et al., 2012; Papastergiou, 2009). This is consistent with reviews on computer-tailored interventions, showing higher effectiveness when using theories more extensively, and more specifically so when using behavior change theories such as the Theory of Planned Behavior (Webb, Joseph, Yardley, & Michie, 2010). This hypothesis also fits with the principle in IMP that in order for health programs to be effective, they should be theory-based.

Second, it has been advocated that for games to be effective, a core list of game characteristics should be considered (Cugelman, 2013). Several reviews suggested positive effects from using individually tailored content (DeShazo et al., 2010; Wilson et al., 2009), realistic avatars (Bedwell, Pavlas, Heyne, Lazzara, & Salas, 2012), goal setting (Baranowski et al., 2008; DeShazo et al., 2010), narrative, high interactivity, fantasy, high player control (Baranowski et al., 2008; Wilson et al., 2009), assessment as feedback or rewards (Biddiss & Irwin, 2010; Wilson et al., 2009), and how to progress to the goal, e.g. by using scaffolding levels (Wilson et al., 2009). Furthermore, the relevance of these game characteristics may differ whether targeting affective, cognitive or behavioral outcomes (Wilson et al., 2009).

Third, games may be more effective if they intensively involve users and stakeholders. This assumption is also in line with IMP principles. Game features should be adjusted to the target users (Cugelman, 2013) as the appreciation of game features differed by target group (Homer, Hayward, Frye, & Plass,

2012; Wang, Shen, & Ritterfeld, 2009; Yee, 2006). User testing (Baranowski et al., 2013; Cugelman, 2013) and user involvement in game design may thus increase the fit with user preferences and enhance game effectiveness (Guy et al., 2011).

In sum, serious digital games can be effective in promoting healthy lifestyles. Their mechanisms of effectiveness are, nevertheless, not yet well understood, since large variations exist between games in their effectiveness. Several hypotheses have been put forward to explain differences in effects, which have yet to be tested.

## 3. Intervention Mapping protocol to develop a serious digital game against cyberbullying

To our knowledge, two serious digital games exist that address traditional bullying. FearNot! was aimed at reducing victimization rates among elementary school children, and was designed in cooperation between several European countries (Germany, United Kingdom, Portugal). Program objectives were to increase knowledge about bullying and relevant coping strategies. The game is set in a school environment, and shows virtual actors in a cartoon-like episode of bullying. The player assumes the role of a mentor and can suggest coping strategies to the victim by typing them in an instant messenger- like interface. The game is played for three weeks, with each session comprising around five bullying episodes. The program was founded on Cognitive Theory of Stress and Coping, and was shown to be effective in reducing victimization (Sapouna et al., 2010).

The KiVA game was developed in Finland and is now used nationwide in all Finnish schools providing education for grades 1 to 9 (n=888). The program is a whole-school approach, of which the game is merely one component. The game is intended to elaborate on the learning process children started during the 10 lessons and discussion groups, and to encourage children to apply their new skills in real-life (Kärnä et al., 2011). It is aimed at grades 1 to 9 (children aged 8-16 years), but is only effective in elementary school-aged children. It recently also showed significant effects in reducing cybervictimization (Williford et al., 2013), and is currently being tested in other countries, such as the Netherlands. The program is mentioned to be based on viewing bullying as a group phenomenon, but mentions no other theoretical foundation (Salmivalli et al., 2011).

Some non-game interventions to tackle cyberbullying were designed using the Intervention Mapping Protocol. A recent intervention against cyberbullying was developed in the Netherlands, using IMP (Jacobs et al., 2014). The intervention ‘Online Pestkoppenstoppen’ transformed an existing intervention into an online tool, and aimed to enhance victim’s coping strategies. It was founded in Rational, Emotional (Behavioral) Therapy. The program focused on improving individual coping behavior; environmental level influences were not included. Despite being time-consuming, they perceived several strengths of using IMP in the development of the program, such as having a solid framework based on evidence, theory and practical guidelines; addressing multiple determinants found in research

to be relevant; and being tailored to the needs of specific target groups. No effectiveness data are yet available on the intervention.

To our knowledge, IMP has so far only been applied to a few development processes of serious digital games (Bartholomew et al., 2000; Brown et al., 2013; Shegog et al., 2007). One of these, the 'Watch, Discover, Think and Act' game, was intended to teach children (aged 6-17 years) in the United States about asthma self-management (Bartholomew et al., 2000). The game was played during medical visits, for on average 8 months, and was effective in improving asthma self-management. They suggested that good program planning aids in communication with creative material designers.

The other two games were developed in the area of sexual health promotion. "Prepare" (Positive Relationships: Eliminating Pressure and Sexual Coercion in Adolescent Relationships) is a game targeting adolescents aged 13-14 years in the United Kingdom. It was intended to be played as a group during class, under teacher guidance, and envisioned as an addition to existing Relationship and Sexual Education material, which generally showed only limited effects. Using the Intervention Mapping Protocol was reflected in iteratively consulting the planning group and working from existing and newly collected evidence. Changing behavior and behavioral determinants was pursued by applying a combination of methods to address each outcome. The game showed small but significant effects on knowledge, attitudes and self-efficacy (Brown et al., 2012; Brown et al., 2013).

The "It's Your Game" intervention (United States) targeted 7th–8th graders. Several game formats were used, in addition to course material and parent–child activities. The game was part of a multicomponent program, also consisting of small group classroom interactions such as role-play and group discussions, and parent–child homework activities. In total, it consisted of 24 45-minute lessons. The lessons taught decision-making skills to set personal limits, to detect risk situations in which their limits would be challenged, and to protect these limits (Shegog et al., 2007). The game was effective in reducing sex initiation (Tortolero et al., 2010).

The Intervention Mapping protocol has been suggested as a method that can facilitate serious game development, by elucidating objectives, methods and implementation plans in a way that can be understood by both health professionals and game developers (Shegog, 2010). Supporting game developers in creating an evidence- and theory-based serious game is an important challenge, where IMP is considered a useful aid (Shegog, 2010).

In sum, the use of serious digital games has been effective in reducing bullying and cyberbullying. The Intervention Mapping Protocol has been applied successfully to an intervention for cyberbullying, and to serious games for health promotion. So far, no serious digital game to reduce cyberbullying has been developed using IMP.

## 4. Research objectives and outline of the dissertation

The overall aim of this doctoral thesis is to contribute to the development of evidence-based interventions to change bystander behavior in cyberbullying among adolescents, and to promote healthy lifestyles using serious digital games.

Part II of this dissertation presents a collection of scientific articles that are published, under review or submitted to international peer-reviewed journals or books. Based on the project goals, this dissertation comprises three sets of articles. The first set aims to better understand bystander behavior in cyberbullying among adolescents. This set consists of five articles presented in chapter 2. A second set aims to assess the potential of serious games to promote social behavior and other healthy lifestyles. Three articles were written on this topic, and are included in chapter 3. A last set, consisting of one article, describes how a serious game can be developed using the Intervention Mapping Protocol, to promote positive bystander behavior in cyberbullying among adolescents.

The **first chapter** of this dissertation covers the needs assessment, behavioral determinants and change objectives in designing an evidence-based intervention to reduce cyberbullying and its harm. The first article in this chapter examined whether severely obese adolescents can be considered at-risk for cyberbullying and its related harm. Data from severely obese patients were matched with those of normal-weight peers. The study aimed to examine differences in prevalence of cyberbullying and traditional bullying between obese and normal-weight youth, and to assess whether obese victims of cyberbullying reported lower psychosocial functioning and more barriers towards healthy lifestyles than those non-victimized. These factors would hinder the effectiveness of weight-loss programs for severely obese adolescents.

A second article summarized existing evidence on mental, physical, social and behavioral health outcomes related to cyberbullying. A systematic review was conducted of 59 studies on cyberbullying, and compared with current knowledge on traditional bullying. The review aimed to explore consequences of cyberbullying by comparing findings from cross-sectional and longitudinal findings, and to distill the unique consequences of cyberbullying, controlled for the involvement in traditional bullying.

A third article explored adolescents' bystander behavior in cyberbullying and its behavioral determinants, using a behavior change theoretical framework. Nine focus groups were held with 61 young adolescents. The study aimed to explore themes related to cyberbullying bystander behavior, to provide input for the design of a quantitative survey questionnaire.

A fourth article investigated adolescents' bystander behavior in cyberbullying and its behavioral determinants, using a behavior change theoretical framework, in a quantitative survey. A sample of 1979 adolescents was used. The study aimed to determine which factors predicted positive and negative bystander behavior in cyberbullying.

A fifth article explored school educators' practices and perceptions in handling cyberbullying. These data provide insights in environmental influences on bystander behavior in cyberbullying among

adolescents. The study comprised 451 school educators, and aimed to detect clusters of educators who were more or less inclined to use recommended strategies in handling cyberbullying.

The **second chapter** in the second part of this dissertation covers the potential of serious digital games as a practical application to improve social behavior, and other healthy lifestyles. A first article in this second chapter reported the average effectiveness of serious digital games to improve healthy lifestyles. A meta-analysis of 54 game studies was used to examine this. The study aimed to establish average effect sizes, and the moderating role of theory, individual tailoring, study and sample characteristics in the games' effects. A second article in this second chapter further elaborated on this. An updated meta-analysis of 58 game studies was conducted. The meta-analysis aimed to find behavior change techniques and game experience enhancing features which could moderate the games' effects. In a third article in this second chapter, the same meta-analytic data were used, to assess the moderating role of user involvement and participatory design in serious game development.

The **third chapter** comprises one article, which discusses the evidence-based and theory-based development, using the Intervention Mapping Protocol, of a serious digital game to promote positive bystander behavior in cyberbullying among adolescents.

Part III aims to tie together the insights from several original research findings in this dissertation. Given the relatively novel area of research into bystander behavior in cyberbullying, and the lack of evidence-based directions in designing effective games for health promotion, this part will also discuss recommendations for future research and intervention development.

## 5. Overview of the original research studies

### Chapter 1: Understanding cyberbullying and cyberbullying bystander behavior

*Chapter 1.1:* DeSmet et al. Traditional and cyberbullying victimization as correlates of psychosocial distress and barriers to a healthy lifestyle among severely obese adolescents – a matched case–control study on prevalence and results from a cross-sectional study. BMC Public Health 2014, 14, 224-236

*Chapter 1.2.:* Gunther, N., DeSmet, A.(shared first authorship), et al. Comparing associated harm with traditional bullying and cyberbullying: a narrative overview of mental, physical and behavioural negative outcomes. Accepted for publication in the book 'Cyberbullying. From Theory to Interventions', published by Psychology Press (August 2015).

*Chapter 1.3.:* DeSmet et al. Determinants of self-reported bystander behavior in cyberbullying incidents amongst adolescents. Cyberpsychology, Behavior and Social Networking, 2014, 17 (4), 207-215

*Chapter 1.4.* : DeSmet et al. Deciding whether to look after them, to like it, or leave it: a multidimensional analysis of predictors of positive and negative bystander behavior in cyberbullying among adolescents. Submitted

*Chapter 1.5.* : DeSmet et al. Secondary school educators' perceptions and practices in handling cyberbullying among adolescents: a cluster analysis. Computers & Education, 2015, 88, 192-201

### Chapter 2: Understanding the potential of serious games to promote healthy lifestyles

*Chapter 2.1.:* DeSmet et al. A meta-analysis of serious digital games for healthy lifestyle promotion. Preventive Medicine, 2014, 69, 95-107

*Chapter 2.2.* :DeSmet et al. The effect of behavioral change techniques and game features in serious digital games for healthy lifestyle promotion: a meta-analysis. Submitted

*Chapter 2.3.:* DeSmet et al. Assessing the moderating role of participatory design in serious game effectiveness: a meta-analysis of serious games for healthy lifestyle promotion. Submitted

### Chapter 3: Using the Intervention Mapping Protocol in the design of a serious game to promote positive bystander behavior among adolescents

*Chapter 3.1. :* DeSmet et al. Bridging behavior science and gaming theory: using the Intervention Mapping Protocol in the design of a serious game to promote positive bystander intervention in cyberbullying among adolescents. Submitted

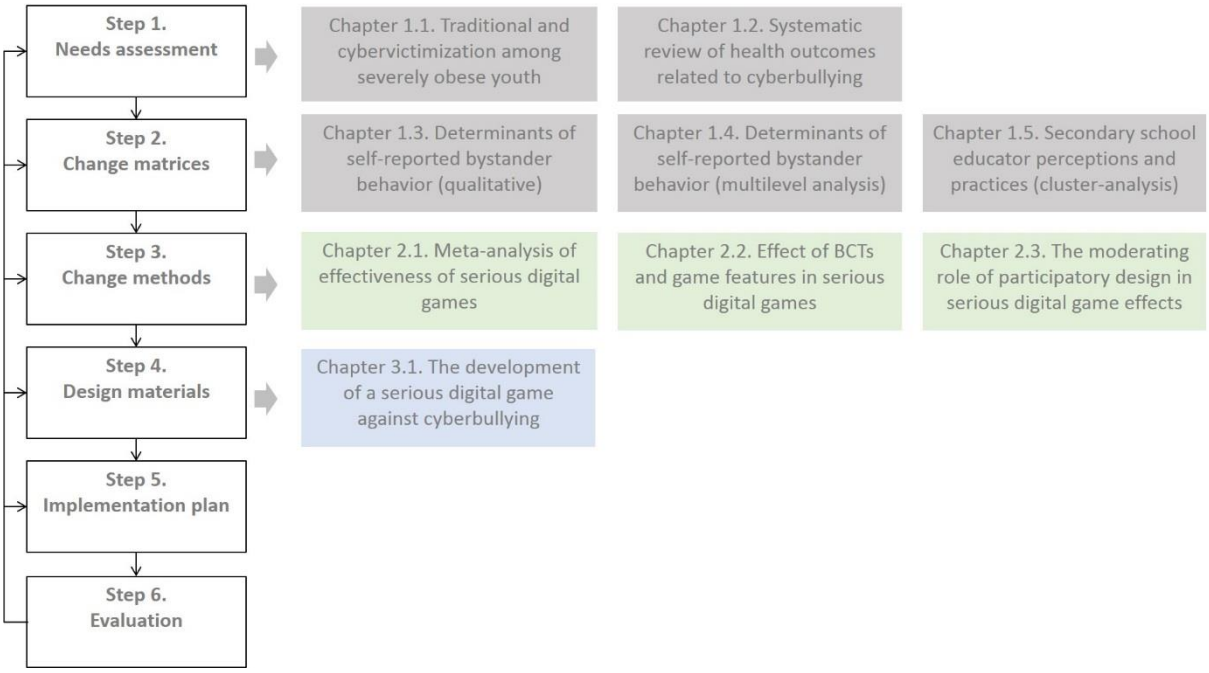


Fig. 2. Graphical representation of the original research studies to complete the steps in the Intervention Mapping Protocol

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