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Serious Game-based Psychosocial Intervention to Foster Prosociality in Cyberbullying Bystanders

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A B S T R A C T

Bystanders of cyberbullying play an important role in the resolution of such situations and therefore, it is beneficial to promote self-regulation strategies that enable them to engage in prosocial behavior in these contexts. We propose that serious game-based psychosocial interventions with profile-based social agents can encourage prosocial bystander behavior in cyberbullying. A pilot quasi-experimental study with repeated and pre/post measurements was performed. We randomly assigned 194 7th and 8th graders to three conditions, namely experimental condition (n = 103, M_{age} = 13.91, SD = 1.02, 53.3% male); alternative condition (n = 37, M_{age} = 14, SD = 0.86, 54.1% female) and control condition (n = 54, M_{age} = 13.92, SD = 0.85, 50.9% female). An analysis of covariance showed that players revealed higher levels of prosocial assertive behavior when compared to other participants. Through multilevel modelling of longitudinal log-file data, we found that those who did not experience the game tended to interpret the cyberbullying situations more as non-serious, avoid assuming responsibility for intervening, and engage in aggressive behavior toward the victim. Players tended to support more and were less aggressive with victims from their in-group than those from the out-group. Insights for the development of games to promote prosocial behavior in bystanders of cyberbullying are presented.

La intervención psicosocial mediante juegos serios para fomentar la prosocialidad en los testigos de ciberacoso

Palabras clave:
Testigos de ciberacoso
Autorregulación
Agentes del grupo y fuera del grupo
Juegos serios

R E S U M E N

Los testigos del ciberacoso juegan un importante papel en la resolución de dichas situaciones, lo que es útil para proponer estrategias de autorregulación que les permitan implicarse en comportamientos prosociales en estos contextos. Proponemos que las intervenciones que se sirven de juegos serios con agentes sociales basados en perfiles pueden potenciar el comportamiento prosocial de los testigos de ciberacoso. Se llevó a cabo un estudio piloto cuasiexperimental de medidas repetidas pre/post. Se asignó a 194 alumnos de 7º y 8º a tres condiciones, condición experimental (n = 103, M_{edad} = 13.91, SD = 1.02, 53.3% varones), condición alternativa (n = 37, M_{edad} = 14, SD = 0.86, 54.1% mujeres) y condición control (n = 54, M_{edad} = 13.92, SD = 0.85, 50.9% mujeres). En el análisis de covarianza los jugadores tenían un mayor nivel de comportamiento prosocial asertivo en comparación con otros participantes. En un modelado multinivel de datos longitudinales de archivo quienes no tenían experiencia en el juego tendían a interpretar más las situaciones de ciberacoso como no serias, a evitar asumir la responsabilidad de intervenir y a participar en comportamiento agresivo hacia la víctima. Los jugadores tendían a dar más apoyo y eran menos agresivos con las víctimas de su grupo que con las de otro grupo. Se presentan ideas sobre el desarrollo de juegos que potencien el comportamiento prosocial en testigos de ciberacoso.

With an increasing adherence to social networks, adolescents often witness aggressive behavior online among peers and may react in different ways as bystanders of these events (Ferreira et al., 2020). How adolescents behave when witnessing cyberbullying incidents may be influenced by personal, behavioral, and contextual aspects (DeSmet et al., 2016). Throughout this decision-making process while interacting with others, personal, behavioral, and contextual factors influence each other at varying levels and in different types

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of interaction (Bandura, 2006). Cyberbullying may be defined as repeated and intentionally harmful actions toward peers using digital technologies (Hinduja & Patchin, 2009) and often occurs without being captured in real-time. Context is critical to help understand and deal with the phenomenon. Serious games with social (non-human) agents offer promising prospects to provide context to understand adolescent bystanders' reactions to cyberbullying. A game may be defined as a system which consists of individuals who engage in the activity of playing, the rules by which the activity is governed and the artefacts that are used in the activity (Martinho et al., 2014). Serious games may be considered applications (if digital) with an entertainment component that include different media to enhance players' experience through interaction in diverse contexts while conveying a message to players, with an educational purpose to foster learning (Laamarti et al., 2014). Social agents may be considered cognitive and evolving artificial intelligence entities that can reason about their own and others' actions, interact with other agents (Foo et al., 2007) and humans (van der Wal, 2012). As recent literature has suggested, social agents are becoming an increasingly significant part of individuals' lives in daily work and leisure activities (Pilarski et al., 2019). Hence, how these agents can trigger individuals' reactions and aid them in managing daily challenges, such as cyberbullying, is of utmost importance.

To understand how different factors play a role in adolescents' reactions to cyberbullying as bystanders, it is imperative to examine these interactions in context as they occur. Serious games with social agents designed within a social-cognitive approach (Bandura, 2006) and a social identity approach (Tajfel & Turner, 1979) may provide such contexts. Therefore, we aim to investigate how explicit training of self-regulation strategies can foster prosociality in bystanders of cyberbullying (social cognitive approach). We also propose to investigate whether social agents in serious games trigger different bystander behavior in cyberbullying events, depending on their role as members of the players' in-group or out-group (social identity approach).

Developing Prosociality in Bystanders of Cyberbullying through Self-Regulation

Recent studies have emphasized the role of bystanders as key agents who can hinder or worsen situations of violence among peers (Moreno-Bataller et al., 2019) and, therefore, are prominent figures in these contexts. Hence, it is imperative to identify aspects which may increase bystanders' intentions to help cybervictims because they are a key factor in reducing cyberbullying (Liu et al., 2021; Luo & Bussey, 2019). In fact, it is important to develop prosocial bystander behavior, such as defending the victim, because it has been associated with reduced moral disengagement and increased self-efficacy to defend others (Bussey et al., 2020).

In previous research, several factors have been identified as having an influence on bystanders' prosocial behavior to help victims, such as interpreting the event as an emergency (Latané & Darley, 1970). In fact, perceiving a situation as severe is a key cognitive factor which leads to prosocial bystander behavior (Shotland & Stebbins, 1983). In the event of an ambiguous situation, which can be characteristic of cyberbullying due to the physical distance (Knauf et al., 2018; Lo Cricchio et al., 2021), bystanders may be uncertain about how to behave in these contexts (Solomon et al., 1978). Another important factor which may impact bystanders' prosocial behavior to help the victim is their perception of the victims' state of emergency. Recent research has shown that bystanders who perceive a victim's state of emergency to be more severe, have a greater tendency to help the latter in cyberbullying situations (Lambe et al., 2019; Liu et al., 2021; Obermaier et al., 2016). Furthermore, research has also shown that feeling responsible for intervening is also associated with bystanders' intentions to help the victims (González & Lay, 2017; Lambe et al., 2019; Latané & Darley, 1970). This also holds for cyberbullying situations where perceived severity and emergency influences bystanders' feelings of responsibility to intervene prosocially (DeSmet et al., 2016; Kazerooni et al., 2018; Obermaier et al., 2016) while triggering empathic reactions towards the victims (Knauf et al., 2018).

According to the bystander intervention model proposed by Darley and Latané (1968), apart from noticing an event and interpreting it as an emergency, as well as taking responsibility for intervening, bystanders go through a decision-making process of determining the appropriate manner in which to intervene before engaging in helping behavior. Recent research has determined that from the moment bystanders notice an event to when they engage in prosocial behavior they engage in a reflective process which implies self-regulation (Ferreira et al., 2021), encompassing self-efficacy beliefs about intervening prosocially (Ferreira et al., 2020). In fact, self-regulation processes may inclusively hinder bystanders' aggressive defending intervention (Valdés-Cuervo et al., 2021) and an aggressive style of interpersonal communication (Veiga Simão et al., 2021) in cyberbullying situations, thus, endorsing the potential of self-regulation as a critical process which constrains aggressive interpersonal behavior (Carlo et al., 2012; Memmott-Elison et al., 2020; Silver & Silver, 2019). Furthermore, self-regulation processes have been known to have the potential to promote prosocial behavior (Veiga Simão et al., 2021) and empathic reactions (Ferreira et al., 2021) through the use of digital tools. Therefore, research is necessary to explore the regulation of bystander behavior in interpersonal relationships (Valdés-Cuervo et al., 2021).

A Social-Cognitive Approach to Self-regulating Bystander Behavior in Cyberbullying in Serious Games

There have been multiple theories providing a framework for the development of serious games. The Social Cognitive Theory, for example, has been used as a specific framework for development (DeSmet et al., 2016). This theory proposes an agentic perspective to human functioning through the influence of personal and contextual factors on the regulation of one's own behavior. Individuals are producers and products of social systems in an interplay between direct, proxy, and collective agency (Bandura, 2001). Agency refers to individuals' ability to determine their own functioning and the circumstances surrounding it through intentionality (i.e., action plans), forethought (i.e., setting goals), self-reactiveness (i.e., self-regulation) and self-reflectiveness (i.e., self-examination) (Bandura, 2006). However, adolescents' ability to understand their own thought and others' perspectives and to make decisions progress with age and maturity (Blakemore, 2012).

Adolescence is a phase of life where emotionally intense relationships are formed and, therefore, understanding how to manage these relationships is an issue of significant value. Hence, developing self-regulation competencies to handle disturbing events is crucial. Specifically, individuals can engage in 1) covert self-regulation, where they adapt specific feelings and thoughts, 2) environmental self-regulation, where they monitor the impact of diverse conditions and control them strategically, and 3) behavioral regulation, where individuals observe and strategically adapt their own performance (Zimmerman, 2013).

The Social Cognitive Theory has been applied to a one-session single-player serious game against cyberbullying, Friendly Attac (DeSmet et al., 2018). A user study of this game, which was designed for 8th graders, revealed that it improved players' prosocial skills, self-efficacy, and intentions to engage in positive bystander behavior. The results from Friendly Attac also revealed that the game fostered awareness regarding cyberbullying, although no effects were found on behavior itself, as well as bullying or cyberbullying prevalence.

Adolescents' efficacy beliefs to deal with adverse situations contributes to how they assume responsibility and take control of their life and peer pressure, which may lead them toward destructive behavior (Bandura et al., 2003). This sense of efficacy to self-regulate one's own life may direct adolescents toward engaging in prosociality and refraining from injurious behavior (Bandura, 2006). While prosociality involves empathetic, collaborative, assertive, and helpful behavior that benefits others (Barrett & Yarrow, 1977; Böckler et al., 2016), aggressive behavior aims to deliberately harm others (Nagin & Tremblay, 1999).

Adolescents can act aggressively in an impulsive or reflected way as a response to observed cyberbullying events, or they can act in a reflected prosocial manner by engaging in problem-solving and/or reporting behavior (Ferreira et al., 2020) and by being assertive (Barrett & Yarrow, 1977). Adolescents can also act passively, experiencing a bystander effect, which can hinder helping behavior toward a victim (DeSmet et al., 2016). The bystander effect (Darley & Latané, 1968) is a psychological phenomenon that occurs in individuals in severe situations where they do not help the victim because the presence of others hinders them from intervening. The bystander effect purports to the inhibiting influence of the presence of others on assisting behavior (Darley & Latané, 1968), which may influence how bystanders resort to the diffusion of responsibility, which entails a reduced sense of responsibility to intervene (Latané & Nida, 1981). Thus, the Bystander Intervention Model was developed to study bystander behavior in different contexts (Latané & Darley, 1970). This model emphasizes various phases through which bystanders may go through to engage in different types of behavior in emergency situations. According to a recent study (Ferreira et al., 2020), the phases proposed by Latané and Darley (1970), namely, noticing a possibly problematic event, interpreting the event as being good or bad, assuming or not responsibility for intervening, knowing whether and how to intervene, and intervening, may lead to either impulsive or reflected aggressive bystander behavior, or to reflected prosocial behavior.

Providing Context with Serious Games and Social Agents within a Social Identity Approach

Serious games can provide a direct immersive experience of the phenomenon, raising awareness and empathy with victims of bullying and cyberbullying (Calvo-Morata et al., 2020). Accordingly, these games can inclusively be used to teach innovative strategies to deal with these phenomena. In a systematic review of research with serious games to prevent and detect bullying (61%), cyberbullying (21%), and other phenomena (18%) among children, adolescents, and adults (Calvo-Morata et al., 2020), a total of 33 games were considered. The main mechanics used in these games to reach their objective are choices, dialogues, adventure, scenarios, exploration, and customization, among others (Calvo-Morata et al., 2020). Similarly, we present a game based on cyberbullying scenarios within a single storyline.

Previous research with serious games has indicated that these tools are meaningful and valid resources to teach adolescents about phenomena related with violence (Bowen et al., 2014). The NN-Lazarinis game presented various short stories about online behavior with different characters (Lazarinis et al., 2020), similar to what we propose with various social agents and scenarios, but with a single storyline. Also, research on CyberBullet (Mikka-Muntuumo et al., 2018) and *Conectado* (Calvo-Morata et al., 2018) presented its design and development as a single player game, whereas we propose a multiplayer game. The latter also presented a single game session, such as other games like FearNot! (Paiva et al., 2005), whereas we propose multiple sessions. However, like with other games, such as the The #StopBully app (Neo et al., 2018), the Inn Inoue game (Higashino et al 2019), the Bully Book (De Troyer et al., 2016), Cyberhero Mobile Safety game (Hswen, et al., 2014), and Cooperative Cybereduca 2.0 (Garaigordobil & Martínez-Valderrey, 2018), research provided no information regarding CyberBullet's effectiveness in promoting prosocial and empathic behavior (Mikka-Muntuumo et al., 2018), which we present in this study regarding our game. Moreover, research on these games presented no analyses with in-game performance. In our study, we present results with this type of data from the experimental condition with the game. We also present our analyses with the inclusion of a control condition, as opposed to previous research (Calvo-Morata et al., 2018). Also, research on the Anti-Bullying Village 3D virtual environment (Olenik-Shemesh et al, 2014) showed that the experimental group reported no changes in cyberbullying experiences and in socio-emotional factors, whereas the control group reported more cyberbullying experiences and a decrease in social support. To contribute to these findings, we expect that the game we present fosters pro-social behavior among those in the experimental condition. In line with our expectation, research focusing on another game (Monité) has found that serious games function to minimize bullying behavior (Guerra, 2017).

Another study focusing on a game (i.e., Bully Book) found that using simulation of interactions on social networks is important to be able to develop games where a social network is a key element of gameplay. Accordingly, we incorporated a fictitious social network into the game we present to set the scene for the storyline with the different cyberbullying scenarios. Moreover, we incorporated various response options, as previous research on games has suggested for these types of scenarios (Carmona Torres et al., 2011).

Furthermore, to understand how players may react to specific situations, it is important to provide context and social feedback with interactive entities, such as social agents (Ahn et al., 2014; Coplan, 2011; Dalibard et al., 2012; Hara et al., 2002; 2002; Johnson et al., 2008; Midden & Ham, 2009; Ohmoto et al., 2017; Ruijten et al., 2015). They may improve social interaction in educational applications, such as serious games (Choi et al., 2001; Fogg, 2003; Nass & Moon, 2000; Yalcin & DiPaola, 2018). Accordingly, social agents can be part of serious games to constitute a context and social belonging for players, where behavioral changes resulting from playing may be observed, which is what we propose to do.

Some studies have highlighted the importance of players belonging to the in-group of the social agents involved, because this type of virtual friendship may influence their emotional and behavioral reactions in the game (Abbink & Harris, 2019; Bos et al., 2004). An in-group is a social group that individuals identify psychologically with as members (i.e., peer group), whereas an out-group is a social group that individuals do not identify with (Taijfel & Turner, 1979; Tajfel & Turner, 1986). In-group preferences may depend on different phenomena and may be established almost immediately, even based on subjective and imaginary characteristics. This in-group and out-group differentiation is part of the Social Identity Theory.

A social identity approach constitutes two overlapping social psychological theories, namely the Social Identity Theory and Self-Categorization Theory. Social identity is a part of individuals' self-concept resulting from their belief that they belong to a certain social group (Turner & Oakes, 1986). Accordingly, the Social Identity Theory was developed to help explain intergroup behavior (Tajfel & Turner, 1979; Tajfel & Turner, 1986; Turner, 1999; Turner & Oakes, 1986) based on perceived group status differences, legitimacy and stability of those status differences, and ability to other groups. The self-categorization theory was developed to add to the social identity theory to generate a broader explanation of self and group processes (Turner & Reynolds, 2010). For this study's purposes, it is important to note that social identification may encourage individuals to engage in prosocial behavior toward others (Hackel et al., 2017), and that players in games show favouritism for their

in-group (Guegan et al., 2015). Therefore, a social identity approach was considered to conceptualize the social agents (see Appendix for details) in the game we present in this study.

The Present Study: Designing Com@Viver – A Serious Game to Foster Prosociality

Prosocial behavior can be determining for reducing aggression in social networks and for building social support, hence, it is imperative to develop psychosocial interventions with resources to foster prosociality in adolescence (Bandura, 2008). In the present study, we propose to focus on the Social Cognitive Theory (Bandura, 2006) and a social identity approach (Turner & Reynolds, 2010) as a framework for developing a serious game with social agents to help adolescents engage in self-reflection and the regulation of behavior in cyberbullying (Figure 1).

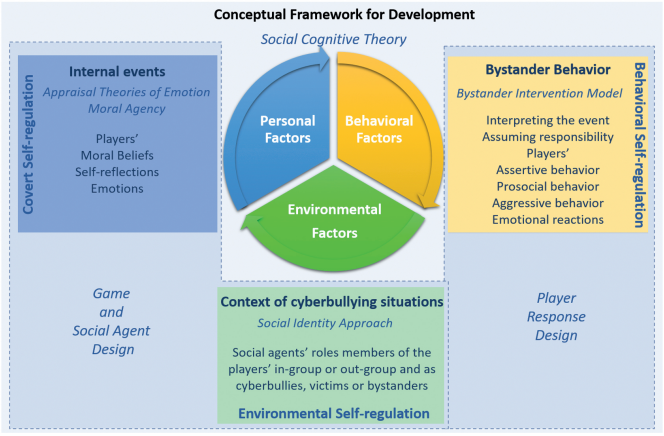

Figure 1. A Conceptual Framework for Developing Serious Game-based Interventions to Foster Prosociality in Cyberbullying

The game we present also used appraisal theories of emotion and moral agency as framework references, but to investigate other variables (i.e., emotions, empathy, and moral disengagement) (Ferreira et al., 2021) and, therefore, will not be explored in this study. The conceptual framework for response options in the game include prosociality (Barrett & Yarrow, 1977; Böckler et al., 2016), and aggressiveness (Nagin & Tremblay, 1999), as well as the Bystander Intervention Model (Latané & Darley, 1970).

Moreover, unlike other games (Calvo-Morata et al., 2020), the multiplayer and multisession Com@Viver focuses on both prevention and intervention, since it is based on a fictitious social network where players interact as bystanders with colleagues and social agents in cyberbullying situations. Players can react to the situations as they unfold on the social network (session 1 is diagnostic) and are guided with self-regulation strategies (sessions 2, 3, and 4) throughout various sessions to learn how to engage in prosocial and empathic behavior.

The Social Cognitive Theory has been used as a specific framework for development (DeSmet et al., 2016). The multiplayer game Com@Viver design provides opportunities for players to reflect on their own and each other's actions and is based on a social cognitive approach, in which personal (i.e., players' moral beliefs, self-reflections, and emotions), behavioral (i.e., players' possible pro-social, aggressive, or passive behavioral reactions), and environmental (i.e., in-group and out-group social agent membership – a social identity approach) aspects are considered (Bandura, 2006) when players are prompted with the social agents' behavior in cyberbullying situations. Such an intervention can provide advances in helping adolescents deal with observed cyberbullying events because of its behavioral self-regulation strategies, which are explicitly taught to the players according to the Social Cognitive Theory to promote reflection (e.g., perspective taking through forethought, intentionality through strategic planning, self-reactiveness through pro-social performance, self-reflectiveness through self-examination), except in an initial diagnostic session of the game, and which we explain ahead. The game design is also built upon the Bystander Intervention Model (Latané & Darley, 1970), since players take the perspective of the bystander in cyberbullying (see Figure 1). Accordingly, the players' behavioral responses in the game were conceptualized according to the Bystander Intervention Model (Darley & Latané, 1968; Latané & Darley, 1970) and behavioral self-regulation (Zimmerman, 2013) toward prosociality in cyberbullying situations.

To design the psychosocial intervention we present in this study, we considered it beneficial (1) to foster human-agent interactions in the game to build social relationships (Ohmoto et al., 2017); (2) that the players have social agents in their in-group (Abbink & Harris, 2019; Bos et al., 2004); (3) to provide social feedback (i.e., in a chat for instance) to offer a more realistic social interaction (Midden et al., 2009); and (4) to provide players with response options to interact in the game (Carmona Torres et al., 2011) so that they may develop self-regulation strategies effectively and meaningfully.

Considering cyberbullying is a social phenomenon (Souza et al., 2018), we present psychosocial intervention based on a multiplayer multi-session game to examine bystanders' behavioral trajectories throughout time while interacting with various social agents. We believe this intervention will answer a call to enable a deep analysis of adolescent bystanders' behavior in cyberbullying situations (Allison & Bussey, 2017), and foster prosociality (Bandura, 2008) and, therefore, we propose to answer two research questions. Firstly, can the explicit training of self-regulation strategies foster adolescent bystander prosocial behavior in cyberbullying in serious games? To answer this research question, we propose to confirm hypotheses which enable to specifically consider bystanders' prosocial assertive behavior, interpretation of cyberbullying situations, responsibility to intervene, aggressive or supportive behaviour towards the victim either before or after playing the game, or during gameplay. Therefore, we propose that:

Hypothesis 1: Players will reveal greater levels of prosocial assertive behavior than individuals who did not experience the game.

Hypothesis 2: Those who did not experience the game will tend to interpret the cyberbullying situations more as non-serious throughout time than the players.

Hypothesis 3: Those who did not experience the game will avoid assuming responsibility for intervening more throughout time than the players.

Hypothesis 4: Those who did not experience the game will engage in aggressive behavior against the victim more throughout time than players.

Hypothesis 5: Players will tend to support the victim more throughout time than those who did not experience the game.

Moreover, can social agents in serious games trigger different bystander behavior in cyberbullying events, depending on their role as members of the players' in-group or out-group? To answer this research question regarding social agents as members of the players' in-group or out-group, we propose to confirm two hypotheses specifically referring to players' aggressive or supportive behaviour towards the victims from their out-group and in-group. Hence:

Hypothesis 6: Both players and those who did not experience the game will tend to be more aggressive with the victims from their out-group.

Hypothesis 7: Both players and those who did not experience the game will tend to support the victims from their in-group.

Method

Study Design

A pilot quasi-experimental control-group design with repeated measurements (with pre- and post-test) was used in this study with process data gathered in classrooms (Klug et al., 2011). Unlike previous research conducted to assess serious games (Calvo-Morata et al., 2020), we used an alternative intervention condition, as well as a control group to test any Hawthorne effects (Schmitz & Wiese, 2006). That is, three conditions were constituted in this study, namely, an experimental condition (EC), an alternative intervention condition (AIC), and a control condition (CC).

Participants

A convenience sample of 194 7th and 8th graders from Portugal (M_{age} = 12.93, SD = .9,; 50.8% male) was used in this study. Participants were randomly assigned to the EC who played the game (n =103, M_{age} = 13.91, SD = 1.02, 53.3% male), the AIC who did not play the game, but viewed the storyline on paper (n = 37, M_{age} = 14, SD = 0.86, 54.1% female) or the CC who had their usual classes (n = 54, M_{age} = 13.92, SD = 0.85, 50.9% female). Participants belonged to eight different classes from three different schools. The data gathered for analysis purposes was only from those who provided own and parental consent to participate in the study, and responses in the pre and post-tests, as well as those who participated in the game throughout all or most of the sessions (see Data Analysis section for details).

Instruments

We used the Prosocial Assertive Behavior (PAB) task, which is composed of ten items and is based (Jakubowski & Lange, 1978) on the theory of communication styles (i.e., assertiveness), to assess prosocial assertive behavior (Barrett & Yarrow, 1977). It was evaluated with the Item Response Theory (IRT) through Rasch analysis polytomous methodology with the Winsteps software program by Linacre (2013) to measure its unidimensionality and to understand participants' scores of prosocial assertiveness in hypothetical situations. Participants were asked to respond to daily life situations of adolescents (e.g., "You are in line at the snack bar and one of your colleagues cuts you. How likely are you to respond 'I was here first. Respect those in line'?"). Participants should respond in the manner presented in terms of probability from 1 (*not likely at all*) to 5 (*very likely*). With Winsteps we estimated participants' scores on a one-dimensional logit scale and evaluated the properties of the PAB. All items were evaluated to understand whether they had excessive infit and outfit mean square residuals. The items all showed infit/outfit scores lower than 1.5, as well as z statistic > 2.00, as recommended in the literature (Bond & Fox, 2007). The distribution revealed a narrow range of difficulty (-1.05 < Di < 0.96). The person separation reliability was .71, the item separation reliability was .99 and the Cronbach's α was .73.

Players' "bystander behavioral reactions" in the game (recorded log-file data of the players' actions during the game), which we analyzed with multilevel modeling, included (for more details on the game design, see Appendix):

a) Interpreting the event as non-serious with euphemistic language (e.g., "She [the bully] was just joking. It's nothing serious").

b) Avoiding responsibility for the event (e.g., "It's [the situation] none of my business").

c) Bystander aggressive intervention toward the victim (e.g., "Hey Samuel [the victim], you have an awful taste in women").

d) Bystander prosocial behavior in the cyberbullying situation (e.g., "I'm talking to her [the victim]").

Procedures

This study complied with all relevant ethical regulations. Authorization to conduct this study was granted by the Ethical Commission of the Faculty of Psychology of the University of Lisbon, the Ministry of Education of Portugal, the Portuguese National Commission of Data Protection, school's boards of directors, teachers, parents, and the adolescents themselves.

We used a longitudinal design with five game playing sessions (a session per week). Specifically, the students in the EC played session 0 with no cyberbullying content, which served to help them learn how to play the game. This session was not included in the multilevel analysis. A face validation was done of the game with the elements from session 0, including a cyberbullying case, with participants who were not in the main study assessed the game to provide suggestions and information regarding instructions, gameplay, the game's objectives, and the overall quality of the interaction.

In session 1, students' initial reactions to the cyberbullying scenario presented served as diagnostic data. In sessions 2, 3, and 4, students reacted to the cyberbullying scenarios, but had explicit training in self-regulation strategies to promote pro-social behavior. The students viewed these scenarios and strategies as posts which were presented by social agents. The students in the AIC experienced the same sessions, but in a paper format, that is, with text to read on paper and multiple choice options to react to the same posts. Therefore, the students in this AIC did not interact with the agents or other colleagues on a computer. The sessions with the EC and the AIC were supervised by three researchers. Those in the CC had their regular classes.

In the pre- and post-test sessions, students from the EG, AIG, and CG filled out the Prosocial Assertive Behavior Task online which was administered by 3 researchers in a classroom context in their own schools. All participants were informed that they could have psychological assistance available to them with a professional psychologist and that they could quit the intervention at any time they felt the need to.

Furthermore, at the end of the intervention, all students were given the opportunity to experience the game for ethical purposes.

Data Analysis

Pre and post-test differences in prosocial assertive behavior among groups. We computed an analysis of covariance (ANCOVA) for repeated measures from the pre- and post-test survey data on prosocial assertive behavior of the EC, AIC, and CC because of existing pre-test differences with IBM, SPSS, 25.0. All statistical assumptions were met. The data used in this analysis was from participants who participated in both the pre and post-tests (EC = 103, AIC = 37, CC = 54). Participants who did not attend the sessions were not included in this analysis. We also present the effect size according to Cohen's (1988) cut-off points for small (hp^2 = .009), medium (hp^2 = .058) and large effects (hp^2 = .137).

Longitudinal data from the game sessions. We used participants' behavioral responses to the cyberbullying situations from the four sessions of the game (EC) and sessions on paper (AIC) as our process data, namely interpreting the event, assuming/avoiding responsibility for intervening, intervening aggressively toward the victim, or with prosocial behavior (coded 1 for no response and 2 for response). We considered time and the experimental condition as the covariates in the multilevel linear modelling analyses. We aggregated the data by day to acquire a mean score of each group for variable per day.

We computed multilevel linear modelling (IBM, SPSS, 25.0) for repeated measures designs in order to measure the difference between the EC and the AIC regarding their bystander behavior throughout the four sessions. Data was structured at the within-

person in time level (level 1) and the between person level (level 2). We used a sample size of 560 session entries (4 session entries per participant measured on four occasions) for participants' bystander behavior at level 1, and of 140 participants at level 2. At level 1 of the analyses, the variance corresponds to the variability in the bystanders' average of interpreting the cyberbullying situation as non-serious (Hypothesis 2), avoiding responsibility (Hypothesis 3), engaging in aggressive behavior toward the victim (Hypothesis 4), and engaging in prosocial behavior/supporting the victim (Hhypothesis 5) around their own growth trajectory (Singer et al., 2003).

We used two commonly used techniques which offer asymptotically unbiased estimates for smaller and unbalanced sample sizes, such as restricted maximum likelihood (models for interpreting the event and avoiding responsibility) and maximum likelihood (models for aggressive and prosocial behavior) for estimation purposes, respectively (Heck et al., 2013; McCoach, 2010), and introduced the variables in SPSS in three steps (i.e., models 1, 2, and 3) to examine the interaction effects. We also used either a scaled identity or a diagonal covariance structure for the repeated measures effect and a variance components covariance structure for the intercept random effect to examine the total variance in the outcome within and between individuals. The scaled identity covariance structure presumes that there is a constant variance across occasions, whereas the diagonal presumes heterogeneous variances for each measurement occasion, but both structures assume no correlation between components (Heck et al. 2013). Moreover, the scaled identity covariance structure has one estimated parameter (models for avoiding responsibility and aggressive behavior toward the victim), whereas the diagonal has 4 (models for interpreting the situation and prosocial behavior toward the victim).

In a first step for each dependent variable model (i.e., interpreting the situation, avoiding responsibility, aggressive behavior, and prosocial behavior toward the victim), we calculated an intercept-only model to determine how much variability existed at each level. In a second step, we analysed the shape of the growth trajectory. Specifically, we tested a model with a linear trend, another model with a quadratic trend, and final model with orthogonal polynomials. The latter did not yield any significant results in explaining dependent variables' growth. The model with linear time revealed significant results for interpreting the situation, avoiding responsibility, and prosocial behavior toward the victim, whereas a linear and quadratic time model was significant for bystanders' aggressive behavior toward the victim. Lastly, we analysed differences in development between the participants in the EC and AIC because we wanted to understand whether the treatment (game) was related to different growth patterns. Therefore, we combined the level 1 model with time specified as linear or quadratic (as mentioned previously) to describe participants' growth over time, presuming the intercept varied between subjects and that the time slope would be randomly varying. We proposed to present parsimonious models (Heck et al., 2013). The proportion of variance (ICC) was estimated with a one-tailed test for variances.

We measured the improvement of each model in comparison with the previous models with the corresponding likelihood ratios. This difference in likelihood approximates is according to the chi-square distribution (change in degrees of freedom between models: subtraction of the number of new parameters added to the model from the parameters of the previous model). Thus, we show the differences in the deviances (by subtraction) as evidence that the model with the covariates fits the data better than the model with the intercept and time and the intercept-only model. Essentially, we compared the intercept-only model (model 1), the intercept + time model (model 2) and the model with the predictors (model 3) for each bystander intervention variable to understand whether or not there were improvements in terms of fit indices.

Results

Pre and Post-test Differences in Prosocial Assertive Behavior in Bystanders of Cyberbullying

We proposed that players in the experimental condition (EC) would reveal greater levels of prosocial assertive behavior than individuals who did not experience the game (Hypothesis 1). The ANCOVA results showed that those in the EC revealed higher levels of prosocial assertive behavior after the intervention in comparison with those in the (alternative intervention condition) AIC and in the (control condition) CC (Figure 2), $F(2, 190) = 20.39$, $p < .001$, therefore, confirming Hypothesis 1. We found large effects for players' prosocial assertive behavior ($hp^2 = .18$).

Longitudinal Results from the Sessions

Firstly, we computed the means, correlations, and reliability coefficients of each variable (Table 1).

After performing multilevel analyses, the estimates of variance for levels 1 and 2 of interpreting the cyberbullying situation as non-serious (repeated measures: $Z_w = 7.54$, $Z_w = 7.20$, $Z_w = 6.35$, $Z_w = 6.60$, $p < .001$; intercept: $Z_w = 3.18$, $p < .001$, respectively) suggest that there was sufficient variation in intercepts across bystanders. Results revealed a variance between individuals of 8% (session 1), 11% (session 2), 22% (session 3), and 22% (session 4) for a diagonal structure of interpreting the cyberbullying situation as non-serious and 92% (session 1), 89% (session 2), 78% (session 3), and 78% (session 4) of variance within individuals for interpreting the cyberbullying

Table 1. Correlations and Descriptive Statistics of Bystander Behavior

Variables	Correlations					Group	Level 1 ($n = 560$)				Level 2 ($n = 140$)
	1	2	3	4	5		1	2	3	4	
1. Condition		.16	-.16**	.01	.26**		*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
2. Interpreting cyberbullying as non-serious	.34**		.44**	.40**	.09	EC	1.19 (0.39)	1.16 (0.37)	1.07 (0.27)	1.04 (0.20)	1.12 (0.32)
						AIC	1.07 (0.26)	1.02 (0.16)	1.00 (0.00)	1.05 (0.22)	1.03 (0.19)
3. Avoiding responsibility for intervening	-.11**	.42**		.59**	-.06	EC	1.25 (0.44)	1.09 (0.29)	1.11 (0.31)	1.05 (0.23)	1.13 (0.33)
						AIC	1.17 (0.38)	1.17 (0.38)	1.25 (0.44)	1.25 (0.43)	1.21 (0.41)
4. Behaving aggressively toward victims	.00	.27**	.39**		-.06	EC	1.16 (0.37)	1.07 (0.26)	1.06 (0.25)	1.09 (0.28)	1.10 (0.30)
						AIC	1.07 (0.26)	1.07 (0.26)	1.10 (0.30)	1.15 (0.36)	1.10 (0.30)
5. Supporting the victim	.18**	.14**	.05	-.02		EC	1.40 (0.49)	1.44 (0.49)	1.46 (0.50)	1.43 (0.49)	1.43 (0.49)
						AIC	1.31 (0.47)	1.28 (0.47)	1.28 (0.45)	1.12 (0.33)	1.25 (0.43)

Note. EC = experimental condition; AIC = alternative intervention condition; correlations below the diagonal are day level correlations ($n = 560$); correlations above the diagonal are person-level correlations ($n = 140$). The level 1 means and standard deviations are reported according to the time variable (from 1 to 4).
*$p < .05$, **$p < .01$.

situation as non-serious over time. For interpreting the cyberbullying situation as non-serious, models 2 and 3 presented improved fit indices over model 1 (deviance = 4.49, *df* = 1, $p < .01$; deviance = 2.69, *df* = 3, $p < .01$, respectively), although model 3 did not present better fit values than model 2. The results pertaining to the fixed effects for interpreting cyberbullying as non-serious suggest that the scores of the participants in the AIC did not increase significantly over each interval. Results also suggest that there was an initial significant difference between this group and those in the EC. However, over time, players (i.e., EC) decreased their interpretation of cyberbullying as non-serious at a greater rate (β = -.05) than those in the AIC (Figure 3). These results confirm Hypothesis 2, which stated that those who did not experience the game tended to interpret the cyberbullying situations more as non-serious throughout time than the players.

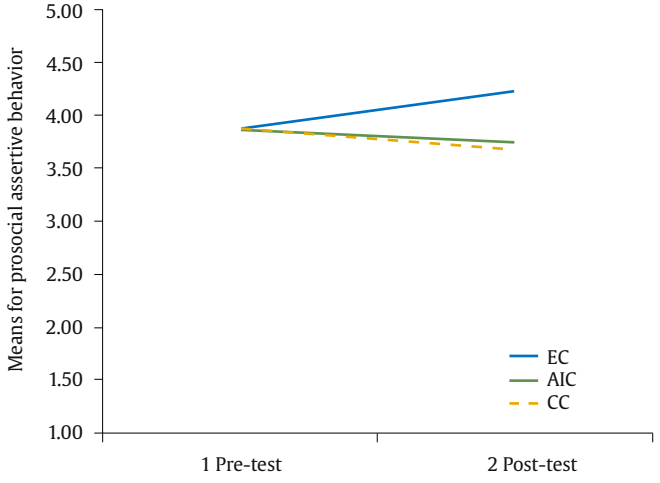

Figure 2. Differences between the EC, the AIC and the CC regarding Prosocial Assertive Behavior.

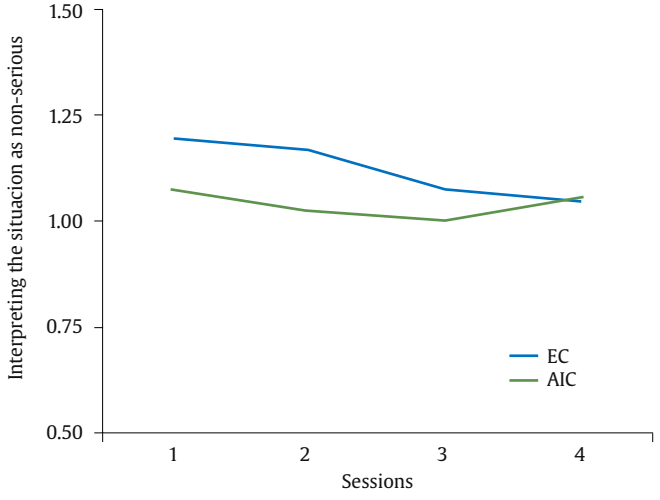

Figure 3. The Trajectories of Bystanders' Interpretation of Cyberbullying as Non-serious.

Levels 1 and 2 estimates of variance for avoiding responsibility (repeated measures: $Z_w = 13.83$, $p < .001$; intercept: $Z_w = 3.83$, $p < .001$, respectively) revealed that there was sufficient variation in intercepts across bystanders. Results showed a variance between individuals of 19% for a scaled identity structure of avoiding responsibility and 81% of variance within individuals for avoiding responsibility over time. For avoiding responsibility, model 3 presented improved fit indices over models 1 and 2 (deviance = 3.06, *df* = 3, $p < .01$; deviance = 4.32, *df* = 2, $p < .01$, respectively), although model 2 did not reveal better values than model 1. The results for the fixed effects regarding avoiding responsibility indicate that those in the AIC increased significantly over each interval (β = .21). Results also indicate that there was no initial significant difference between the control condition and the EC. However, over time, those in the EC decreased avoiding responsibility in cyberbullying (β = -.09), thus, confirming Hypothesis 3, which stated that those who did not experience the game would tend to avoid assuming responsibility for intervening more throughout time than the players (Figure 4).

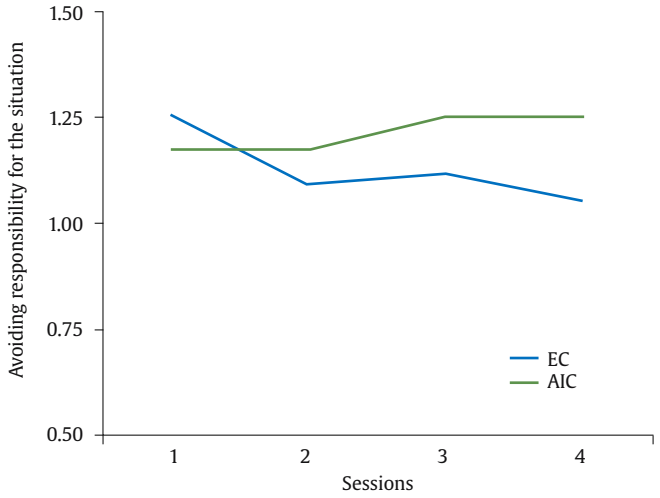

Figure 4. The Trajectories of Bystanders Avoiding Responsibility for Intervening in Cyberbullying.

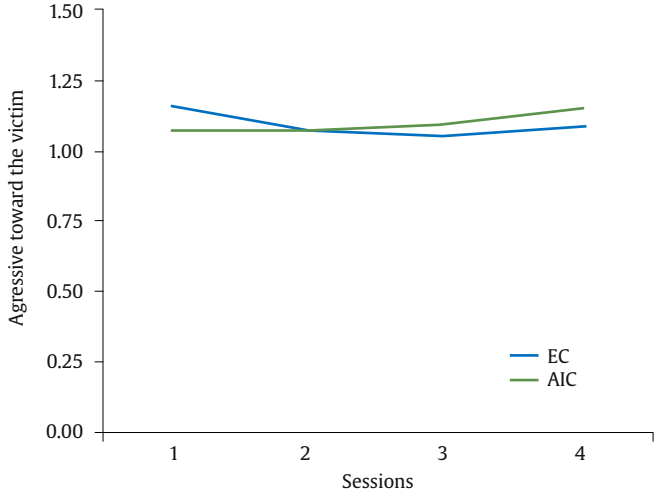

Figure 5. The Trajectories of Bystanders' Aggressive Behavior toward Victims of Cyberbullying.

The estimates of variance for levels 1 and 2 of engaging in aggressive behavior toward the victim (repeated measures: $Z_w = 13.81$, $p < .001$; intercept: $Z_w = 4.47$, $p < .001$, respectively) showed that there was sufficient variation in intercepts across bystanders. Results demonstrated a variance between individuals of 25% for a scaled identity structure of engaging in aggressive behavior toward the victim and 75% of variance within individuals for engaging in aggressive behavior toward the victim over time. For engaging in aggressive behavior toward the victim, model 2 showed an improvement over model 1 (deviance = 4.34, *df* = 2, $p < .01$), whereas model 3 revealed

better values then models 1 and 2 (deviance = 9.31, *df* = 4, $p < .01$; deviance = 4.96, *df* = 2, $p < .01$, respectively). The fixed effects result for engaging in aggressive behavior toward the victim suggest that the scores of those in the AIC did not increase significantly over each interval. Results also suggest that there was no initial significant difference between this group and those in the EC. Nevertheless, over time, players (i.e., EC) decreased their aggressive behavior toward the victim at a greater rate (β = -.04) than those in the AIC (Figure 5). These results confirm Hypothesis 4, which stated that those who did not experience the game tended to engage in aggressive behavior toward the victim more throughout time than the players.

Levels 1 and 2 estimates of variance for engaging in prosocial behavior/supporting the victim (repeated measures: Z_w = 6.76, Z_w = 6.92, Z_w = 6.64, Z_w = 6.72, $p < .001$; intercept: Z_w = 4.41 $p < .001$, respectively) demonstrated that there was sufficient variation in intercepts across bystanders. Results presented a variance between individuals of 27% (session 1), 26% (session 2), 28% (session 3), and 27% (session 4) for a diagonal structure of engaging in prosocial behavior/supporting the victim, and 73% (session 1), 74% (session 2), 72% (session 3), and 73% (session 4) of variance within individuals for prosocial behavior/supporting the victim over time. For engaging in prosocial behavior/supporting the victim, model 2 showed an improvement over model 1 (deviance = 0.43, *df* = 1, $p < .01$), whereas model 3 revealed better values then models 1 and 2 (deviance = 13.61, *df* = 3, $p < .01$; deviance = 13.17, *df* = 2, $p < .01$, respectively). The results for the fixed effects of engaging in prosocial behavior toward the victim showed that over each interval, the scores of those in the AIC decreased significantly (β = -.19). Results also showed that there was no initial significant difference between this group and those in the EC. Nonetheless, over time, players (i.e., EC) increased their prosocial behavior in cyberbullying situations at a greater rate (β = .07) than those in the AIC (Figure 6). These results confirm Hypothesis 5, which stated that players would tend to support the victim more throughout time than those who did not experience the game.

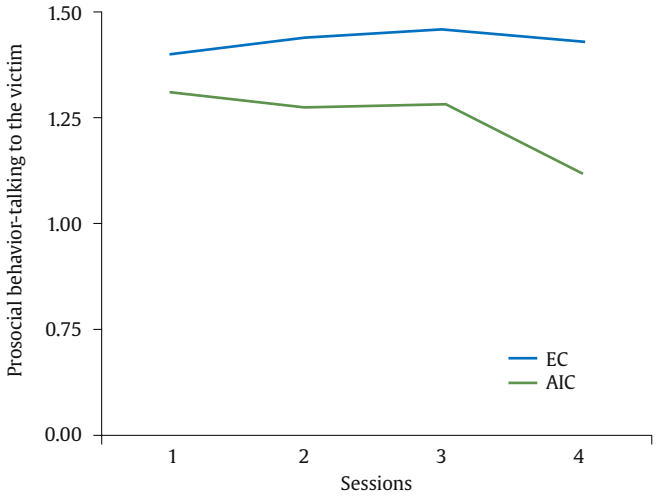

Figure 6. The Trajectories of Bystanders' Prosocial Behavior toward Victims of Cyberbullying.

A linear time variable was significant in explaining the growth of interpreting the cyberbullying situation as non-serious, avoiding responsibility and engaging in prosocial behavior/supporting the victim, whereas linear and quadratic time were significant in explaining the growth of engaging in aggressive behavior toward the victim (Table 2).

Results also indicated (Table 1) that the players (EC) were more aggressive toward the victims in sessions 0 (*M* = 1.16, *SD* = 0.36) and 3 (*M* = 1.09, *SD* = 0.28), who were from the out-group. Moreover, results also revealed that those in the AIC were more aggressive to the victim in session 3 (*M* = 1.15, *SD* = 0.36) who belonged to the out-group, and then the victim in session 2 (*M* = 1.10, *SD* = 0.30) who belonged to the in-group. These results corroborate in part Hypothesis 6, which stated that both players and those who did not experience the game would tend to be more aggressive with the victims from their out-group. Specifically, only the players in the EC fully substantiated this hypothesis, whereas those in the AIC upheld it in part.

Moreover, results also revealed that (Table 1), the players (EC) were more prosocial toward the victims in sessions 2 (*M* = 1.46, *SD* = 0.50) and 1 (*M* = 1.44, *SD* = 0.44), who were from the in-group. Furthermore, those in the AIC were more prosocial to the victim in session 0 (*M* = 1.31, *SD* = 0.47) who belonged to the out-group, and then the victim in sessions 1 (*M* = 1.28, *SD* = 0.47) and 2 (*M* = 1.28, *SD* = 0.45) who belonged to the in-group. These results corroborate in part Hypothesis 7, which stated that both players and those who did not experience the game would tend to be more prosocial with the victims from their in-group. Specifically, only the players in the EC fully substantiated this hypothesis, whereas those in the AIC upheld it in part.

Discussion

Self-regulation Training to Foster Prosocial Bystander Behaviour in Cyberbullying

To answer the first research question, this study found that the explicit training of self-regulation strategies could foster prosocial bystander behavior in cyberbullying with serious game-based interventions. Specifically, results from pre- and post-tests showed that players revealed greater levels of prosocial assertive behavior than those who did not experience the game. These findings are an important contribution, since they showed that in fact, serious games have the potential to develop and encourage the use of prosocial assertive behavior to benefit others (Barrett & Yarrow, 1977; Böckler et al., 2016) through self-reflection (Ferreira, et al., 2020) even in severe situations, where the presence of others may hinder them from intervening (Darley & Latané, 1968; DeSmet et al., 2016). They also contribute to research on prosocial game development to encourage prosocial behavior by showing that players' prosocial behavior can increase throughout time, especially when the game clearly shows that they will have to express this behavior in order to "win". Even if it is not support for behavior change in real life, it shows that the participants know what is considered appropriate from the point of view of social behavior, as they manage to win the game. By encouraging a participant to implement prosocial behavior in the game itself through self-regulation, the game can offer a greater understanding of the consequences of this same behavior, which only happens through interactivity. Therefore, it is essential to develop serious games that focus on the promotion of prolonged prosociality, as opposed to a one-session episode of prosocial training, which is what previous research has found (DeSmet et al., 2018). Moreover, this study focused on placing the participants as bystanders of cyberbullying (not victims for ethical purposes) as they occurred in the game, providing them with an opportunity to interact with the social agents and have the power to intervene in different situations, as opposed to watching videos or reading about scenarios, or as opposed to not focusing on the role of the bystander (Chatzidaki et al., 2011; De Troyer et al., 2016; Higashino et al., 2019; Hswen, et al., 2014; Lazarinis et al., 2020; Mikka-Muntuumo et al., 2018; Neo et al., 2018; Olenik-Shemesh et al., 2014).

Also to help answer our first research question, the results from the longitudinal data (Hypothesis 2 and 3) also revealed that those who did not experience the game tended to interpret the cyberbullying

Table 2. Fixed and Random Effects Parameter Estimates for Models Predicting Bystander Intervention

	Bystander Intervention											
Parameter	Interpreting cyberbullying as non-serious			Avoiding Responsibility			Aggressive behavior toward victims			Prosocial behavior		
Fixed Effects	Intercept-only	Intercept + time	With predictors	Intercept-only	Intercept + time	With predictors	Intercept-only	Intercept + time	With predictors	Intercept-only	Intercept + time	With predictors
Intercept	1.07**(.01)	1.14**(.02)	0.72**(.14)	1.15**(.02)	1.20**(.03)	1.06**(.16)	1.10**(.01)	1.13**(.02)	0.93**(.13)	1.37**(.02)	1.39**(.03)	1.17**(.21)
Time		-0.03**(.01)	0.05 (.06)		-0.03**(.01)	0.21**(.07)		-0.07**(.03)	0.05 (.06)		-.01 (.01)	-0.19**(.09)
QuadTime								0.02 (.01)	0.02 (.01)			
Condition			0.16**(.05)			-0.05 (.05)			0.07 (.04)			0.08 (.07)
Time*Training			-0.05*(.02)			-0.09**(.02)			-0.04** (.02)			0.07* (.03)
Random Effects												
Repeated measures	0.12**(.01)	0.12**(.01)	0.12**(.02)	0.11**(.01)	0.11**(.01)	0.10**(.01)	0.06**(.00)	0.06**(.00)	0.06**(.00)	0.16**(.02)	0.17**(.02)	0.17**(.02)
	0.09**(.01)	0.09**(.01)	0.08**(.01)							0.18**(.02)	0.18**(.02)	0.18**(.02)
	0.03**(.00)	0.04**(.01)	0.04**(.01)							0.16**(.02)	0.16**(.02)	0.16**(.02)
	0.03**(.00)	0.04**(.01)	0.04**(.00)							0.18**(.02)	0.17**(.02)	0.17**(.02)
Intercept	0.01**(.00)	0.01**(.00)	0.01**(.00)	0.03**(.03)	0.03**(.01)	0.03**(.01)	0.02**(.01)	0.02**(.01)	0.02**(.01)	0.06**(.01)	0.06**(.01)	0.06**(.01)
Deviance	136.456	131.958	133.764	402.998	404.256	399.932	188.246	183.897	178.93	675.375	674.939	661.761
AIC	146.456	141.958	143.764	406.998	408.256	403.932	194.246	193.897	192.93	687.375	688.939	679.761
BIC	167.687	163.179	164.965	415.49	416.744	412.412	206.990	215.138	222.67	712.863	718.675	717.993

Note. Standard errors are in brackets.

*p = .05 or p < .05, **p < .01 or p < .001.

situations more as non-serious and avoided assuming responsibility for intervening more throughout time than the players (EC). These results add to previous findings that indicated that adolescents tend to distort the consequences of cyberbullying and even engage in cognitive restructuring to transform the phenomenon into something less serious (Romera et al., 2021), especially in the case of no self-regulation training. Moreover, although minimizing responsibility was not significant for cyberbullying in Romera et al's (2021) study, our results indicated that this type of moral disengagement mechanism can be more evident in those who do not have self-regulation training that is specific to managing cyberbullying events.

By promoting self-regulation, the game empowered players to reduce the possibility of interpreting the event as non-serious, as well as diffusing or displacing responsibility (i.e., both moral disengagement mechanisms), which implies a minimized sense of responsibility to intervene when amongst a group of people (Latané & Nida, 1981). Furthermore, those who did not experience the game engaged in aggressive behavior against the victim more throughout time than players. This result adds to previous research that found that an intervention based on reflecting on values and behaviour change using narratives could reduce cyberbullying perpetration in the experimental condition (Calvete et al., 2021). Moreover, our findings help explain how serious games based on the training of self-regulation strategies can reduce individuals' tendency to act passively, experiencing a bystander effect, which can hinder helping behavior toward a victim (Darley & Latané, 1968; DeSmet et al., 2016), and even aggressively to either impulsively or deliberately harm others (Ahn et al., 2014; Ferreira et al., 2020). These findings contribute to previous research that demonstrated that games can increase knowledge about cyberbullying in a ludic manner, but that have not provided objective evidence regarding their effectiveness to promote prosocial behavior (Chatzidaki et al., 2011; De Troyer et al., 2016; Guerra, 2017; Higashino et al., 2019; Hswen, et al., 2014; Lazarinis et al., 2020; Mikka-Muntuumo et al., 2018; Neo et al., 2018; Olenik-Shemesh et al., 2014), such as our in-game performance data.

In-group and Out-group Social Agents Can Foster Different Bystander Behaviour in Cyberbullying

This study also questioned whether social agents could foster different bystander behavior in cyberbullying events in serious games, depending on their role as members of the players' in-group or out-group. To help answer this second research question we proposed and confirmed two hypotheses which revealed that only the players were more aggressive with the victims from their out-group and supported the victims from their in-group. Therefore, the social agents did foster different bystander behavior in cyberbullying events in serious games. These results support previous research that has stressed the importance of players belonging to the in-group of social agents because this interaction can have an impact on their emotional and behavioral reactions towards situations (Abbink & Harris, 2019; Bos et al., 2004). Nonetheless, our findings provide an important contribution to research on self and group processes (Turner & Reynolds, 2010) because it has provided evidence that social identification may encourage individuals to engage in prosocial behavior toward others (Hackel et al., 2017), and that players can in fact show favouritism for their in-group (Guegan et al., 2015), but that the promotion of self-regulation strategies can increase prosociality also toward individuals of an out-group.

Limitations and Future Directions

This study has some limitations which are worth mentioning. Other variables could have been measured, such as specific moral disengagement mechanisms, which are part of the social cognitive perspective of moral agency (Bandura, 2006; Romera et al., 2021). These variables could provide promising opportunities for future research. Moreover, although the amount of data we examined was substantial, we used a small sample size and future work could use not only larger sample sizes to examine results as those presented here, but also used samples from more diverse cultural contexts. Nevertheless, 30 level-2 units are sufficient to produce unbiased parameter estimates in multilevel linear analysis; therefore, we decided to present the results (McCoach, 2010).

Furthermore, in this game, the in-group and out-group of the players were predetermined. However, future research could invest in having players choose which social agents may belong to their in-group so that further insights may be acquired regarding their preferences and beliefs of which group they belong to within this context (Turner & Oakes, 1986). By providing this choice, research could further investigate how players react to the social agents' role in the game (whether they are victims, aggressors, and/or observers of cyberbullying), thus offering more detailed data on how these individuals engage during intergroup interactions (Tajfel &

Turner, 1979; Tajfel & Turner, 1986; Turner, 1999; Turner & Oakes, 1986). Moreover, future research with serious game-based psychosocial interventions could provide more awareness of the impact of bystander behavior by focusing on providing participants with opportunities to see different outcomes of cyberbullying situations by viewing both pro-social and aggressive bystander interventions.

Theoretical Contribution and Implications for Practice

The theoretical relevance of this study falls on the integrated approach with which it framed prosocial behavior among adolescents in cyberbullying contexts. The serious game presented in this study included elements from a social identity approach as a framework for developing a serious game with social agents (Turner & Reynolds, 2010) and a social cognitive perspective of self-regulation (Bandura, 2006) to empower adolescents to engage in the regulation of behavior as bystanders in cyberbullying. The assistance of these digital resources enhanced bystanders' prosocial potential, as they engaged in helping behavior more towards the victims who were their friends (in-group), but the training of self-regulation enabled them to become increasingly prosocial in a flexible manner. Therefore, they were not only products of the context that surrounded them, but were also active producers of their environment (Bandura, 2001). By intentionally engaging in planning possible courses of action and self-examining their own behavior and that of others (Bandura, 2006) in cyberbullying, players had opportunities to interpret the events, consider responsibility for intervening, and determine their course of action to increase their prosociality (Latané & Darley, 1970), independently of whether the victims were from their in-group or out-group. In doing so, the players engaged in individual agency, by influencing their own gameplay through their behavior; in proxy agency by helping the victims of cyberbullying; and in collective agency by socially coordinating efforts with their team members to reach their shared goal to go on the school field trip (Bandura, 2008).

The practical implications of this theoretical contribution may be a step forward to a human-machine partnership to reach various milestones in designing serious games for preventing and intervening in cyberbullying. Firstly, players can be given the option to make responsible decisions in choosing which social agents they want to build social relationships with based on their characteristics (in-group vs. out-group), which complements previous design recommendations to foster human-agent interactions (Abbink & Harris, 2019; Bos et al., 2004; Ohmoto et al., 2017). Accordingly, players could also be given the opportunity to change the status of their relationship with the social agents. Secondly, this responsible decision-making can be encouraged through the regulation of behavior and emotions, as well as empathy promotion (Souza et al., 2018; Veiga Simão et al., 2021) with a solid basis on social emotional ethical learning (Burroughs & Barkauskas, 2017). Thirdly, the feedback received from the social agents to offer a more realistic social interaction can be complemented with emotional cues that other players could post (e.g., sharing emojis to express emotions regarding the cyberbullying situation in a private area), which could be integrated into the game and add to previous research on game design (Midden & Ham, 2009). Lastly, in providing response options for social interaction, the game could provide players with features (e.g., feedback loops of their own behavior and the social agents' actions and vice versa) which enable them to re-examine their own behavioral response to previous cyberbullying incidents and make desired changes (Bandura, 2006). This is also an innovative contribution to previous research on behavior change and game design based on previous studies that have been conducted with games (Calvo-Morata et al., 2020; Carmona Torres et al., 2011), showing that online violence does not have to cause more violence or silence among bystanders.

Conflict of Interest

The authors of this article declare no conflict of interest.

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Appendix

Com@Viver: A Serious Game-based Psychosocial Intervention to Foster Prosociality

The Com@Viver game includes an introductory session (session 0) where players learn how to play, a diagnostic session (session 1) with no intervention, and three remaining intervention sessions (2, 3, and 4) based on the social-cognitive approach to self-regulation (Zimmerman, 2013). At the end of each session, players also express their self-reflections about the cyberbullying situation in the game (i.e., how they felt, what they thought, and why they voted for a specific team).

In the second, third, and fourth sessions, specific self-regulation strategies are presented to players by a social agent (with the function of guidance counsellor) to aid them in reflecting on their decisions and in regulating their behavior. This type of information is displayed prior to the interactions with the social agents and their real-life peers in these latter sessions. These self-regulation strategies are presented as follows: 1) think about what the other person is feeling. (perspective taking through forethought), 2) plan how you are going to respond (intentionality through strategic planning), 3) respect everyone while communicating your thoughts (self-reactiveness through prosocial performance), and 4) reflect about the consequences of your responses (self-reflectiveness through self-examination).

This type of strategic guidance is also offered as feedback (about players' behavior in the previous session) in the following session before players interact with the social agents and their peers. This feedback includes suggestions about the consequences of their behavior, how they can self-regulate their behavior toward prosociality and alludes to what was said in the previous session as a form of contextualization. As an example, at the beginning of a session, the following information is presented:

"In the last session, Carmen (the cyberbully) sent an aggressive post about Estrela." Some bystander reactions to this post were": 1) "It's none of my business", 2) "What the heck. Estrela deserves our respect", 3) "I think she deserves it!", 4) "I understand both sides and why you're both angry, but I don't like to see you like this."

"Reading these bystander behavioral reactions of the cyberbullying event could lead to different consequences." The first behavioral reaction could "lead to no one assuming responsibility for intervening, making matters worse." The second behavioral reaction could "lead Estrela to feel respected and other colleagues might also help her." The third behavioral reaction could "lead to not understanding Estrela's perspective, blaming her for what happened." The fourth behavioral reaction could "lead both Carmen and Estrela to feel understood and others might think better before responding to try and resolve the situation".

The game starts with a storyline in an immersive school context where social agents are depicted as peers with different profiles, a profile picture, and a background story to increase players' engagement and interaction. Some of the social agents' characteristics potentially resemble some of the players so they can identify more easily with them. A total of twelve social agents are presented in the storyline, five of which belong to the players' in-group of friends to create proximity, while the remaining agents belong to the out-group.

The players' main objective is to earn a place on this year's bus field trip, where there are a limited number of seats. To do so, each group of three players log onto the same network and perform activities to organize the trip as they interact with each other and the social agents on a fictitious social network during gameplay.

This social network is composed of a public area, which is the feed, and a private area, which is the chatroom. Additionally, each player can select a profile photo and create their identity in the game to personalize the game experience. The players and social agents are divided into five work groups (i.e., players are all in one group) with different activities to complete for the field trip. At the end of each session, players and social agents vote for the three groups they think should go on the field trip. The three groups with the most votes at the end of the game go on the trip.

Cyberbullying situations emerge as posts in the feed during gameplay. Players are bystanders in these immersive cyberbullying situations, whereas social agents are cybervictims, cyberbullies, and other bystanders, who generate posts and chats in humanlike interaction. Players may react to these situations by posting likes/dislikes or by posting predefined comments on their feed or in the chatroom. The text of the different posts is predefined so that players are unable to bully each other or the social agents on the network. Players' behavior influences whether the social agents vote for them to go on the field trip.

The game offers social feedback in the form of the chatroom to provide a more realistic social interaction. The chatroom is a private area of interaction between the players and one or two agents. In this area, players and agents exchange messages about the cyberbullying case they have just witnessed.

Simulations of cyberbullying incidents (cases) were provided based on real stories and the actual language (Ritterfeld et al., 2009) that was used in these contexts to observe behavioral change in players. Each cyberbullying case had an aggressor, a victim, and bystanders. Only social agents were victims and aggressors in the game. Bystanders were both social agents and players. Some social

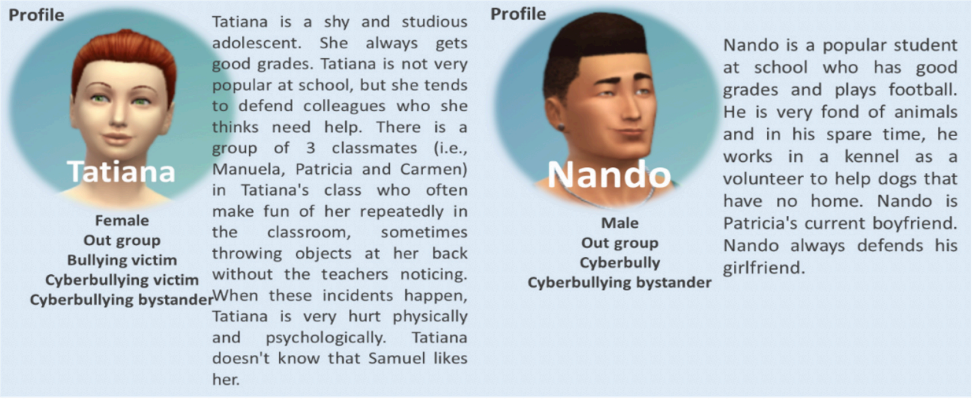

Figure 1. Examples of the Social Agents' Profiles in the Serious Game Com@Viver.

agent bystanders showed behavior in favour of aggression, whereas others revealed they are in favour of the victim. Others did not react to the situations. There were a total of 4 explicit cyberbullying situations: case 1, with a victim and an aggressor that are not in the players' in group; case 2, with a victim and an aggressor of the players' in group; case 3, a victim of the players' in group and an aggressor of the out group; and case 4, with a victim of the out group and an aggressor of the players' in group.

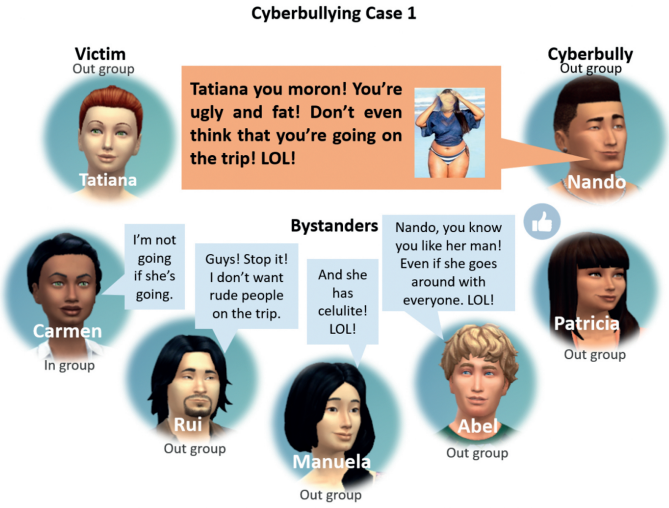

Figure 2. A Representation of the First Hypothetical Cyberbullying Case.

Com@Viver is a fictional social network site (SNS) whose content was generated by AA (a thread created by the SNS Management which generates content for the SNS where each thread is responsible for an individual network). It runs in any browser although the latest version was built of Chrome (66.0.3359.181) which was the default browser available in all the schools at the time of the intervention. This website has a client-server relationship with a Representational State Transfer (REST) Application Programming Interface (API) server that was hosted on AmazonWeb Services (AWS) (On a t2.micro machine). The back-end was developed using Spring Boot and a Java Persistence API (JPA) database while the front-end is a combination of Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), JavaScript (JS), and jQuery.

We avoided polling which occurs in the front-end and is the act of constantly checking with the back-end if there is new information. Our network could not function as a regular SNS, since in our implementation, players had to be notified whenever there was a new post, because we wanted to study their reactions to the content of the network. We had to confirm that players saw the content and interacted with it.

We used Simple (or Streaming) Text Oriented Message Protocol (STOMP), a technology that allows us to notify the front-end through specific endpoints about new or updated information, which is supported by websockets (SockJS3) that allow a continuous communication between the back-end and the front-end. This function is not present in the communication protocol of REST APIs, the Hypertext Transfer Protocol (HTTP). With STOMP4 technology we were able to not only inform the user about new content, but also incrementally update the front-end without having to refresh the page and making unnecessary requests to the server.

References

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