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Design of a Digital Game Intervention to Promote Socio-Emotional Skills and Prosocial Behavior in Children

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Abstract: In emergency contexts such as the COVID-19 pandemic, mental health risk factors affect children and may affect behavioral and emotional problems including anxiety, self-blame, emotional disturbance, and stress. Preventive measures are crucial to address these health risks. Research highlights strength-based factors, such as socio-emotional skills and prosocial behaviors, as important for childhood development and socio-emotional wellbeing. Yet, the initial evidence base shows mixed effectiveness and insufficient behavior change theory application into socio-emotional and prosocial digital game interventions. Additionally, few interventions are designed with a clear process to convert theory into practical game solutions and very limited guidance on the digital game development process exists. This study describes the Intervention Mapping Protocol (IMP) and theory application in the design of a digital game intervention which aims to strengthen social-emotional skills development and promote prosocial behavior in 8–11-year-old children. The method systematically describes the steps of the IMP process in detail to guide future theory-based game design. The results explain the final digital game prototype that was co-designed with continuous input and insights provided by stakeholders and feedback from children. This paper contributes to our understanding of theory application in the design of digital game interventions focused on health and behavior change and provides much needed guidance on how theory and stakeholder input can be incorporated into a final game design.

Keywords: intervention mapping; socio-emotional skills; prosocial behavior; digital game; serious game; game-based learning

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1. Introduction

Digital games for health are innovative and potentially effective methods for promoting health outcomes, knowledge, skills and behaviors in children [1,2]. While digital games have been used with children in several contexts [3,4], limited attention has been given to creating digital games that leverage strengths for promoting socio-emotional skills and prosocial behaviors that are crucial for children's development [5,6]. The purpose of this research is to describe the process of applying theory and empirical evidence to the design of a digital game intervention to promote socio-emotional skills and prosocial behavior in 8–11 year-old children, using an evidence-based health intervention protocol [1].

Increasing socio-emotional skills is crucial for children's wellbeing and development, and acts as a protective factor against mental illness and maladjustment [7,8]. Preventive measures for mental health issues in children are particularly important in emergency contexts, such as the recent COVID-19 context, where children are experiencing substantial changes to their daily routine and social infrastructure, which ordinarily fosters resilience to challenging events [9]. The mental health risk factors that affect children include lost support of friends and family [9] and household psychological distress [10]. The pandemic's impact on children's behavioral and emotional problems may include anxiety, self-blame [11], emotional disturbance and stress [12]. Additionally, the social isolation

resulting from this event has created several barriers for children regarding access to mental health services, for example accessing tele-mental health services in a private setting away from family members. Thus, equipping children with the socio-emotional skills and personal tools enabling them to thrive in new complex environments is crucial.

The Social Emotional Learning framework (SEL) underpins this paper as it highlights the most important socio-emotional skills in children. SEL is "the process through which children and adults understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions" [13]. SEL is a collection of life skills and, therefore, is a potential protective factor and promoter of mental health [14]. The Collaborative for Academic, Social, and Emotional Learning (CASEL) classifies SEL skills into five types of competencies: (1) Self-awareness—the ability to identify one's own emotions, thoughts, and values and understand how they guide behavior. (2) Self-management—the ability to regulate one's own emotions, thoughts, and behaviors in different situations, and to set and work toward goals. (3) Social awareness—the ability to take the perspective of and empathize with others, and to understand social and ethical norms for behavior. (4) Relationship skills—the ability to communicate clearly, listen well, cooperate with others, resist inappropriate social pressure, negotiate conflict constructively, and seek and offer help when needed. (5) Responsible decision- making—the ability to make constructive choices about personal behavior and social interactions based on ethical standards, safety concerns, and social norms [15]. Traditional universal school-based SEL programs have demonstrated improvements in socio-emotional skills, attitudes and behavior in diverse contexts through kindergarten to high school [16,17].

In respect to social-emotional development, middle childhood, the period between six and twelve years, occupies a critical position between the preschool years and adolescence [18]. During middle childhood, particularly important developments occur within the emotional and social domains such as increased use of emotional expression, increased efficiency in identifying and using strategies to regulate emotions, increased use of social skills to deal with emotions of self and others and use of information about emotions of self and others to make and maintain relationships [18]. Well-adjusted children in middle childhood tend to become well-adjusted adolescents [18]. Thus, for this game design we focused on 8–11-year-old children, considering cognitive and developmental differences, but also game acceptability and engagement.

The knowledge, skills and attitudes needed to demonstrate social-emotional competence, developed through SEL, require integration across affective, cognitive, and behavioral systems [7]. Emphasizing positive behaviors and relationships, the SEL framework focuses on the development of prosocial behaviors, such as helping and defending [19]. Thus, prosocial behavior development, as part of SEL, serves as a protective factor for children's mental health and social adjustment. Prosocial behavior is voluntary, intentional behavior that results in benefits for another; the motive is unspecified and may be altruistic, non-altruistic or both [20]. Previous research has identified relationships between aggressive and prosocial behavior [21,22], finding that negative social behaviors (such as aggression) may reflect the lack of contextual opportunities to learn and practice prosocial behavior alternatives [23,24]. Thus, preventive efforts may focus on the development of prosocial behaviors [25,26]. Yet, most previous research focuses on understanding mechanisms that predict negative behavioral outcomes, such as aggression and bullying [27,28], while little empirical research takes a strengths-based approach, focusing on understanding, developing and strengthening prosocial behaviors as preventive measures [29]. Prosocial digital game interventions have the potential to serve as innovative alternatives to the delivery of socio-emotional skills training to children in a socially distanced society or in other remote learning environments.

With the purpose of creating innovative and more engaging health-promotion interventions, the application of digital games in diverse contexts include alcohol consumption [30], smoking cessation [31], physical activity [32] and overall health and wellbeing [33]. A sys-

tematic review by All et al. [34] explains that digital games comprise a variety of types and genres of games played, using multiple digital technologies such as computers, consoles and mobile devices. Previous literature reviews have employed the term "digital games" to include computer games, video games, serious games and game-based learning [35,36]. Although digital games offer innovative and potentially effective methods for influencing health outcomes, there is a need for additional research to determine the game design and behavior change procedures that best promote digital games for health effectiveness [2]. Previous evidence suggests digital games for health may have applied theory to different levels, as categorized by DeSmet et al. [37]: behavioral theories such as Social Cognitive Theory [38], game-based learning theories such as Embodiment Theory [39], psychology approaches or theory-based methods. While a significant portion of studies (38%) did not report any theoretical foundation, some studies may only mention a theory, but not report theory application to game design [37]. Overall, findings showed that a focus on game-based learning theories alone or combined with behavioral prediction theories related to higher game effectiveness [37]. Similarly, a recent review specific to the prosocial digital games context, found the initial evidence base showed insufficient theory application, where some studies might mention theory or theoretical frameworks but did not apply or test theory in the design or evaluation of the intervention [5]. The need to expand our understanding in terms of how to apply theory in the educational game context is crucial to enable the design of effective games. Applying different theories in varied ways to educational game design will provide insights into what is, and what is not, effective with appropriate evaluation and reporting.

Additionally, limited work has investigated the value of integrating different game applications into program design and their relation to program effects [30]. More specifically, the application of strength-based digital game interventions in the area of children's socio-emotional skills and prosocial behaviors is still very limited [3,5]. Previous interventions that aim to promote these skills and behaviors in youth have generally done so with school curriculum programs [16,40,41], while only recently, practitioners have started to apply digital games to intervention design [42–45]. Interestingly, a review by Saleme et al. [5] found that a small sample of prosocial digital games showed positive behavioral results, where children transferred skills leaned in digital games into real social interactions, which was measured by observed prosocial behavior outcomes [42–44,46]. This shows the potential for transferring prosocial skills and behaviors learned in digital environments into real life positive experiences and behaviors [47].

The Intervention Mapping Protocol (IMP) [1] appears as a valuable approach widely applied to health-promotion interventions and implementation strategies in community and clinical settings globally [48]. Recent literature demonstrates the application of IMP in the development of school-based social-emotional learning programs [49,50]. IMP aims to assist in the systematic and stepwise application of theory to behavioral change programs [1]. IMP focuses on increasing efficacy and effectiveness through a reiterative process of evidence review, application of theory-based strategies, and stakeholder consultation in six steps [1]. This protocol emerged to aid behavioral science requirements for a better understanding of how interventions are informed by, and test, theory [51].

Previous computer-based health behavior interventions for young people have been developed using the IMP in health-related contexts such as drinking behavior [52], safe sex behavior [53,54], healthy diet and physical activity [55] and cyberbullying [56,57]. Yet, a digital game specifically designed to promote socio-emotional skills and prosocial behaviors in middle childhood using IMP is missing. Most importantly, IMP appears as an approach that can facilitate evidence and theory-based digital game design [57]. IMP is valuable in the specific context of digital games for health because it provides steps to take by game developers to acquire design information and enable the cooperation between game developers and health professionals [58]. Yet, the illustration, interplay and study of this cooperation and other stakeholder involvement during the different stages of IMP in developing digital games for health requires further examination. Stakeholder theory

entails the involvement of stakeholders in intervention planning, implementation and evaluation stages, which may enhance intervention outcomes [59,60]. Previous health and behavior change interventions have applied stakeholder involvement in key stages of design and development including formative research, implementation and evaluation stages [61]. Yet, digital games for health designers and practitioners may focus on clients and users, with the purpose of yielding engagement. This may create a lack of involvement of other crucial stakeholders, which may affect health and behavioral outcomes. Additionally, digital games for health researchers may design theory and evidence-based interventions and collaborate with digital game developers to create the final product. This key partnership and cooperation may assist in bridging the theory and practice divide in digital game design and implementation.

In light of the significant gaps found, the purpose of this research is to apply theory and empirical evidence from systematic reviews [5,37,62,63] and stakeholder involvement processes [61] as well as evidence-based behavior change techniques (BCTs) [1], to the design of a prosocial digital game intervention. Additionally, this research employs the six-step IMP process to select Social Emotional Learning theory-based performance objectives, behavioral determinants and behavior change techniques and aligns them to practical game applications. This paper serves as the first step to identify and select actionable behavioral-change techniques and game applications to be tested in later stages of the research project, that aim to strengthen socio-emotional skills and prosocial behaviors in children. This paper contributes to the literature of theory application in digital game interventions in the health and behavior change context, providing information about theory and evidence-based processes for digital games for health design. Practically, the stepwise process offers researchers and practitioners guidance in digital game intervention mapping with clear theory mapping instructions while navigating and overcoming the theory-practice divide.

2. Methods

Ethical approval for this research was obtained through the university ethics committee (Ref. N: GU 2020/747). The digital game intervention was designed using IMP featuring six steps [1]. Focused on the Social Emotional Learning framework [13,15], the Prosocial Behavior model [20,64] guided the selection of behavioral determinants and performance objectives. This paper reports on the six steps of IMP to inform the digital game design; step 1—needs assessment, step 2—behavioral objectives and matrices of change, step 3—change methods and strategies, step 4—program production and materials, step 5—program implementation plan and step 6—evaluation plan. Table 1 illustrates how the first three IMP steps are aligned with the performance objectives and change objectives.

2.1. Step 1: Needs Assessment

The needs assessment involves defining goals and priorities regarding which health factors to focus on, defining the population and understanding the context [1]. This step provides a wider view of relevant factors, in this case, specific socio-emotional skills and prosocial behaviors. The needs assessment involved a systematic literature review to identify previous prosocial digital games for youth [5] and key stakeholder involvement. The research team undertook a systematic review [5] to examine the application of digital games to promote prosocial skills and behaviors in children and adolescents, investigating their effectiveness. Eleven studies met the inclusion criteria, and the analysis of the sample highlighted a heterogeneity of measures, lack of a consistent framework and mixed effectiveness. Additionally, the review emphasized the need for future research on prosocial digital games focused on implementing clear theoretical frameworks and analyzing key game design attributes to enhance prosocial digital games' effectiveness (further details are available in Saleme et al. [5]).

Table 1. Intervention Mapping Protocol Steps and Objectives.

IMP Terms		Program Objectives	Performance Objectives	Change Objectives	Change Methods	Applications or Strategies
IMP Objective	Identify the health or quality of life problem	State the desired reduction in health problem/define the health-promoting situation	Identify behaviors that can help achieve the health-promoting situation	Select determinants that influence these behaviors. A change in the determinants is needed to allow people to perform the target behavior.	Select behavioral change techniques relevant for changing specific determinants.	Select applications that are suitable for the change methods and change objectives
IMP step	Step 1—Needs assessment	Step 1—Needs assessment	Step 2—Change matrices	Step 2—Change matrices	Step 3—Change methods and strategies	Step 3—Change methods and strategies
Applied to Project	General: Improve social-emotional skills and prosocial behavior in 8-11-year-olds	1. Improve self-awareness: identifying own emotions, recognizing strengths	PO1 Identifying own emotions, PO2 recognizing own strengths	Knowledge & self-efficacy for PO1 & PO2	Behavior Change Techniques: Active learning, Challenge, Feedback, Narrative, Using Imagery, Modelling, Contingent reinforcement (rewards)	Practical Game Applications: Game activities, Interactive game scenarios, Curriculum materials (discussion post game)
		2. Improve social awareness: empathy, perspective-taking	PO3 Perform Empathy (affective), PO4 Perform Perspective-taking (cognitive)	Knowledge & self-efficacy for PO3 & PO4		
		3. Improve relationship skills (prosocial behavior): collaborate, offer help	PO5 Collaborate, PO6 Offer help	Knowledge, self-efficacy & intentions for PO5 & PO6		

Importantly, the needs assessment also entails stakeholder consultation and contribution. This allows integration of key stakeholders' opinions and preferences into the digital game solution. From a stakeholder involvement approach, health interventions are designed to change behavior at an individual level by offering competitive alternatives that are valuable to the target audience and are supported by stakeholder groups involved [61]. Key stakeholders included teachers and education experts (n = 3) that work with the target group to identify the most pressing socio-emotional skills categories to develop in the target audience. Based on consultation with all stakeholders and initial learnings from Saleme et al. [6], the research team proposed that the digital game design should be guided by the SEL framework which highlights the most important socio-emotional skills and behaviors to develop in children, namely, self-awareness, social awareness, self-management, relationship skills, responsible decision making. Subsequently, the priorities were identified and formulated into digital game objectives, specifying the desired change in health outcomes [1].

2.2. Step 2: Behavioral Objectives and Matrices of Change

Following the needs assessment, step two is focused on the program goals and desired behavioral outcomes for the target audience [1]. Specifically, the research team investigated which performance objectives (POs) can address the health factors and help attain the digital game objectives, and which determinants (change objectives) influence these behaviors. Findings from step one suggested a focus on three main SEL skill sets: self-awareness, social awareness, and relationship skills (that includes prosocial behaviors). Environmental factors (connectedness to peers and adults, school experience, and after school activities) were considered, but were deemed out of the projects scope following stakeholder consultation (see step 1). Figure 1—Logic model of change, illustrates how the performance objectives will be influenced by determinants to create behavior outcomes. Environmental factors were included in the graphic as per IMP standard to denote the influence on the environment on the expected health outcomes.

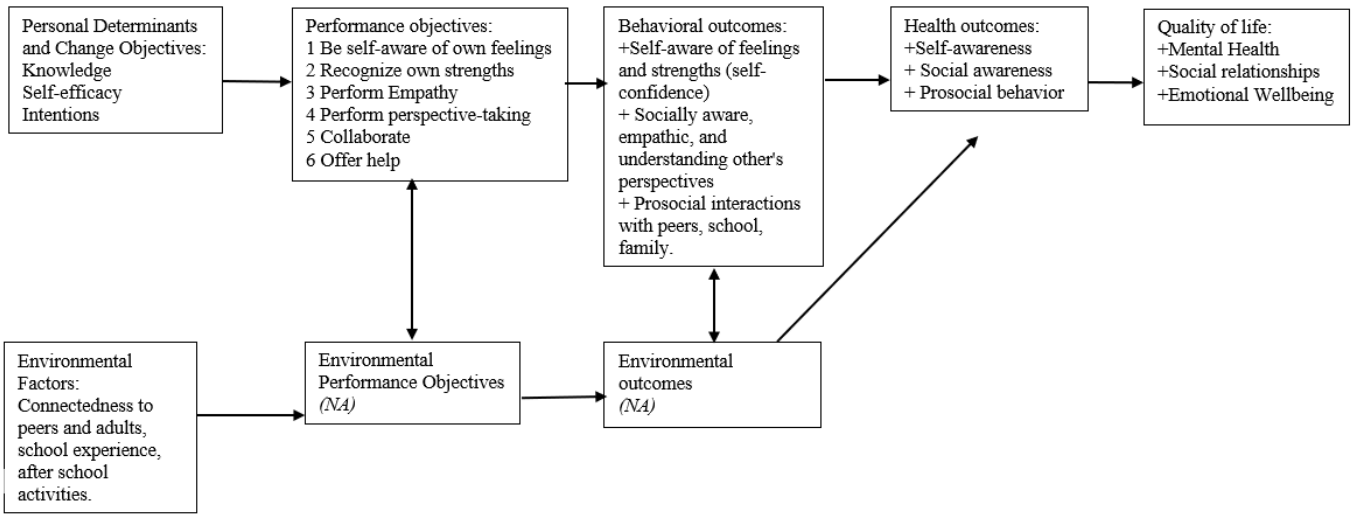

Figure 1. Logic Model of Change.

Next, IMP suggests the alignment of each behavioral determinant and performance objective with the aim to find elements that need to change (change objectives) in order for the person to be able to perform the target skill or behavior. Determinants were selected using the specific theoretical model of prosocial behavior (action) [20] which is a heuristic model that explains prosocial action as the outcome of multiple individual (including biological) and situational factors. Biological factors affect the child's individual characteristics (e.g., socio-cognitive development, empathy, sociability). In the model, personal competencies (knowledge, skills, self-efficacy, self-regulation) influence the intention to

perform prosocial action [64]. This model guided the selection of behavioral determinants of socio-emotional skills and prosocial behavior. Determinants identified were integrated with the formulated performance objectives and are listed in Tables 2 and 3.

Table 2. Matrix of Change Objectives: Self-awareness & Social Awareness.

Performance Objectives	Knowledge	Self-Efficacy
Behavioral Objective (BO) 1	Self-awareness	
PO1. Be self-aware of own feelings/emotions	K1.1 Identify own emotions	S1.1 Demonstrate awareness of own feelings
	K1.2 Define/describe which emotions one can feel in common challenging situations	S1.2 Express confidence in identifying own emotions/feelings
PO2. Recognize own strengths (self-esteem)	K2.1 Identify/describe own strengths	S2.1 Express confidence in understanding own strengths
	K2.2 Define/describe common situations when one can use own strengths	S2.2 Express confidence in recognizing situations to use strengths
Behavioral Objective (BO) 2	Social Awareness	
PO3. Perform Empathy (affective)	K3.1 Describe how others may feel in certain challenging situations	S3.1 Express confidence in identifying how others may feel in certain challenging situations
	K3.2 Describe how one feels when others feel certain challenging emotions	S3.2 Demonstrate the ability to share other person's feelings
PO4 Perform Perspective-taking (cognitive)	K4.1 Explain (understanding) why others may feel sad/angry/etc in certain situations	S4.1 Express confidence in understanding how others feel and why

Table 3. Matrix of Change Objectives: Relationship Skills.

Performance Objectives	Knowledge	Self-Efficacy	Intentions
Behavioral Objective (BO) 3	Relationship Skills (Prosocial Behavior)		
PO5 Collaborate	K5.1 Describe ways to collaborate with others in common scenarios (classroom work, at home, in sports, at lunch)	S5.1 Express confidence in the ability to collaborate with others in everyday scenarios	I5.1 Intend to collaborate with others in specific everyday scenarios *
PO6 Offer help	K6.1 Describe ways to help others in challenging scenarios (someone crying, bullying, etc)	S6.1 Express confidence in helping others in challenging scenarios	I6.1 Intend to help others in specific challenging scenarios *

* The "Intentions" change objectives are extended with more specific scenario-led objectives in the prototype design stage.

2.3. Step 3: Change Methods and Applications

Bartholomew et al. [1] explains the steps in selecting and identifying change methods: reviewing existing evidence in the literature, reviewing theories of change, considering which behavior change techniques (BCTs) apply to a specific determinant and reviewing its definition and parameters. Thus, selecting BCTs is based on IMP guidelines, as well as a general literature review on BCTs used with children, and the learnings from the systematic literature review performed in the needs assessment [5].

BCTs are theory- and evidence-based change methods for influencing changes in determinants of behaviors of the target audience [1]. Having specified the change objectives in terms of what needed to be achieved in the digital game, behavioral change techniques (BCTs) were selected that would facilitate these changes [65]. Application of

BCTs to interventions aims to ensure theory application and boosting effectiveness [66]. More specifically, the incorporation of a higher number of BCTs has been linked to larger effects in previous reviews of interventions for children [63,67] and technology-based interventions [62,68].

The overall review of previous literature on BCTs used in digital games and in interventions for children plus the needs assessment guided the selection of BCTs for the game. In this third step—change methods, theory is aligned to specific practical game applications. Stakeholder involvement and cooperation with game storytellers, designers, developers and programmers is crucial in this third IMP step. The research team recommends the BCTs while the game designers and creatives create the game narrative and concept. Then, researchers assess whether BCTs are present and in which capacity to ensure that outcome change is more likely. Theory based BCTs were aligned with game applications that were suitable to the target audience, plausible for game developers' expertise, and fit the budget. Finding a balance between educational BCTs embedded into engaging and fun game features that may enhance gameplay and behavioral outcomes was important [30]. In the context of social-emotional skills, an attractive storyline and relatable characters that children could identify with where also crucial [69]. Additionally, high-end realistic graphics was another design feature that was crucial to the target audience of 8–11-year-old children. Table 4 illustrates an example of how the behavioral determinants align with theory-based behavior change techniques that are then transformed into the game design. The final choice of BCTs may also occur after the pilot test of the prototype, when the concept and methods may need to be revised according to user feedback [57].

Table 4. Examples of Change Methods and Applications.

Change Objective	Behavior Change Technique	Practical Application (in Game)
	PO6 Offer Help	
	Determinant: Knowledge	
K6.1 Describe ways to help others in challenging scenarios (someone crying, bullying, etc.)	Using Imagery (TIP) * Modelling (SCT) * Empathy training (TSD) * Consciousness Raising (HBM) * Active learning (SCT) * Framing (PMT) * Feedback (LT; SCT) * Shifting Perspective (TSD) * Scenario-based information (PAPM) *	Framing different interactive scenarios based on children's life experience and selecting options of prosocial actions to perform in the game. Players receive positive or negative feedback from nonplayable characters (NPCs) depending on the selected social action.
	Determinant: Self-efficacy and Intentions	
S6.1 Express confidence in helping others in challenging scenarios. I6.1 Intend to help others in everyday and challenging scenarios.	Goal setting (TSR) *	Final in-game goal setting activity selecting social-emotional skills to improve or prosocial behaviors to perform in the next year.

* Taxonomy of behavior change techniques and associated theories found in Kok et al. [1,65]. * TIP: Theory of Information Processing; SCT: Social Cognitive Theory; TSD: Theories of Stigma and Discrimination; HBM: Health Belief Model; PMT: Protection Motivation Theory; LT: Learning Theories; PAPM: Precaution Adoption Process Model; TSR: Theories of Self-Regulation.

3. Results

3.1. Step 4: Producing Program Components and Materials

Using the game design materials developed in the previous IMP steps, the project team decided to develop one digital game intervention prototype containing scenarios children may encounter in everyday school settings (but immersed in an imaginary storyline with fictional elements), with tailored decisions points, where the journey changes according to the decisions made. A program plan including the scope, sequence and program materials was developed. With a focus on stakeholder involvement in every step of the IMP processes, involvement of key partners was undertaken during the production of the digital game intervention. A multidisciplinary team of education experts and teachers (n = 4), game designers and developers (n = 3), a child counsellor (n = 1) and behavior change researchers (n = 4) were consulted, participating in seven online Living Lab sessions (n = 7). A Living

Lab is a "physical or virtual space in which to solve societal challenges by bringing together various stakeholders for collaboration and collective ideation [70]". Importantly, end users (children 8–11-years-old) participated during the process of designing the digital game components and materials to identify their preferences and ideas. Living Lab co-design sessions (n = 4) with children (n = 6–10 per session) were conducted, including discussion and voting activities, similar to Jacobs et al. [56].

The R.E.M.I. (Robotic Empathy Machine Intelligence) social-emotional game is a new iteration of a previous digital game that was tested as a pilot program and demonstrated effectiveness in improving effective empathy and prosocial behavior intention outcomes [6]. The new R.E.M.I digital game prototype is a web-based interactive social simulation game with two animated sequences, five decision-making scenarios, two in-game activities, and a post-game face-to-face discussion activity. Appendix A illustrates examples of the scenes and activities included in the digital game. The game can be completed in 30 to 40 min, plus the 10–15-min discussion activity. The post-game face-to-face discussion activity has been included to complement the game and allow reflection on the topics present in the game and the lessons learned. The purpose of this new prototype is to test the game with end users before adding additional levels and activities. Facilitators or primary school teachers will implement the game for the testing phases, with the ultimate objective enabling children to play the game any time, at school and at home. Table 5 describes the game materials and content, and Table 6 describes the practical game development adapted from Verschueren et al. [71]'s framework for developing serious games for health.

Table 5. Game content.

Activities	Description
Introductory scene (1)	An animated sequence presents the academy environment (futuristic, located in a different galaxy) and the narrative of the story. In this narrative, children are attending the first day at a special academy on another planet. In this imaginary world, every new student gets paired with a "*biobot*" (a living robot that can adapt to the human they are paired with) called R.E.M.I. Children have to train their robot by showing it how they behave and interact with other people (by being a role-model) which can be seen in their decision-making throughout the game. The decision points are socio-emotional dilemmas adapted to their age and experiences.
Creating an ID card (2)	After the introductory scene, each player has to create their student card, where they select their personal strengths (self-awareness performance objective). Additionally, they create a de-identified code, the same that will be used to gather pre-post measurements anonymously.
Decision-making scenarios (3–7)	Five decision-making scenarios have the objective of promoting reflection and use social-emotional decision-making and social problem-solving skills to promote using empathy, perspective taking, self-awareness, collaboration and helping (SEL objectives). Each selection (more or less prosocial) creates a new storyline that the game develops. Depending on how prosocial the players decisions are, they receive positive or negative reactions from the nonplayable characters (NPCs) (feedback). For instance, if the player selects the least prosocial action in a behavioral scenario, the NPCs will have a negative response (as seen in character's face expressions and read in the dialogue box that follows each scenario).
Robot upgrade scene (8)	Animated sequence. According to the decisions selected throughout the game, the player's robot receives better or lower quality "upgrades" (fun pieces of robot equipment like propellors, satellites, etc.). This gives the player feedback on the prosocial level achieved by the choices they made throughout the game. The prosocial levels of "biobot upgrades" are classified in three categories. The robot will be golden and have better upgrades if more prosocial options were selected, silver if medium, and copper with the lowest quality upgrades if the least prosocial options were selected. Additionally, the Professor (NPC) that gives the player the robot upgrades, gives feedback on the level achieved in the dialogue box on the scene.
Goal setting (9)	The goal setting activity will challenge participants to reflect about what they have learned and set prosocial goals. Examples are presented to children to answer this question. Alternatively, users can type in their answers.
Post-game discussion (10)	To reinforce and explain the learnings of the game, a brief small groups discussion activity (10–15 min) is implemented. Facilitators and/or teachers explain what the correct answer in each scenario is and why, as well as explaining the socio-emotional skills that each action entails. Students reflect on how to apply what has been learnt in everyday life.

Table 6. Practical game development.

Genre Interface | Procedure	Visuals and Ux Theme | Level of Visual Conceptualization
Interface: Web-based interactive social simulation. Social simulation games are a subgenre of life simulation games that explore social interactions between multiple artificial characters [72]. Procedure & Software: Blender for 3D modelling, rigging and animation. Unity for development. Google Firebase for storing information on a database. Adobe Illustrator for creating the graphical user interface.	Visuals: Layered graphical composition including 3D models, 3D animation, 2D graphical user interface, text, and interactive buttons. E.g., 3D location in background, 3D animated characters in foreground, 2D user interface overlay of text-based dialogue and buttons. User Experience: Users will experience a sequence of animations, music, and textual dialogues between multiple characters in each scene, and at certain stages, be offered a selection of three possible decisions. The decisions the user makes will direct them towards three possible outcomes that can be seen at the end of the game.

The design documents were refined through continual feedback from end users and discussions between stakeholders and the research team. After finalizing the storyline and characters, the researchers worked with the game designers and creatives to produce the digital game intervention. The web-based interactive social simulation game was developed using a series of software and user-experience principles (described in detail in Table 6). The Living Lab sessions with children include feasibility and acceptability testing, usability, game appeal and comprehension, as well as alpha-testing (to examine elements of the game) and beta-testing (to identify technical problems) [73,74].

3.2. Steps 5 and 6: Developing Implementation and Evaluation Plans

Implementation planning occurred throughout the entire game design and development process. The stakeholder consultation process was crucial to intervention design as it ensured that the final game prototype would be suitable and feasible for the target group. The multidisciplinary team of stakeholders participated in decisions such as the appropriate content and language for the age group, the most essential SEL skills needed for the target audience, as well as nuances around implementation at schools or at home. More importantly, the process included continuous consultation with children at key design stages to ensure the content was user-driven and to achieve game appeal for the target audience.

The program was design enhanced the potential for adoption, implementation, and continuation. For instance, teachers can access the web-based game online to use it in class any time. Additionally, parents and children can also access the website at home to play in any device (computer, tablet, smartphone). This reduces costs associated with implementation. The digital game format allows reach to a wider audience at a lower cost.

A pre-post-test design will evaluate the digital game intervention and its impact on the set change objectives. The evaluation plan includes recruitment of three primary schools (one public and two private) in one of Australia's main metropolitan cities. The procedure entails a brief introduction to the game, a pre-test survey, the interactive digital game, the final discussion activity, and a following post-test survey. A nonprobability sampling method will recruit boys and girls from year 4 to 6 (8–11-years-old). Effects on change objectives will be evaluated using subscales from validated questionnaires [75,76] at pre- and post-intervention time points.

4. Discussion

The current study described the process of using the Intervention Mapping Protocol [1] to develop a digital game intervention using a strength-based approach to support social-emotional skills development and promote prosocial behavior in children aged 8–11 years old. IMP was applied to plan, design and develop the digital game. Additionally, this paper demonstrates how theory (SEL framework and the Prosocial Behavior model) can be embedded into the IMP process and it highlights how stakeholder consultation and

collaboration can bridge the theory and practice divide. Computer-based health behavior interventions for young people have been developed previously using the IMP in health-related contexts such as drinking behavior [52], safe sex behavior [53,54], healthy diet and physical activity [55] and cyberbullying [56,57]. However, this is the first study that has demonstrated the application of the IMP process to the design of a digital game specifically elaborated to promote socio-emotional skills and prosocial behaviors in middle childhood as a preventive measure. This contributes to the literature through reporting theory application in digital game design with the aim to expand our understanding of theory application in different ways with the goal of creating effective digital games. This paper makes two contributions regarding theory application in game design. Firstly, by providing a theory application process to integrate digital game intervention design, and secondly by discussing the challenges of diverging and converging stakeholders' contributions. These contributions are now discussed in turn.

4.1. Theory Application in Digital Game Design

This study contributes to the literature of theory application in digital game intervention design with a focus on health and behavior change. While there has been an increase in the application of digital games for health to programs and interventions, information about theory and evidence-based processes in the design of digital games for health development is still in its early days. For example, the prosocial pilot intervention that preceded this game design lacked the theory mapping this study now utilizes [6]. Further, previous systematic reviews have demonstrated a lack of clear theory application in 38% of reported studies [37] and those that mentioned theory in most cases did not report on how theory informed game design apart from DeSmet et al. [57]. This provides evidence that the interpretation and application of theories may be different across digital games studies and that the terminology of theories is not used in a consistent manner across interventions [37]. Thus, it is important to expand our understanding on theory application in educational game contexts to design games that are more effective. Applying theories to educational game design in different ways will provide insight into what works and what does not work if done right and appropriate detail reported. This paper responds to the need for more detailed process descriptions on how theory guides change in specific game outcomes [37]. As well as responding to calls for additional research to determine the role of theory application in game design, and the behavior change procedures that best promote digital games for health effectiveness [2].

Furthermore, this paper demonstrates how the SEL framework and Prosocial Behavior Model can be applied to intervention development steps and therefore showcases how prosocial behavior determinants can be aligned with SEL objectives to build a theory-based digital game intervention. This in turn should yield higher rates of effectiveness [62,66]. Additionally, the alignment of behavior change methods to practical game applications can link game attributes to theory-based methods, strengthening digital game development and application through the identification of modifiable factors, including those which have potential for strengthening. As reviewed in step 1—needs assessment and applied in step 3—change methods, most effective interventions highlighted several techniques, including: providing general information on behavior–health links, prompting practice of behavior, planning for social support/social change [67], demonstration, practice and providing instructions on how to perform a behavior [63], feedback and monitoring, shaping knowledge, repetition and substitution, and reward [62]. Additionally, design features can amplify the impact of BCTs in the digital game and engagement. These game features include an attractive storyline adaptable to gender and age, including diverse (antagonist) characters the user may identify with, high-end realistic graphics, well-defined instructions which can be skipped, in combination with clear feedback and a balance of educational and fun content [69].

In this context, DeSmet et al. [77]'s digital game stood out in the needs assessment. This was not only because it embedded BCTs (using IMP) into practical applications in

the digital game, but proposed a categorization of BCTs (e.g., feedback, information of consequences, instructions to perform behavior, link to desired outcome) and gaming features (e.g., personalization, challenge, narrative) used in digital games that was employed to inform BCT selection, highlighting enactive mastery learning, modelling, positive self-revaluation, perspective taking, conditioning (rewards), and immediate feedback. Additionally, highlighted game design elements used in prosocial digital games include first-person control, personalization of avatars, a mystery-themed story, mission-based levels with increasing level of difficulty, rewards and feedback [57]. These BCTs and game features demonstrated positive effects on behavior, its determinants, and/or engagement in a systematic review by the same authors [78] and other reviews of interventions.

The insights from the present study and other digital game studies discussed herein may aid practitioners in selecting performance objectives, behavioral determinants, and game applications for prosocial digital game interventions for children. While digital games for health practitioners have used IMP processes to develop interventions for children in other contexts [55], limited empirical evidence illustrates design processes for digital interventions focused on socio-emotional skills and prosocial behaviors [5]. Thus, the work presented provides a clear process for applying theory and its integration to digital game intervention design.

4.2. Diverging and Converging Stakeholders' Contributions

The illustrated process may aid collaboration between all stakeholders involved in the design process in applying relevant theory and evidence-based behavior change methods into digital game interventions. The multidisciplinary team involved in this study included education experts and teachers, game designers and developers, a child counsellor and behavior change researchers that participated in online Living Lab sessions to promote innovation and collaboration from different expertise. Thus, it was important to translate insights from each expert into the project, which was achieved by carefully evaluating and discussing the relevance and application of each expert and user's suggestions for the purpose of the game intervention. For instance, a focus on engagement was present from the game designers' view, which focuses on increasing game "fun" or entertainment, and boosting the storyline or narrative immersion [2]. In contrast, the behavior change research team's priority was to map theory throughout the design process and apply behavior change techniques [66], with the ultimate goal of achieving positive outcome change. Through the process, it became evident that some BCTs (e.g., elaboration, guided practice, cue altering) that were recommended in the IMP taxonomy for health interventions did not fit engagement-focused game applications for this particular game (e.g., short dialogue vignettes, scenario-based choices, feedback from nonplayable characters), which are needed to maintain the entertainment and educational balance of digital games for health [74]. Thus, appropriate behavioral change techniques were selected in terms of their flexibility to blend with the narrative and practical game applications designed by the creative team. Meanwhile, education experts, teachers and a counsellor set priorities for the SEL skills that were most crucial for the target population, and ensured the language and content was developmentally adequate and relatable for children. Yet, multiple consultations with users determined the final content and preferences for the digital game. Consequently, the process included several drafts of specific performance objectives, and different combinations of behavior change methods, evaluated according to the feasibility of alignment to game characteristics and applications. After that, refinement included rounds of narrative and general script revisions, and more importantly, behavioral scenario revisions with expert and user's feedback. We balanced diverse game focuses, merging socio-emotional, educational and behavior change aims, with a defined focus on creating an interesting narrative and compelling storytelling to immerse the users in the game experience. The challenge of translating different voices to find comprehensive solutions during the game design and development process also becomes a strength, providing insights and inputs

from key stakeholders and users into the intervention mapping process an achieving a well-rounded final intervention.

Thus, this stepwise process offers guidance in identifying and applying theoretical frameworks into the design of digital games while working with external game developers and involving other key stakeholders to create effective digital game interventions. Consultation and consideration of stakeholder input is called for [61] and was applied during all steps of the intervention mapping process. This study has focused on the steps for researchers to provide theory-and-evidence-based game design information to game developers in order to bridge the theory-and-practice gap [58], an ensure an evidence-based approach to game design that is needed in games with health contexts [79]. The learnings from this study contribute to our understanding of how a multidisciplinary team of researchers, teachers, education experts, creatives, and game developers can co-create a theory-informed innovative digital game for health that takes a strength-based approach.

5. Conclusions

The aim of the present study was to describe the process of applying the Intervention Mapping Protocol with incorporation of stakeholder and user input throughout the process, with the aim to design a digital game intervention to support social-emotional skills development and promote prosocial behavior in children aged 8–11 years old. The method systematically described the steps of the IMP process in detail, to guide future theory-based digital game design. The resulting digital game intervention, co-designed with the continuous insights provided by stakeholders and feedback from users (children).

This paper is not without limitations. The generalizability of the objectives, determinants and BCTs applied are limited to the targeted skills and behaviors of this project: socio-emotional skills and prosocial behaviors. Additionally, these are also specific to the target audience of Australian children aged 8–12 years. Ultimately, future research should employ an experimental design to validate the results of the digital game for health.

Bartholomew et al. [1]'s IMP framework was crucial to the theory and evidence driven design of the digital game. This framework is widely used in health and behavior change interventions targeting physical issues such as safe sex behavior, healthy eating and physical activity. Yet, application of IMP into more psychosocial health issues such as mental health and psychological wellbeing is still limited. Future research targeting socio-emotional skills and prosocial behavior should strive to maintain a rigorously mapped application of theory and evidence into each intervention design step (as proposed in IMP) to demonstrate a scientific method aligned with a public health approach. Specifically, in the context of digital game interventions for children, where creativity and engagement tend to steer intervention design and development, the application of IMP is a valuable asset to ensure a scientific grounding. Digital games are often designed based on the intuitive understanding of game developers, and are only sometimes informed by formative qualitative and or quantitative research [79]. Thus, this common approach does not elucidate the most effective game design elements for behavior change [79]. This paper emphasizes the application of behavior change theory into the process of game design, that very few researchers have detailed [57], instead of creative processes and game mechanics of digital game development. Prosocial digital game researchers and practitioners may shift their focus to evidence-based, data-driven procedures and empirical testing. Following this process aligns with the broader call for research to enhance the knowledge base for the design and efficacy of digital games with an approach to research the game components with the potential to boost the effectiveness of digital games for health and behavior change [79].

Digital games for health, underpinned by theory and evidence, offer an innovative strength-based approach for developing interventions for the promotion of important health skills and behaviors that affect children's mental health and wellbeing and society more broadly. This study makes important contributions to theory application in digital games through the application of a stepwise process involving multiple stakeholders and

provides early evidence for the utility of this process in guiding practitioners in the digital game design journey.

Author Contributions: Conceptualization, P.S. and T.D.; methodology, P.S. and T.D.; formal analysis, P.S.; investigation, P.S.; writing—original draft preparation, P.S.; writing—review and editing, T.D., B.P. and J.P.; supervision, T.D., B.P. and J.P.; project administration, P.S. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Appendix A. Photos of the Game Prototype

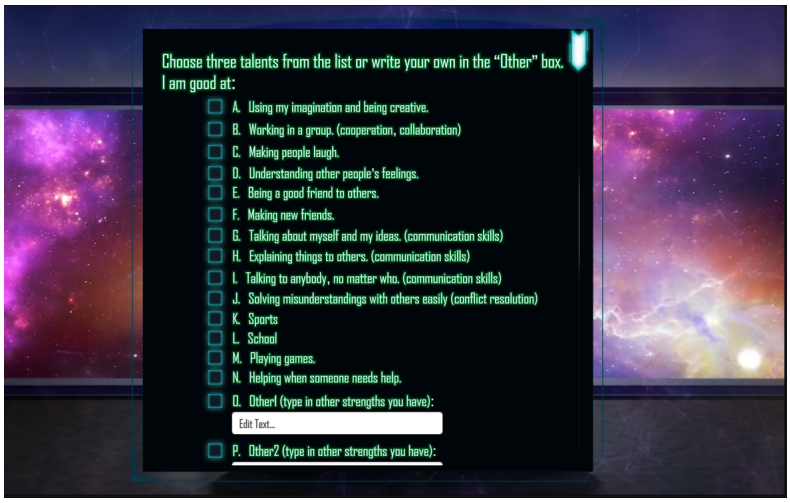

Figure A1. Personal strengths activity.

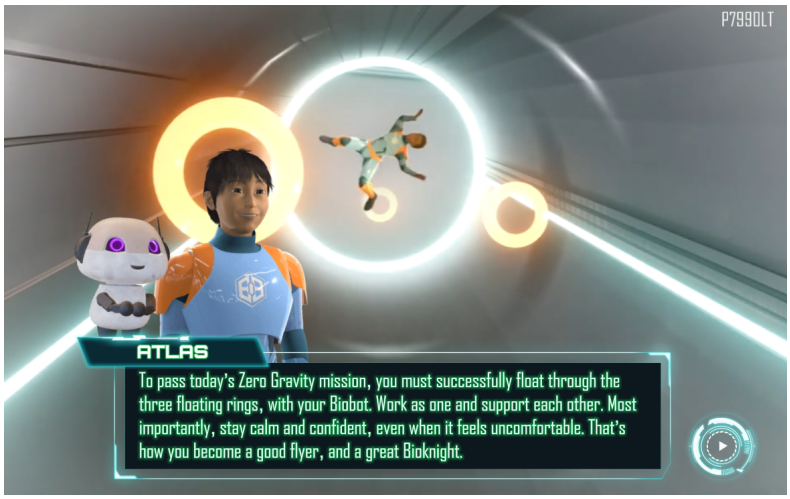

Figure A2. Example dialogue screen.

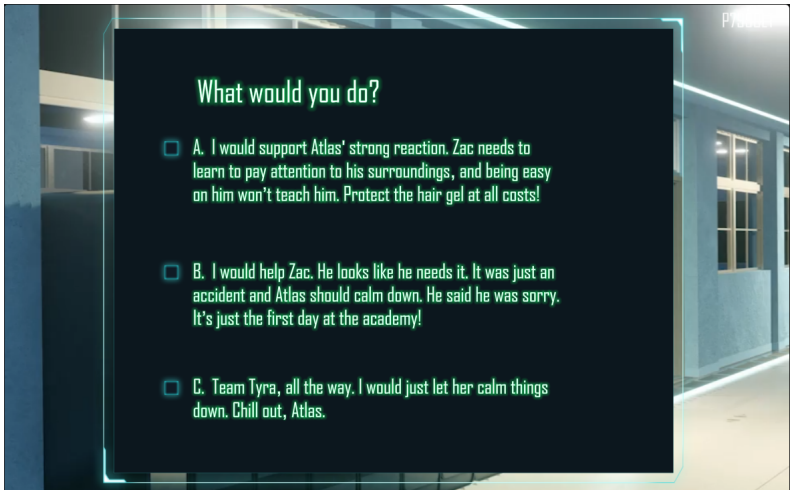

Figure A3. Example of choices in a behavioral scenario.

Figure A4. Example of final dialogue screen.

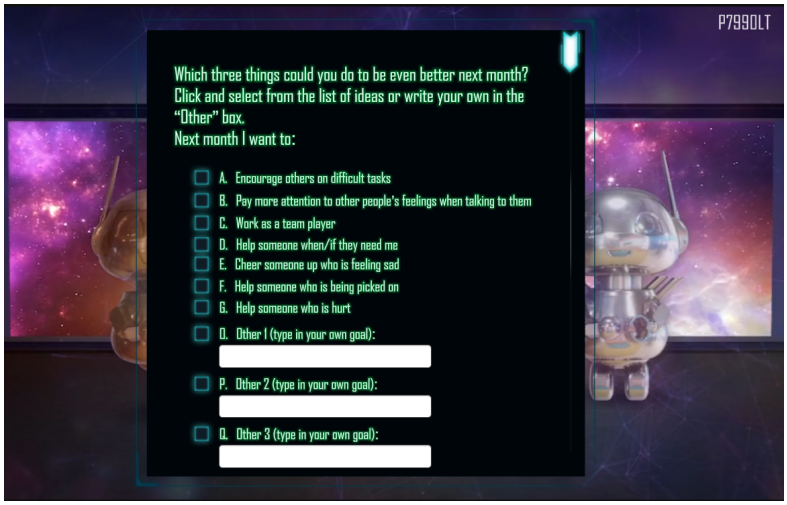

Figure A5. Goal setting activity.

Figure A6. Final game animation.

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