Bridging behavior science and gaming theory: Using the Intervention Mapping Protocol to design a serious game against cyberbullying

Ann DeSmet a, Katrien Van Cleemput b, Sara Bastiaensens b, Karolien Poels b, Heidi Vandebosch b, Steven Malliet b, Maïté Verloigne c, Griet Vanwolleghem a, Lieze Mertens a, Greet Cardon a, Ilse De Bourdeaudhuij a, *

a Ghent University, Faculty of Medicine and Health Sciences, Department of Movement and Sport Sciences, Belgium
b University of Antwerp, MIOS, Department of Communication Studies, Belgium

corresponding author. Faculty of Medicine and Health Sciences, Department of Movement and Sport Sciences, Watersportlaan 2, 9000 Gent, Belgium.

E-mail addresses: Ann.DeSmet@ugent.be (A. DeSmet), Katrien.VanCleemput@uantwerpen.be (K. Van Cleemput), Sara.Bastiaensens@uantwerpen.be (S. Bastiaensens), Karolien.Poels@uantwerpen.be (K. Poels), Heidi.Vandebosch@uantwerpen.be (H. Vandebosch), Steven.Malliet@uantwerpen.be (S. Malliet), Maïté.Verloigne@ugent.be (M. Verloigne), Griet.Vanwolleghem@ugent.be (G. Vanwolleghem), Lieze.Mertens@ugent.be (L. Mertens), Greet.Cardon@ugent.be (G. Cardon), Ilse.Debourdeaudhuij@ugent.be (I. De Bourdeaudhuij).

1. Introduction

Cyberbullying is commonly defined as intentionally and repeatedly sending or posting electronic messages or images to cause the victim harm (Kiriakidis & Kavoura, 2010; Tokunaga, 2010). Cybervictimization rates among adolescents largely vary between 3% and 24% (Hinduja & Patchin, 2012; Olweus, 2012), depending on the definition and timeframe that is used (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 penetration of cyberbullying (Modecki, Minchin, Harbaugh, Guerra, & Rumions, 2014). A systematic review suggested a curvilinear linear between age and cyberbullying victimization, with a peak in 7th and 8th grade, and decreasing towards later adolescence (Tokunaga, 2010). Other studies found a weak linear correlation between age and cyberbullying involvement (Zych, Ortega-Ruiz, & Del Rey, 2015). Both cyberbullying perpetration and victimization relate to numerous psychosocial problems (Kowalski, Giumenti, Schroeder, & Lattanner, 2014). Recent longitudinal research has shown that cybervictimization in adolescents which was stable at a one-year follow-up was associated with the highest levels of depressive symptoms and problematic alcohol use compared to non-stable victims or non-victims (Gámez-Guadix, Gini, & Calvete, 2015). Cyberbullying prevention and intervention efforts are
consequently needed to end or prevent a stable pattern of cyber-victimization and reduce its harm among adolescents.

In traditional bullying prevention programs, several elements were considered as key ingredients for effectiveness: 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 (Tröf & Farrington, 2011). Recent systematic reviews on cyberbullying prevention and intervention programs indicated that these elements were not frequently incorporated in current anti-cyberbullying programs (Della Cioppa, O’Neill, & Craig, 2015; Van Cleemput et al., 2014). A recent review of cyberbullying prevention and intervention programs indicated a lack of evidence-based rather than evidence-informed programs, that used a whole-school approach, and that included components addressing several individual behavioral determinants and the social context (e.g. family) (Della Cioppa, O’Neill, & Craig, 2015).

For cyberbullying prevention and intervention programs, no clear key success factors have yet been established. One potential success factor suggested for cyberbullying prevention and intervention programs, was underpinning these by behavior change theories (Tokunaga, 2010). Behavior change theories explain the dynamics and determinants of health behavior, and relate these to methods and processes for change (Shegog, 2010). Behavior 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 the review mentioned above, were founded in behavior change theories (i.e. 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., 2014). A similar hypothesis was made about serious game design: the key to serious game effectiveness may lie in its use of behavioral and motivational theory (Shegog, 2010).

Theories should, moreover, be implemented using standardized definitions. 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). In sum, while no evidence is yet available on key ingredients of these programs, behavior change theories may be critical drivers of success, but require a systematic implementation and standardized application to practice.

The Intervention Mapping Protocol (IMP) was designed by leading behavior change experts (Bartholomew, Parcel, Kok, Gottlieb, & Fernandez, 2011) to aid in the systematic and step-wise 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 Intervention Mapping Protocol was suggested as a model that can facilitate evidence- and theory-based serious health game design. It examines the steps that should be taken by game developers to acquire design information, and can provide a common basis for process decisions, and enable the cooperation between serious game developers and health professionals (Shegog, 2010).

1.1. Current study

The aim of this study was to describe the application of the Intervention Mapping protocol, developed by Bartholomew et al. (2011), to the design of a serious game against cyberbullying. The Intervention Mapping protocol aids in a systematic intervention design based on evidence and behavior change theories. As mentioned earlier, this may be a critical driver of success for cyberbullying intervention and prevention programs, whereas this particular theory-based design is currently not often used in cyberbullying programs.

Several theories have been reported in literature to understand or predict cyberbullying involvement, such as personal deficit models, stress coping models, computer-mediated communication models or behavior prediction models (for an overview, see DeSmet, 2015). The Intervention Mapping Protocol was not used as a theoretical framework to understand cyberbullying behavior, but as a method for evidence- and theory-based intervention design grounded in behavior change theories.

The study was hence innovative in using a systematic approach to design a cyberbullying prevention program underpinned by behavioral change theories. A similar approach to the Intervention Mapping protocol is described by the Behaviour Change Wheel (Michie, Atkins, & West, 2014). This approach was fairly new and not yet available in intervention design guidelines at the start of our project. Consequently, the choice was made to use IMP (Bartholomew et al., 2011; soon available in 4th edition, Bartholomew et al., 2016) as a well-validated approach in the design of behavior change interventions.

Our study is, furthermore, the first to apply this protocol to the design of a serious game intervention against cyberbullying. Games are tools that, if attuned correctly to the educational context (Bourgonjon, Valcke, Soetaert, & Schellens, 2010), are highly appreciated by adolescents compared to traditional teaching methods (Vogel et al., 2006). And lastly, this study is innovative in its evidence-based intervention components to address social environmental influences of educators and parents in cyberbullying.

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 (Salis, Owen, & Fisher, 2008). An ecological model was also considered important for studying bullying and peer victimization, and for designing appropriate bullying prevention and intervention strategies (Hong & Espelage, 2012). This protocol was 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, & Bekkes, 2005), and recently also to cyberbullying (Jacobs, Vollink, 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).

1.2. Theoretical foundation

Our study applied the IMP to design a serious game against cyberbullying among young adolescents (12–14y). As mentioned above, a socio-ecological approach was used. In line with the socio-ecological model, this game was intended as part of a wider school approach that would also address educator and parental behavior, who are important environmental agents in influencing adolescent behavior in cyberbullying. Its development was guided by the
Reasoned Action Approach (also named integrated model, Fishbein & Ajzen, 2010), by Social Cognitive Theory (Bandura, 2002, 2007) and the Bystander Intervention Model (Latane & Darley, 1970). The MDA (Mechanics, Dynamics, Aesthetics) Framework was used as a game-based learning theory in game design (Hunnicke, LeBlanc, & Zubek, 2004). Where evidence related to cyberbullying was lacking, insights from traditional bullying were used and additional research was conducted (e.g. behavioral determinants of bystander, educator and parental behavior). This paper describes the application of the Intervention Mapping Protocol to the design of the program (Step 1 – 4) and planned actions for implementation and evaluation (Step 5 and 6). This study provides result and process information at each design step.

Presented below is a detailed description of the design process, based on published or submitted findings (e.g. literature review, qualitative study, quantitative study among adolescents and educators, meta-analysis, initial concept test), and unpublished findings (e.g. quantitative study among parents, narrative preferences, usability tests, comparisons between behavior change techniques and game design methods).

The results of this design process will also provide a broad overview of insights in bystander behavior in cyberbullying, and of strategies to balance behavior change methods and gaming features in serious game design, to maximize both effectiveness and game engagement. These insights may aid professionals who wish to tackle cyberbullying, as well as professionals involved in serious game design.

In sum, there is a need for evidence- and theory-based cyberbullying prevention and intervention programs, using a whole-school approach, including components that address several individual behavioral determinants and the social context. Our study aims to meet this current lack in literature and practice.

2. Methods and results

The Intervention Mapping Protocol consists of six different steps: 1) needs assessment, 2) preparing matrices of change objects, 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. In the following sections, these steps are described. They are described consecutively, although the process is in fact iterative. The IMP steps are summarized in Table 1; the process of developing our program according to IMP is outlined in Fig. 1 and described in more detail below.

Although IMP provided the roadmap for program development, the specific information required for each step, needed to be collected by our research team, through literature search, expert consultation and/or additional research. A variety of research methods was used to collect the information needed in the development of the program, including a systematic literature review, focus groups, observational research, survey research, and meta-analyses. Several behavior change theories recommend using qualitative techniques to collect insights which are then validated in quantitative surveys (Bartholomew et al., 2011). This approach was also followed in our study. In some steps, several quantitative surveys were conducted, e.g. when vignettes or scenarios were used to further explore context-dependent behavior. Ethical approval was provided by the Ethics Committee of the Ghent University Hospital. Informed consent was obtained from participants for all research conducted. Results are described immediately after describing the methods for each step, to enhance clarity of data presentation, since each preceding step influenced the decisions in the next step. All surveys and qualitative research were conducted in [region info omitted].

2.1. Step 1: needs assessment

The purpose of the first step was to define goals and priorities on which health problems to tackle, to find the population at risk and understand their environmental context. Next, this was translated into what is needed to change the behavior of the at-risk group into health-promoting behavior (Bartholomew et al., 2011). Priorities are set by looking at what is relevant, desirable to change, creates the highest burden and is also most changeable (Bartholomew et al., 2011). These priorities are formulated in program objectives, stating the desired change in health status.

Three studies were conducted as part of this first step: a literature review to assess mental health outcomes; a qualitative study to understand bystander behavior; and a quantitative study to understand contextual influences of bystander behavior.

2.1.1. Literature review

Previous reviews indicated that young-adolescents (7th–8th graders, circa 12–14 year olds) were most at risk for being a victim of cyberbullying (Kirikidis & Kavoura, 2010; Tokunaga, 2010). A study conducted among severely obese adolescents who were matched with a sample of normal-weight peers drawn from the Health Behaviour in School-Aged Children (HBSC) study, included 6th to 12th graders. This study also showed a higher risk of cyber-victimization among the younger group of adolescents (DeSmet, DeFoeche, et al., 2014). The intervention was thus decided to focus on this age group of young adolescents (12–14 year olds).

To assess the health problem of cyberbullying, a systematic literature review was carried out for studies examining mental, physical health or behavioral harm in relation to cyberbullying among children or adolescents (Gunther, DeSmet, Jacobs, & De Bourdeaudhuij, 2016). Our literature review showed that the most severe health and quality-of-life outcomes related to cyber-victimization were depression, suicidal ideation, psychosomatic complaints, substance abuse and low school attachment (Gunther et al., 2016).

2.1.2. Qualitative study

To overcome health problems related to cyberbullying, increasing positive bystander interventions may be a viable approach. In traditional bullying, bystander interventions were very successful in ending peer victimization and in reducing the harm for the victim, by providing social support to the victim (Rothon, Head, Klineberg, & Stansfeld, 2011; Tu, Erath, & Flanagan, 2012), by increasing the perception of school as a safe place (Gini, Pozzoli, Borghi, & Franzoni, 2008), and by not reinforcing the bully (Hawksins, Peper, & Craig, 2001; Salmivalli, Voeten, & Poskiparta, 2011). The scarce studies on bystanders in cyberbullying showed that, as in offline bullying, many adolescents have witnessed cyberbullying, and that most bystanders witnessed passively and took no action (Huang & Chou, 2010; Salmivalli, 2010; Vandebosch & Van Cleemput, 2008). Further research was needed to explore how this behavior occurred in cyberbullying, and what influenced this behavior.

Consequently, data were collected from 61 adolescents in nine focus groups. The aim of these focus groups was to gain insight in social environmental influences of cyberbullying (bystander) behavior. A convenience sample of three secondary schools in Flanders was drawn. All 7th, 8th, and 9th graders received information and consent forms to take home. Fifty-three percent did not return forms; 27% did not provide consent. In total, nine focus groups were conducted with adolescents for whom both youngster and parental consent was obtained. Groups were organized per
grade. The full interview guide and more detailed information is reported elsewhere (DeSmet, Veldeman, et al., 2014). Focus group results confirmed targeting bystanders may be useful to reduce cyberbullying and its harm: adolescents reported similar bystanding behavior and consequences of bystander behavior as in traditional bullying. The intervention was thus decided to focus on increasing positive bystander behavior among these young adolescents. This positive behavior can consist of defending or comforting the victim, and of reporting to adults. The aim of the intervention was to also reduce negative bystander behavior, such as passive bystanding, joining, and assisting the bully (DeSmet, Veldeman, et al., 2014). Bystanders preferred to handle cyberbullying offline and in person, and comforting the victim was considered more feasible than facing the bully. Adolescents were not much inclined to report an incident, unless it was considered severe (repeated, physical threats or of sexual nature). Moral disengagement attitudes, in which victims are considered to have provoked the cyberbullying by their behavior or their looks, were very prominent. Self-reported bystander behavior heavily depended on contextual factors: what the level of popularity of the bully is, how close they are to the victim and whether the circumstances clearly justify a condemnation of the incident (e.g. racial remarks, attacking family). The results also indicated low perceived support from adolescents’ environment to perform positive bystander behavior. School educators were perceived not to respond appropriately, and instead, to suspect that adolescents who reported, had been actively involved in the bullying themselves. Perceived support from parents for positive bystander behavior was also low. Comments and quotes from the adolescents are reported extensively in the paper describing this study (DeSmet, Veldeman, et al., 2014).

2.1.3. Quantitative study

A quantitative survey using vignettes was conducted among 453 adolescents (Bastiaensens et al., 2014). Method information is provided elsewhere (Bastiaensens et al., 2014). The cyberbullying scenarios described in the vignettes, varied by the identity of other bystanders, the severity of the bullying and the reactions of other bystanders. This survey confirmed the influence of circumstances on youngster’s intentions to perform positive bystander behavior. As noted in the qualitative study, bystanders showed higher behavioral intentions to help the victim when they witnessed a more severe incident. Furthermore, they found an interaction effect between the severity of the incident and the identity of other bystanders. When witnessing a highly severe incident, bystanders were more inclined to help the victim when other bystanders were good friends than when these were mere acquaintances. When witnessing an incident of lower severity, however, a reverse relationship was present: bystanders were more inclined to help when other bystanders were acquaintances than when these were good friends. Adolescents were more likely to join in with the bully if their good friends were also joining in. In sum, adolescents reported that bystanders can aid in ending cyberbullying and reducing its harm. Qualitative and quantitative studies showed the behavior is context-dependent. Some behavioral determinants, such as moral disengagement attitudes, appeared important, but require further exploration in a quantitative determinant study.

Based on these findings, program goals were formulated to reduce cyberbullying and to reduce the health risks related to cyberbullying. The program aims to reduce these levels of health risks to levels similar to those of adolescents not involved in cyberbullying: 1) reduce internalizing problems of depression, anxiety and suicidal behavior 2); reduce externalizing problems of smoking and alcohol abuse; and 3) increase school attachment (perceived safety and truancy). These levels in a non-involved population were derived from the Flemish Health-Behaviour in School-Aged Children study (Hublet, Vereecken, & Maes, 2012). These program goals are expected to be achieved by changing adolescent bystander behavior. To understand how to change this...
### Table 2
Matrices of change for bystanders.

<table>
<thead>
<tr>
<th>Performance objectives (bystanders)</th>
<th>Knowledge</th>
<th>Skills and self-efficacy</th>
<th>Attitudes and outcome expectations</th>
<th>Perceived social norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01. Assess whether the message is meant to hurt</td>
<td>K1a. Define which typical elements in online/GSM messages show a bully's wish to hurt</td>
<td>SSE1. Express confidence in recognizing a bully's intentions</td>
<td>OE1. Believe that recognizing whether something is meant as funny or nasty can help in better responding to cyberbullying</td>
<td>PSN1. Recognize that others also assess whether the message is intended to hurt or not</td>
</tr>
<tr>
<td>P02. NEVER: laugh or say something to the bully to show you agree</td>
<td>K2a. Express that assisting or laughing is just as bad as the initial cyberbullying itself</td>
<td>SSE2a. Express confidence in understanding a victim's emotions</td>
<td>OE2a. Judge that cyberbullying is not justified, for no-one</td>
<td>PSN2. Recognize that others do not expect you to laugh or join in</td>
</tr>
<tr>
<td>P03. ALWAYS comfort the victim</td>
<td>K3a. Recognize that by comforting the victim or providing advice, you are making the victim feel better</td>
<td>SSE1. Express confidence in being able to comfort or provide advice to the victim</td>
<td>OE3. Expect that by comforting the victim, they will feel better</td>
<td>PSN3. Recognize that your friends expect you to comfort or provide advice to the victim</td>
</tr>
<tr>
<td>P04-P05. Defend your friends</td>
<td>K5a. Recognize assertive reactions as a witness can stop cyberbullying</td>
<td>SSE5a. Express confidence in resisting peer pressure to not defend</td>
<td>OE5a. Judge that everyone deserves to be defended</td>
<td>PSN5a. Recognize that your parents approve of assertive reactions on behalf of friends who are cyberbullied</td>
</tr>
<tr>
<td>P06. Talk to friends of bully and victim to understand the situation</td>
<td>K6a. Describe strategies on how to collect more information to clarify the situation</td>
<td>SSE6. Express confidence in talking to friends of bully and victim to gather information</td>
<td>OE6. Expect that talking to the bully's or victim's friend will clarify the situation and make it easier to decide what to do</td>
<td>PSN6. Recognize that others also collect information when the situation is unclear</td>
</tr>
<tr>
<td>P07. Do not blame the victim</td>
<td>K7a. State that cyberbullying is never right or justified, even if you don't like or know the victim well</td>
<td>SSE7. Express confidence to refrain from sensing the bullying is justified because of some victim's traits</td>
<td>OE7. Believe that by not blaming the victim, you are helping them to feel better</td>
<td>PSN7a. Recognize that your parents and friends expect you not to blame the victim</td>
</tr>
<tr>
<td>P08-P09. Tell an adult</td>
<td>K8-9a. Recognize that telling an adult is also a viable strategy for a bystander and not only for the victim</td>
<td>SSE8-9. Express confidence in talking to an adult when witnessing someone is being cyberbullied</td>
<td>OE8-9a. Expect that talking to adults will help end the cyberbullying</td>
<td>PSN8-9a. Recognize that your parents expect you to tell them when someone is being cyberbullied</td>
</tr>
<tr>
<td></td>
<td>K8-9b. Describe strategies on how you would tell an adult about someone else being cyberbullied</td>
<td></td>
<td>OE8-9b. Expect that when talking to teachers, they will quickly and effectively intervene</td>
<td>PSN8-9b. Recognize that your teachers expect you to tell them when someone is being cyberbullied</td>
</tr>
<tr>
<td></td>
<td>K8-9c. List who you could turn to and confide in when you want to report someone being cyberbullied</td>
<td></td>
<td>OE8-9c. Expect that when talking to parents, they will not overreact and will support positive bystander behavior</td>
<td>PSN8-9c. Recognize that your friends will tell an adult also when someone is being cyberbullied</td>
</tr>
</tbody>
</table>

Legend. PO – Performance objectives; K – Knowledge; SSE: Skills and self-efficacy; OE: Attitudes and Outcome expectations; PSN: perceived social norm.

behavior, several studies on individual determinants and environmental influences were conducted, and described in step 2.

#### 2.2. Step 2: preparing matrices of change objectives

The purpose of this second step was to investigate which behaviors (i.e. performance objectives) can reduce the public health problem and help attain the program objectives, and which determinants influence these behaviors (i.e. change objectives). These change objectives form the basis of the intervention. As findings from the first step revealed the significant role of bystanders in ending cyberbullying and reducing the harm for the victim, further research in subsequent steps of the protocol focused on bystander behavior. Surveys were conducted among adolescents to explore determinants of positive bystander behavior, and among parents and educators to explore determinants for supporting this positive behavior. Performance and change objectives were designed for adolescents, for parents and for educators. The change objectives
indicate what is needed to enable adolescents to show positive bystander behavior, and what needed to change for educators and parents to show support for adolescents’ positive bystander behavior.

### 2.2.1 Adolescents

A survey among 1979 adolescents was conducted to assess which behavioral determinants predicted the intention to perform positive defending behavior (i.e. assertive defending, comforting or reporting). Method information is provided elsewhere (DeSmet et al., submitted). The theoretical model composed of the Reasoned Action Approach, Social Cognitive Theory (see DeSmet, Veldeman, et al., 2014), and the Bystander Intervention Model, guided the questionnaire development and analysis. Multilevel analysis indicated positive bystander behavior was mostly predicted by adolescents’ intentions to act as a positive bystander, which in turn was mostly predicted by the expectation that their actions would benefit the victim. Intention to perform positive bystander behavior (e.g. also predicted by social skills, moral disengagement attitudes, mother’s awareness of activities, coping skills) did not completely translate into behavior, since other factors also predicted behavior independently of behavioral intention. Girls more often showed positive bystander behavior. When the victim was a good friend, adolescents more often acted as a positive bystander. More positive attitudes towards comforting and less positive attitude towards passive bystanding, predicted positive bystander behavior, as did having a higher sense of self-efficacy towards being able to end cyberbullying. School and class variables did not contribute to explaining positive bystander behavior, after taking individual characteristics into account. Performance objectives (specific behaviors we wish to obtain through the intervention), were set for the adolescents, taking into account what they considered acceptable and feasible. This meant a gradient of behaviors, where easy behaviors could be performed for any incident, while more risk-taking behaviors would depend on the identity of the victim and on the circumstances. First, the adolescent needs to assess the situation as cyberbullying and in all cases: never blame the victim, never join in or reinforce the bully, and always comfort the victim. Next, if the victim is a friend, the bystander should defend the victim. If the bullying may have been provoked, or is of more serious nature, the bystander should report to adults (Table 2, first column). As a next step, IMP prescribes to cross behavioral determinants with every performance objective, to find elements (‘change objectives’) that need to change in order for the person to be able to perform the target behavior. Determinants identified in our survey were thus crossed with the formulated performance objectives, and are listed in Table 2.

### 2.2.2 Parents

Two studies were conducted to find predictors of parental advising behavior in relation to how adolescents should respond to cyberbullying, and whether this advising behavior also took into account context-specific information. For the surveys among parents of 7th–9th graders, two convenience samples were drawn of respectively one school community (two schools in total), and two school communities (consisting of six schools in total) in one province of Flanders. For both studies, parent questionnaires were distributed via their children at school in a closed envelope. Parents could return the completed questionnaire in a separate, sealed envelope via their child to school, or fill out the questionnaire online. For the first study among parents, 323 valid questionnaires were returned (response rate 40%). Linear regression analyses were conducted to find predictors of parental advising behavior. The dependent variables in this analysis were the extent of parents advising their children to: 1) provide support and comfort the victim; 2) assertively defend the victim; 3) report to teachers; and 4) stand by passively. The independent variables were individual behavioral determinants such as knowledge on cyberbullying’s harm, (moral disengagement) attitudes, outcome expectations, subjective norms, self-efficacy and parenting styles. This first study showed that parents would most often advise their children to report to a teacher, followed by providing social support to victims. Parents were less inclined to advise their children assertive defending, and parents’ intentions were lowest to advise passive bystanding. Parents advised reporting to teachers because it is an easy advice, they feel some action is needed, but advising to defend is considered difficult ($R^2 = 23\%$). Parents who more often advise assertive defending are less concerned about protecting their own child and have more positive attitudes of defending ($R^2 = 32\%$). Those who are more inclined to advise comforting, are most driven by a desire to take responsibility, resolve bullying and create a positive climate for their children’s development, while also having a negative attitude towards passive bystanding ($R^2 = 28\%$). Parents who more often advise to stand-by passively are mostly influenced...
For the second study among parents, 159 valid questionnaires were returned (response rate 26%), of which, 48 parents were selected at random for analysis. This study consisted of open-ended questions and the purpose was to explore context-specific behavior using scenarios. A content analysis was performed on these data. The answers were analyzed via thematic analysis in NVivo software. Both questionnaires were anonymous. The findings from the second study confirmed parents mostly advised to report or provide informational and emotional support. For more severe incidents (repeated incidents, physical threats), positive bystander behavior was less often recommended than for less severe incidents, presumably to reduce risk for their own children, although this is where it is most needed. Based on these results and on literature, performance objectives were designed for parents, such as understanding that reducing all cyberbullying is the only way to protect their child against cyberbullying, to not ignore and advise to stand-by passively, but instead advise to comfort and take positive action, and lastly to only advise to report to adults when parents are certain this will lead to actions. As was done for adolescents, change matrices were derived from crossing the performance objectives with their behavioral determinants (Appendix Table A1).

2.2.3. Educators

Among educators, an anonymous online survey was conducted in Flanders. Method information is provided elsewhere (DeSmet, 2015). The purpose of this study was to assess how educators responded to cyberbullying. First, cluster analyses were performed on this survey data, revealing four educator clusters. The two largest clusters less often used recommended strategies, such as talking to pupils, and these clusters mainly consisted of teachers. The other two clusters more often used several recommended strategies (i.e. conversations with pupils, enlisting professionals for support, parental involvement, providing supportive victim advice), were much smaller, and comprised more other educators, such as principals, school counsellors, or educators in combined roles (DeSmet, 2015). These findings indicated a need for educator training, which should be tailored to job position, since teachers showed different training needs than other educators.

Furthermore, linear regression analyses were conducted to find predictors of the target behaviors for educators (not elsewhere published). Dependent variables were the extent to which educators took the following actions when aware of a cyberbullying incident, such as 1) talking with pupils; 2) enlisting professionals for support; 3) involving parents. Independent variables were school and educator characteristics such as educator age and position, having a school policy against cyberbullying; and individual behavioral determinants such as problem perception, (moral disengagement) attitudes, outcome expectations, subjective norms, self-efficacy and student–educator relationship skills. First, taking appropriate educator actions against cyberbullying (i.e. talking with pupils ($R^2 = 32\%$), enlisting professionals for support ($R^2 = 28\%$) and involving parents ($R^2 = 33\%$)) was predicted by positive outcome expectations, having a school policy against cyberbullying, perception to possess good educator–pupil relationship skills, subjective norm that others expected them to act and high problem perception of cyberbullying at their school. Younger educators showed these appropriate actions less often than older educators. Based on these results and on literature, performance objectives were designed for educators, such as talking with pupils about what has happened, involving parents of bully and victim, consulting professionals in case of severe cyberbullying, installing and being informed of an anti-cyberbullying policy, and not disciplining the bully or ignoring the incident. Change matrices were derived from crossing the performance objectives with their determinants (Appendix Table A2).

2.3. Step 3: selection of theory-informed intervention methods and practical strategies

In a third step of the Intervention Mapping Protocol, theoretical methods are chosen to influence the change objectives. For each change objective, the appropriate theoretical method known to impact this type of behavioral determinant is chosen (Bartholomew et al., 2011). Next, these methods are commonly matched with practical strategies, e.g. videos.

The choice of theoretical methods occurred in two phases: one prior to pilot testing a prototype, and one after this pilot test, when the concept and methods needed to be revised.

In a first phase of our project, behavior change techniques and game design methods were chosen separately. The choice of behavior change techniques was based on a summary of methods provided in the Intervention Mapping handbook (Bartholomew et al., 2011), and on change techniques proven effective in serious health games in a meta-analysis. Game design methods were chosen based on the same meta-analysis, and on the game developers’ expertise. The meta-analysis comprised 54 game studies for health promotion (DeSmet, Van Ryckeghem, et al., 2014). A detailed method description of this meta-analysis is provided elsewhere (DeSmet, Van Ryckeghem, et al., 2014). This meta-analysis showed games were best non-tailored, or tailored to both socio-demographic (e.g. age, gender) characteristics and information on lifestyles or change needs (e.g. severity of health problem). Moreover, they should be founded on game theories, or game and behavioral change theories. Moderator analyses were conducted on an update of this meta-analysis, comprising 58 game studies. These analyses revealed that using more behavior change techniques did not relate to higher effectiveness, and that using more game-experience enhancing features even related to lower effectiveness. Presumably, more challenging games created a higher cognitive load and reduced the fun of the games. The use of particular game features (e.g. mechanics, aesthetics, narrative) did, however, relate to higher game effectiveness, such as using a simple challenge, or a challenge that adapts to the players’ proficiency, and not using personal goal-setting. Some features related to higher effectiveness for some outcomes (e.g. knowledge), but not others (e.g. attitudes). Games should thus always be designed with the specific behavior and behavioral determinant outcome in mind (DeSmet et al., submitted). Based on the Intervention Mapping Protocol and the meta-analytic findings, behavior change methods employed in a first prototype of the game were active mastery learning, modeling, positive self-reevaluation, perspective taking, conditioning (rewards), and immediate feedback. These change methods are most appropriate for changing attitudes and outcome expectations, which were the strongest predictors of positive bystander behavior. Game design elements were first-person control, personalization of avatars, a mystery-themed story, mission-based levels with increasing level of difficulty, rewards and feedback. There was no pre-determined time limit for achieving the game goal.

These behavior change techniques (BCT) and game design elements were revised in a second prototype of the game. This revision took into account how behavior change strategies can be best balanced with game design principles, to maintain both effectiveness and game engagement. User feedback on the first prototype
indicated behavior change strategies and game design methods needed to be better balanced and integrated. This game-specific application of behavior change strategies is currently not included in the Intervention Mapping Protocol. These behavior change techniques (BCTs) and game design features (GFs) needed to form an integrated part in the game. The MDA (mechanics, dynamics, aesthetics) framework of applied game design (Hunicke et al., 2004) was used to implement the behavior change techniques in a challenging and motivating virtual environment. An overview of behavior change or gaming methods was constructed based on meta-analytic, review or experimental findings. This overview aided in a shared understanding of game methods between game developers and behavior change professionals, and supported the evidence- and theory-based choice from both disciplines (Table 3). Step 4 (2.4.3) will discuss how these BCTs and GFs will be applied in the second prototype.

2.4. Step 4: development of the intervention program

In step 4 of IMP, all information from the previous steps was combined to create the program material. Information from step 4 was also used to revise earlier made decisions in step 3.

2.4.1. Story preferences

The first survey among 530 adolescents elicited game preferences prior to development and consisted of a sub-sample of the survey among 1750 adolescents, described in step 2. Adolescents who finished early with the first survey, received a second, very brief, survey, in which they were asked to describe what a game would look like if they were the designers. In this sample, 38.8% were 7th graders, 46.7% were boys. A content analysis of these stories was performed using thematic analysis in Nvivo. The stories adolescents wrote showed a preference for a detective theme (e.g. solve a murder); where the world had to be saved from a disaster in the future (e.g. virus that wipes out the world population); solving a mystery (e.g. solve the mystery of the empty city and the missing people); conquering the bad ones (e.g. squirrels who wish to master the world); imitating real life (e.g. buying a house, going to work, have pets and children), and taking place in a large city (e.g. Boston, New York, London).

This input was provided to a professional story writer, who created the story of ‘The Messenger’, used in the first prototype. The story is set in 2043 and features an anonymous cyberterrorist, whose identity is about to be revealed by a journalist, Barbara West. Barbara unfortunately gets killed in a cyber-attack, leaving behind a husband, Professor West, and their 13-year old son/daughter, Rafa (i.e. personalized to the player’s gender). Professor West, grief-struck, designs a time-travel machine to return to the date before the cyber-attack and, together with his son/daughter, to prevent his wife from getting killed. By an unforeseen power disruption, Rafa lands 30 years back in time, without professor West. He/she recognizes the setting (school) from clues his/her mother left behind and realizes this place is related to the cyberterrorist. The activities in the game, aimed at improving class climate and reducing cyberbullying, will help Rafa solve the mystery of the identity of the cyberterrorist, and prevent the person from turning into a cyberterrorist. When this is achieved, Rafa returns to the future, to a reunited family and a world without cyberterrorism.

2.4.2. Pilot test of the concept for prototype 1

Next, game story, characters and layout were pilot tested in focus groups with 69 adolescents. Four schools were contacted. These schools were a convenience sample, but were selected to represent different educational types, grades and regions. Participants were selected at random among those who had provided informed consent. The concept test was guided by theories on narratives in health communication (Transportation Theory, Extended Elaboration Likelihood Model), behavior change (Social Cognitive Theory) and media enjoyment (Flow theory, Identification). The story was well-liked, but the looks of the characters and setting needed adjusting to teenage preferences (e.g. clothing outdated, colors too gloomy) (Van Cleemput et al., 2016).

2.4.3. Pilot test of prototype 1

Finally, a prototype of a first game level was pilot tested with 8 adolescents (4 boys, 4 girls), using a convenience sample of 4 schools. A retrospective think-aloud method and semi-structured questionnaire were used to collect the data. Results showed adolescents found it difficult to understand what was expected of them in the gameplay. Addressing all change objectives (e.g. subjective norm, attitudes) with the appropriate strategies, highly complicated the game. Furthermore, many behavioral change strategies (e.g. modeling, self-reevaluation) fit best with a story-driven game. Our story-driven game, however, reduced the interactivity and control, as it had a linear structure in which players were guided via their choices towards one story ending, the plot.

2.4.4. Design of prototype 2

Given that the story-driven game in its current form had low interactivity, but that a game without the story would reduce the opportunity to address all behavioral determinants appropriately, it was decided to split the intervention into several components: 1) a background narrative was used to create the mood and context (e.g. improve mood in classroom), whereas an in-game narrative (e.g. social media page with degrading comments and pictures) influenced gameplay; 2) a more interactive game was used, and game mechanics and behavior change techniques were used mainly to increase knowledge, skills, and to a smaller extent, subjective norm; 3) supplemental non-game material was created for use in a classroom or by the adolescents privately, to address the other behavioral determinants of e.g. attitudes and self-efficacy.

The adjusted overall game objective consisted of scenarios of potential cyberbullying, where the player needs to select the appropriate response as a bystander. The game is a 2.5 D puzzle-adventure game in which the player has to uncover the identity of a mystery cyberbully by correctly applying positive bystander strategies in a classroom context. The player’s response affects the victim’s mood, the classroom climate and the bully’s level of bullying. Hints are provided when the player’s score drops down. At certain stages in the game, extra activities (‘missions’) will be provided, when change objectives require more than choosing the right strategy. Examples are assessing the situation and collecting information from the victim’s or bully’s friends; finding an adult to report to and being able to describe the incident to the adult (Fig. 2). Mechanics involve a discussion system in which the player needs to assess the situation, character development where characters can evolve to several participant roles in cyberbullying, and a reputation system where the classroom climate is set as a final game objective.

The overview of behavior change techniques (BCTs) and game design features in Table 3 aided the choice of methods for prototype 2. This overview showed that feedback (BCT1) was an essential condition for effectiveness to many other behavior change methods, and also supported game engagement. To not interrupt game flow, feedback will be divided into: 1) individual, immediate, non-specific feedback, in the form of pleasant or unpleasant sounds which also present a type of classical conditioning for the behavior; and 2) individual, delayed, specific feedback, which gives more detailed, textual feedback when a level was completed. This feedback will also include information on the consequences (BCT2) for
Table 3
Overview of behavior change techniques (BCTs) and gaming features (GFs) applied in games, organized in categories of BCTs.

<table>
<thead>
<tr>
<th>BCT/GF</th>
<th>Technique or feature</th>
<th>Target outcome</th>
<th>Conditions</th>
<th>Effects on target outcome</th>
<th>GAME engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCT</strong></td>
<td><strong>Individual tailoring</strong>&lt;br&gt;(Matching content parts of the intervention to user characteristics)</td>
<td>Behavior and behavioral determinants</td>
<td>Tailoring needs to be performed on aspects relevant to the behavior change (Bartholomew et al., 2011)</td>
<td>Tailoring related to higher effects, but only when tailored to sociodemographics, in a meta-analysis of 54 serious health game studies (DeSmet, Van Ryckeghem, et al., 2014)</td>
<td>Tailoring is assumed to increase the extent to which game-based learning is experienced as fun (Lieberman, 2009).</td>
</tr>
<tr>
<td><strong>GF</strong></td>
<td><strong>Personalization</strong>&lt;br&gt;(Matching visual parts of the intervention to user characteristics)</td>
<td>Behavior and behavioral determinants</td>
<td>Personalization may act as self-modeling, but requires that the model is reinforced for positive behavior (Bartholomew et al., 2011)</td>
<td>Personalizing game looks to users characteristics related to lower effectiveness, in a meta-analysis of 58 serious health game studies (DeSmet et al., submitted)</td>
<td>In only half of the studies, having virtual characters or environments positively impacted emotional and cognitive engagement according to a systematic review of educational games. It is, however, unclear whether these avatars were personalized (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td><strong>BCT/GF</strong></td>
<td><strong>Information on the link between health outcome and the desired behavior</strong>&lt;br&gt;(General information on health risk related to the behavior)</td>
<td>Behavior</td>
<td>Needs to be combined with either: personal goal-setting/ intention formations; OR providing information on consequences, and use of follow-up prompts</td>
<td>One of the most effective techniques to change behavior, but only in combination with other techniques, in a meta-analysis of 101 studies to promote a healthy diet and physical activity (Dusseldorp, van Genugten, van Buuren, Verheijden, &amp; van Empelen, 2014)</td>
<td>Built-in, supportive learning tools positively impacted both emotional and cognitive engagement in a systematic review of educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td><strong>BCT/GF</strong></td>
<td><strong>Providing information on consequences</strong>&lt;br&gt;(Information on costs and benefits of performing or not performing the behavior)</td>
<td>Behavior</td>
<td>Needs to be combined with information on health-behavior link, and follow-up prompts</td>
<td>One of the most effective techniques to change behavior, but only in combination with other techniques, in a meta-analysis of 101 studies to promote a healthy diet and physical activity (Dusseldorp et al., 2014)</td>
<td>Not effective when studied as a single component</td>
</tr>
<tr>
<td><strong>BCT</strong></td>
<td><strong>Use of follow-up prompts</strong>&lt;br&gt;(Contacting the user after the intervention is complete)</td>
<td>Behavior</td>
<td>Needs to be combined with information on health-behavior link, and providing information on consequences</td>
<td>One of the most effective techniques to change behavior, but only in combination with other techniques, in a meta-analysis of 101 studies to promote a healthy diet and physical activity (Dusseldorp et al., 2014). May replace the need for prompting goal review.</td>
<td>No information on game engagement.</td>
</tr>
<tr>
<td><strong>BCT</strong></td>
<td><strong>Personal goal-setting and intention formation</strong>&lt;br&gt;(Encouraging the person to decide to act or set a general goal)</td>
<td>Behavior/behavioral determinants</td>
<td>Requires high motivation to change in target group (Sheeanc, Webb, &amp; Gollwitzer, 2005)</td>
<td>Using personal goal-setting and planning related to lower effectiveness in serious games, in a meta-analysis of 58 serious health game studies (DeSmet et al., submitted)</td>
<td>No information.</td>
</tr>
<tr>
<td><strong>BCT/GF</strong></td>
<td><strong>Setting graded tasks, ‘scaffolding’</strong>&lt;br&gt;(Setting easy tasks which become increasingly difficult until target behavior is reached)</td>
<td>Skills, self-efficacy</td>
<td>The target behavior needs to be divisible in smaller, increasingly difficult tasks</td>
<td>Scaffolding levels related to a lower effectiveness on self-efficacy, in a meta-analysis of 58 serious health game studies (DeSmet et al., submitted)</td>
<td>Scaffolding related to more emotional and cognitive engagement, but feedback was also counted under this feature in a systematic review of educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td><strong>BCT/GF</strong></td>
<td><strong>Providing instruction</strong>&lt;br&gt;(Telling the person how to perform a behavior)</td>
<td>Behavior</td>
<td>Needs to be combined with providing feedback</td>
<td>58% of interventions with feedback and instructions were effective, versus 14% that only gave feedback, in a meta-analysis of 101 studies to promote a healthy diet and physical activity (Dusseldorp et al., 2014)</td>
<td>Giving instructions on what health behavior is expected, is similar to expected game behavior, when stating game rules and goals, and could be integrated here. Game rules and goals are essential parts of the (continued on next page)</td>
</tr>
</tbody>
</table>
cyberbullying and the victim, of the behaviors chosen by the player. Quantitative analyses of determinants of bystander behavior showed that seeing positive consequences for the victim of their bystander actions, was a crucial predictor. Given that feedback is ineffective without providing clear instructions (BCT3) on what is expected, this information will also be provided, together with the game rules. These instructions moreover include information on the link between the behavior required of the player in the game, and the desired outcome, i.e. ending cyberbullying and its harm (BCT4). These effects on emotions will also be noticeable in a mood slider and scene lighting. The game will use enactive mastery experiences (BCT5), giving opportunities for high user control (GF1). Although the level of user control did not relate to effectiveness in our meta-analysis of serious health games, the solid theoretical support for this method and the positive effect on game engagement motivated the choice to include this in the game. The game

### Table 3 (continued)

<table>
<thead>
<tr>
<th>BCT/GF</th>
<th>Technique or feature</th>
<th>Target outcome</th>
<th>Conditions</th>
<th>Effects on target outcome</th>
<th>GAME engagement</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCT/GF</td>
<td>Narrative/using imagery, scenario-based information (A coherent story with beginning, middle and plot resolution)</td>
<td>Knowledge, attitudes</td>
<td>Should not reduce interactivity of the game; imagery should use familiar analogies, plausible scenario with a cause and an outcome (Bartholomew et al., 2011)</td>
<td>A narrative did not relate to game effectiveness on behavior or its determinants, in a meta-analysis of 58 serious health game studies (Desmet et al., submitted)</td>
<td>A narrative positively impacted mostly emotional engagement in a systematic review of educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td>BCT/GF</td>
<td>Feedback (Giving information on the extent to which they are achieving the behavior, or the extent to which the behavior is having an impact on outcome)</td>
<td>Behavior and behavioral determinants</td>
<td>Needs to be individual, specific and immediate (Bartholomew et al., 2011)</td>
<td>Only tested the effect of immediate feedback, games providing feedback were borderline significantly more effective in changing behavior, in a meta-analysis of 58 serious health game studies (Desmet et al., submitted)</td>
<td>Feedback aims to enhance the experience and help you progress in the game (Prensky, 2007).</td>
</tr>
<tr>
<td>BCT</td>
<td>Prompting review of behavioral goals (Encouraging users to review or reconsider previously set goals or intentions)</td>
<td>Behavior</td>
<td>Requires personal goal-setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCT/GF</td>
<td>Classical and operant conditioning (Intrinsically pleasant -or unpleasant- outcomes, social or material rewards linked to the achievement—or failure- of specified behaviors)</td>
<td>Behavior, attitudes, skills, self-efficacy</td>
<td>Time interval between behavior and response needs to be short; needs to be tailored to the individual; and needs to be seen as a consequence of behavior (Bartholomew et al., 2011)</td>
<td>No relation of rewards (e.g. point scoring) with effectiveness in serious games, in a meta-analysis of 58 serious health game studies (Desmet et al., submitted)</td>
<td>Only in half of the papers, rewards positively impacted emotional engagement, according to a systematic review on educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td>BCT/GF</td>
<td>Enactive mastery experiences (Practicing in a simulated setting with increasingly difficult tasks)</td>
<td>Skills, self-efficacy</td>
<td>Requires feedback, and user willingness to accept feedback (Bartholomew et al., 2011)</td>
<td>The degree of interactivity and control did not significantly relate to game effectiveness on behavior or its determinants, in a meta-analysis of 58 serious health game studies (Desmet et al., submitted)</td>
<td>Having control and choices positively impacted mostly emotional engagement in a systematic review of educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
<tr>
<td>GF</td>
<td>Challenge (The game problem a player is trying to solve)</td>
<td>All behavioral determinants, and in particular knowledge, skills, self-efficacy</td>
<td>Adjusted to the player’s mental capabilities, or remain simple if adjustments are not possible</td>
<td>Simple challenges, and more difficult challenges adjusted to the players’ performance, yielded higher effects than difficult, non-adjusted challenges, in a meta-analysis of 58 serious health game studies (Desmet et al., submitted)</td>
<td>All papers studying the presence of a challenge reported this had a positive impact on cognitive engagement, in a systematic review of educational games (Jabbar &amp; Felicia, 2015)</td>
</tr>
</tbody>
</table>

BCT: behavior change technique; GF: gaming feature.
may be tailored on content by gender (BCT6), since our research on determinants of bystander behavior showed that boys had different issues than girls.

The game will be personalized on looks by gender and certain lifestyle preferences (e.g. clothing) (GF2). This choice of game feature was motivated by a potential positive effect on game engagement. Given personalization’s negative effect on knowledge, care will be taken to reduce the prominence of personalization in the game parts that address knowledge. The challenge (GF3) consists of a relatively simple question-and-answer format, to reduce cognitive load. No explicit rewards are provided, other than the auditive and textual feedback. Personal goal-setting, and goal monitoring, despite being effective methods in other health interventions, were not used here, since they related to lower effectiveness in serious health games, and could not be linked to game engagement. The number of gaming features was kept low, since the meta-analysis indicated that using more immersive features reduced effectiveness.

Not all change objectives could be addressed via this game. Especially methods to change attitudes and self-efficacy were considered difficult to implement in a game with predetermined choices and rewards. These other change objectives are planned to be addressed via practice material, made available on a dedicated website. The material can be used in a classroom, but similar versions will be available for adolescents who wish to use these at home. Methods used here will be e.g. project work (guided practice), cooperative learning for classroom material and videos (modeling, vicarious reinforcement). The environmental conditions to facilitate adolescent behavior will also be addressed in supporting material made available on a dedicated website. Most used methods here will be modeling via video’s and active (problem-based) learning. The same narrative will be used here as in the game to create a sense of immersion in the fantasy world, even when provided outside of the game context. A recent study employing a similar approach showed good usability for this method (Brand et al., 2015). A full description of methods and strategies is available upon request from the authors.

2.5. Step 5: planning for adoption, implementation and sustainability

Although listed as step 5, implementation planning runs throughout the whole development process. To ensure that the finished product would be feasible to use in practice, a group of stakeholders was set up at the onset of the project. The stakeholder group was composed of representatives of schools, school counselors, governmental department of education, parent associations, youth advisory centers, youth helplines, youth TV channels, and umbrella organizations in health promotion. They convened at least twice per year and aided in decisions on e.g. whom to target, which situations to take into account, which skills adolescents need the most, what is feasible in average gameplay duration, how to distribute the program, and how to promote the program.

Stakeholders’ perceptions confirmed that middle school students should be the primary target for the intervention. They suggested not to frame the game as a game against cyberbullying, but to approach this problem from a different, broader topic such as social life and communication. This suggestion was reflected in our choice of game narrative, where solving cyberbullying is merely an instrumental part to solving a mystery and getting Rafa’s life back on track. Stakeholders emphasized that the game should be diverse to fit different learning styles, different cultures and should also appeal to youngsters in different school types, such as vocational or technical education. They mentioned that cyberbullying language and even emoticons were culturally dependent. Emoticons and cyberbullying phrases were aimed to be generic and appeal to a broad audience, which was also pilot tested. Stakeholders advised against the use of mini-games which would contain educational content, whereas the overall game would be merely fun without providing educational content. Combining fun and education in each intervention component was crucial. This was monitored for each part (e.g. game and classroom material includes both fun and educational aspects).

Stakeholders’ input also affected decisions on game distribution and promotion. It was decided to make the program available via schools to increase reach, but with the possibility to be played in the adolescents’ own privacy, to increase practice. Stakeholders requested to provide a ‘save’ option to enable adolescents to continue their game play at home and improve their skills, which will indeed be provided. To be able to run the game on school computers, the stakeholder group advised not to use high-end graphics, and we decided to design the game in two-dimensional (2D) instead of 3D view. Representatives from schools recommended to start with a smaller program on which to gradually add components, instead of immediately installing a whole-school program. Stakeholders, however, also agreed that a supportive network at school and supplementary classroom material were basic conditions for the game to be effective. Homeroom teachers should have a crucial role in providing the context for the game. A school manual should clarify that this package is intended as a method of prevention and not as acute care when a cyberbullying incident has taken place. This is, however, often when schools decide to adopt a preventive approach, when instead, a remediation approach is needed. These stakeholder comments were integrated in the classroom material and accompanying manual for schools. Although the material is designed to integrate the game in a whole-school program, based on stakeholders’ suggestion, the
game will also be available as a stand-alone version that schools can use within their existing approach. The manual will clearly state which objectives are met by the game, and which components are needed in the school’s own complementary approach in order to reach all change objectives.

2.6. Step 6: development of an evaluation design

As for step 5, evaluation runs throughout the whole development process by conducting formative research, assessing feasibility, with end users. A final part of formative research is planned with the adolescents and schools, to tweak the game and extra material on usability, player experience, game appeal, comprehension, and fit with their culture in the language and visuals used. In a next phase, a quasi-experimental study is planned to evaluate the efficacy of the program in addressing the change objectives. Schools will be randomly assigned to either control or intervention condition. Effects on change and program objectives will be measured using validated questionnaires at pre- and post-intervention. A process evaluation among users playing the game and using the material is scheduled concurrently. These tests will take place in Fall 2015.

3. Discussion

This study showed a meticulous, evidence-based planning process of a cyberbullying prevention program for adolescents. A recent review of cyberbullying prevention and intervention programs indicated a lack of evidence-based programs, that used a whole-school approach, and that included components addressing several individual behavioral determinants and the social context (e.g., family) (Della Coppa et al., 2015). Our cyberbullying prevention program attempts to meet this current lack in literature and practice.

Evidence-based design of behavioral change interventions begins by understanding the changeable determinants of this behavior and their importance (Bartholomew et al., 2011; Glanz & Bishop, 2010). These steps were conducted and detailed information was presented here, to enable other professionals to start from a ready available list of change objectives and methods, and hence avoid duplication of efforts. The Intervention Mapping Protocol (IMP) process is costly and time-consuming (see e.g., van Empelen, Kok, Schaalma, & Bartholomew, 2003; Reinaerts, de Nooijer, & de Vries, 2008), with commonly 3–4 years of research preceding the actual availability of program material (see e.g., De Craemer et al., 2014). Especially investigating the determinants of behavior has been reported as a bottle-neck (Godin, Gagnon, Alary, Levy, & Otis, 2007), and sharing this central research, as done here, can shorten the time needed for other professionals to develop their intervention. This can consequently leave more time for evaluation of longer-term intervention effects (e.g., health outcomes such as depression, suicidal ideation) or effects in community implementation, where IMP-developed interventions may be especially effective (Reinaerts et al., 2008), due to their continuous user and stakeholder involvement (Klesges, Estabrooks, Dzewaltowski, Bull, & Glasgow, 2005). Since these long-term and community implementation effects are often hard to document in the time available for most project developments, it would advance research into cyberbullying interventions to continue from existing evidence, and instead, devote more time and resources to effect evaluation. If our program material, which will be tested in step 6, proves effective, not only the central research presenting determinants and methods, but also the finalized program may inspire other professionals in future research or interventions. Since cultural differences may exist in how cyberbullying occurs or is perceived (Ortega et al., 2012), a verification of findings in a different cultural context may be appropriate prior to founding the intervention design on our evidence. Future research in cross-cultural settings would therefore be useful.

Applying the IMP resulted in decisions which changed the project’s course. Firstly, this approach triggered the decision to target bystanders, as a group which possesses better social and coping skills than either victim or (victim-) bullies (Campbell, Spears, Sleet, Butler, & Kift, 2012; Vollink, Bolman, Dehue, & Jacobs, 2013), and who may effectively reduce the harm and prevalence of cyberbullying (Hawkins et al. 2001; Williford et al., 2013). Although victims and perpetrators also require interventions, changing bystander behavior was perceived as creating the highest potential impact from a public health perspective. Only a few cyberbullying intervention and prevention programs so far have included components on changing bystander behavior, either indirectly by using peer educators (Palladino, Nocentini, & Menesini, 2012; Wölfer et al., 2013), or by directly targeting bystander behavior, as in the KiVa program (Williford et al., 2013). This latter program aimed to increase bystanders’ awareness, empathy skills, anti-bullying attitudes and self-efficacy to defend and support the victim. Changes to bystander behavior were only measured, but the program’s very small yet significant effects suggested that changing bystander behavior can indeed reduce cyberbullying and victimization in elementary school children. Effects in the age group most at risk for cyberbullying and victimization (i.e., 12–14 year olds), were not significant, and the KiVa program may need to be adjusted to increase effectiveness here. Possibly, other behavioral determinants than those included play a role. Indeed, our results among 12–14 year olds showed that although anti-bullying attitudes were important, the most predictive determinants of positive bystander behavior were positive outcome expectations towards this behavior. Applying the IMP approach, which encourages using several behavioral change theories, and the need to assess all core behavioral determinants and their relative importance in changing the target behavior (Bartholomew et al., 2011), resulted in the following recommendations for bystander behavior change programs in cyberbullying: 1) emphasizing the benefits for victims, 2) reinforcing negative attitudes towards passive bystanding and positive attitudes towards comforting, 3) increasing self-efficacy to end cyberbullying and reducing the effect of incident factors on self-efficacy to intervene; 4) strengthening social skills, and 5) reducing moral disengagement; 6) increasing maternal awareness of cyber-activities; 7) reducing self-protective motives; and 8) reducing cognitive avoidance coping skills.

Secondly, the IMP acknowledges the importance of assessing environmental influences. Our results on environmental influences suggest effectiveness of cyberbullying programs may be further improved by a strong involvement of parents and educators. Adolescents mentioned their bystander behavior was influenced by (a lack of) support from educators and parents for positive behavior (DeSmet, Veldeman, et al., 2014). Our study contributes to cyberbullying intervention research by its theory- and evidence-based approach in addressing the behavior of parents and educators. While several existing interventions have included components for teachers (see e.g., Wölfer et al., 2013; and Van Cleemput et al., 2014, for a full overview), the theoretical or evidence basis for these components is often not described. Our study is hence, to our knowledge, the first to do so, using behavioral change theories in predicting and changing educator behavior. Our findings showed especially teachers need support in appropriately handling cyberbullying. Positive outcome expectations, problem perception and basic skills in pupil-educator relations need to be reinforced, whilst moral disengagement attitudes should be countered. Even fewer
current interventions for cyberbullying have included a parent component (Ortega-Ruiz, Del Rey, & Casas, 2012; Willford et al., 2013; Wölfer et al., 2013), despite the widespread assumption that targeting parents may be very important in cyberbullying, since this often takes place at home (Vandebosch, 2014). Parent material should emphasize that protecting one’s child can only be achieved by promoting a positive classroom climate. Attitudes and positive outcome expectations towards supporting positive bystander behavior, and the perception that others expect them to support this behavior, also need to be addressed in material for parents.

A last novel aspect of this study lies in the application of the IMP to the development of a serious game against cyberbullying. IMP has been effectively used before in the design of two serious games for sexual health (Brown et al., 2013; Tortolero et al., 2010), in a serious game for asthma self-management (Bartholomew et al., 2000), and evaluation is currently underway for a serious game on energy-balance related behaviors (Spook et al., 2015). A serious game is assumed to derive its effectiveness from coupling fun and educational strategies (Prensky, 2007). In our project, we observed that the choice of some behavioral change methods which are in general appropriate for health promotion interventions, conflicted with methods needed to maintain the fun value of serious games. More attention may be needed in the IMP guidelines on how to choose behavior change techniques, not only fitting with the target behavioral determinants, but also fitting with the specific application (e.g. videos, games). The overview provided in this paper of how behavior change techniques can fit with game design elements, may aid in bridging the communication gap between game developers and behavior change professionals. In educational games to increase curriculum-related knowledge, some attempts have been made in frameworks to match learning strategies with game features (see e.g. Carvalho et al., 2015). More efforts are needed to also establish such frameworks for behavior change games.

In sum, there is a need in literature and practice for evidence-based intervention design, targeting several determinants and social context factors. Our study was innovative in specifically targeting bystander behavior in cyberbullying. Based on evidence and theory, the program addresses several determinants which were the strongest predictors for this behavior in the age group most at risk for cyberbullying (12–14y). Doing so, our program aims to be effective in an age group in which previous programs aiming to change bystander behavior have shown limited success. Moreover, this evidence and theory-based approach was also applied to addressing social context influences, whereas these components or the evidence-base for these components are often not described in other programs. And lastly, the program used a format, namely a game, that has a high appeal to our target group. Our study presented a systematic method for selecting game features and behavior change techniques to optimize both the motivational appeal and effectiveness of the serious health behavior change game.

4. Conclusions

This paper presented an evidence- and theory-based development of a serious game against cyberbullying among adolescents, by promoting positive bystander behavior. Based on systematic reviews, qualitative and quantitative studies among adolescents, parents and educators, performance objectives were designed to aid in the attainment of the desired reduction in cyberbullying and its harm. Studies were guided by several theories, such as the socioecological approach, Reasoned Action Approach, Social Cognitive Theory, and Bystander Intervention Model. Meta-analyses and an overview of effective methods assisted in the translation of these performance objectives into a concrete game application. User and stakeholder consultations helped refine the serious game ideas and implementation plan. The insights and evidence presented in this article may help in the development of other evidence- and theory-based cyberbullying prevention and intervention programs, and in the design of serious games.

Disclosure statement

This study received a grant (no. 110051) from the Flemish agency for Innovation by Science and Technology. All authors’ contribution to this study was funded by this grant, apart from Maite Verloigne, who is supported by the Research Foundation Flanders (FWO) (postdoctoral research fellowship: FWO13/PDO/191). The funding agency had no role in study design, analysis or report writing. No competing financial interests exist.

Acknowledgment

The authors wish to thank all other Friendly Attac project members for their contributions to the project (in alphabetical order: Edgar Cebolledo, Gie Deboutte, Gaetan Deglorie, Olga De Troyer, Samantha Fernandez, Olivier Janssens, Koen Samyn, Wouter Spaas, Bart Uytdenhouwen, Frederik Van Broeckhoven, and Sofie Van Hoecke).

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.chb.2015.11.039.

References


A. DeSmet et al. / Computers in Human Behavior 56 (2016) 337–351


