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Research article

A serious-game for child sexual abuse prevention: An evaluation of orbit

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ABSTRACT

Background: Greater public and professional awareness of the extent and impact of child sexual abuse (CSA) has prompted the inclusions of prevention initiatives within school curricula. However CSA education is not always soundly grounded in empirical evidence, and evaluations of the impact of programs often inadequate.
Objective: This paper reports on a randomized-control trial of an empirically informed serious-game for CSA prevention, for children aged 8–10 years. The study also evaluates the impact on learning of complementary classroom lessons and part completion of the Orbit game.
Participants and Setting: The evaluation involved 139 students (female = 78; male = 61) aged 8–10 years (Mage = 9.64, SD = 0.33), from an elementary school in *Queensland*, Australia.
Method: All children were pre-tested and post-tested (at 3 months) for knowledge of abuse prevention using the Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R-III), and a short form (SF) mapped to the learning objectives of Orbit . Children were assigned to one of three groups; i) play Orbit (n = 50); ii) play Orbit and CSA lessons (n = 55); and iii) control (n = 34).
Results: Children in the Orbit play, and Orbit play and lesson groups, significantly ($p < .001$) increased their CKAQ SF scores, whereas those in the control group did not. Furthermore, those children who completed all of Orbit significantly ($p < .001$) increased their post-test CKAQ scores, whereas those who didn't complete the game did not.
Conclusions: This study shows the strength of a serious-games approach for school CSA prevention whilst reporting how child completion can impact learnings.

1. Introduction

Games-based learning can facilitate improved engagement, motivation and equity of access for individuals to education (Australian Government Department of Education, 2020; Gee, 2003, 2008; Ito et al., 2009; Jenkins, Clinton, Purushotma, Robinson, & Weigel, 2006; Klopfer et al., 2009), and has been used in the support of learning from STEM to the liberal arts (Stieler-Hunt & Jones, 2017; Scholes, Jones, Stieler-Hunt, Rolfe, & Pozzebon, 2012). Beyond the standard education curriculum, this mode of

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learning has the potential to address significant social issues such as child sexual abuse (CSA) (Scholes et al., 2012). Previous work (Scholes et al., 2012; Scholes, Jones, & Stieler-Hunt, 2014; Stieler-Hunt, Jones, Rolfe, & Pozzebon, 2014; Scholes, Jones, and Nagel, 2014) demonstrates a need for the development, trial and facilitation of empirically grounded games-based prevention programmes to advance CSA prevention resources in schools.

This paper reports on the development and evaluation of a game-based CSA prevention program in Australia entitled *Name* – a computer game and complementary learning materials, designed for use with school children aged 8–10 years, their teachers, parents and the wider community.

1.1. Child sexual abuse prevention

Child abuse and neglect remains a major societal issue (International Society for the Prevention of Child Abuse & Neglect [ISPCAN], 2020; Mathews et al., 2016; World Health Organization, 2019; United Nations Children's Fund [UNICEF], 2020), requiring strategic national and international response (Litrownik et al., 2005; Renk, Liljequist, & Steinberg, 2002; Wurtele, 2009; Department for Education, 2017; Department of Health, Social Services and Public Safety (DHSSPS) and Department of Justice (2016); Scottish Government, 2018; Welsh Government, 2019). Games-based approaches to CSA prevention have been developed (Finkelhor, 2009; Renk et al., 2002; International Society for the Prevention of Child Abuse & Neglect [ISPCAN], 2020; Sanderson, 2004; United Nations Children's Fund [UNICEF], 2020; Wurtele, 2009; Walsh, Berthelsen, Hand, Brandon, & Nicholson, 2019), however many exhibit conceptual weaknesses (Sanderson, 2004). For example, many programs still warn of 'stranger danger' (National Centre for Missing & Exploited Children [NCMEC], 2019; Trewin, 2005) when in fact an estimated 90 % of abuse is committed by familiar adults (Trewin, 2005). Other programs teach children to listen to their body for warning signs of abuse however overlook that 'bad' touches may actually feel good (Whetsell-Mitchell, 1995). CSA prevention programs should focus on recognising grooming (Briggs, 2007; Smallbone & Wortley, 2001) and help children to resist or report grooming early (Walsh et al., 2019). Additionally, programs should cover non-touching forms of sexual abuse such as pornography, naked photographs, and use of sexualised language.

When designed well, CSA prevention program can be effective in teaching children knowledge and skills (Kenny, 2009; MacIntyre & Carr, 2000; Sanderson, 2004; Walsh et al., 2019; Wurtele & Owens, 1997; Wurtele, 2002). According to a review by Sanderson (2004), p.6), effective CSA programs must "involve children, with explicit training in preventive behaviours and disclosure; involve group training using standardised materials, content and administration; be of longer duration, involving repeated presentations; be incorporated into the school curriculum; and involve a multi-systemic approach, which targets children, parents and teachers. "Effective programs also involve active student participation and engagement so participants can practice the intended behaviour or skill (National Centre for Missing & Exploited Children [NCMEC], 2019). There are challenges to providing young children (aged 8–10 years) with CSA prevention teaching whilst offering a safe, fun and engaging environment to play and learn. Serious-games offer one solution.

1.2. Serious games

Serious games are games that are designed for more than just entertainment (Abt, 1987) and provide learning environments for problem solving (Australian Government Department of Education, 2020; Futurelab, 2014; Gee, 2008; Klopfer, Osterweil, & Salen, 2009). Often used for behaviour change (Baranowski, Buday, Thompson, & Baranowski, 2008), serious games are effective in boosting learning effects, leading to positive functional development (Ito et al., 2009; Jenkins et al., 2006; Johnson, Smith, Willis, Levine, & Haywood., 2011) and improved education training effects (Connolly, Boyle, MacArthur, Hainey, & Boyle, 2012; De Freitas & Jarvis, 2007).

Within the school classroom, serious-games have been seen to improve engagement, help higher-order thinking and problem-solving, and to support decision-making and collaboration (Scholes, Jones, & Stieler-Hunt, 2014). Collaboration and relationship building is important to address weaknesses in prior CSA programs, and serious-games can strengthen healthy relationships between peers and between students and teachers (Stieler-Hunt & Jones, 2015).

1.3. Name game design

Orbit is a free CSA prevention program created by the University of the Sunshine Coast, Australia with financial and in-kind support from the Telstra Foundation, the Daniel Morcombe Foundation, and the Queensland Police Service. This game based approach to CSA prevention was grounded in empirically based attributes of effective CSA prevention programs for schools and contemporary pedagogies for learning. In this way, *Name* is an integrated CSA resource for children, their parents, teachers, and the wider community. Prior to development, a systematic review of international school-based CSA prevention education and training was conducted to identify best practice. Multi-disciplinary teams produced research-based reports on CSA prevention associated with age, gender, computer games and pedagogy, delivery and disclosures, key messages and teacher training requirements (See Scholes et al., 2012; Scholes, Jones, & Stieler-Hunt, 2014; Stieler-Hunt, Jones, Rolfe, & Pozzebon, 2014; Scholes, Jones, and Nagel, 2014; Stieler-Hunt & Jones, 2015). Working within a gaming paradigm allowed *Name* to include key elements identified by Davis & Gidycz, 2000 as often missing, such as longer, repeated programs (of at least 4 incremental sessions), students active in the learning, and where behavioural skills could be practiced.

Development of game content and the project framework for *Name* used measures of treatment fidelity from the National Institutes of Health Behavior Change Consortium (NIHBCC) (Bellg et al., 2004) five-part treatment fidelity checklist, updated in

Table 1
How problematic content was addressed in *Name*.

Problematic content for CSA prevention initiatives	How content was addressed in *Name*
Abuse perpetrated by a familiar adult – Sexual abuse usually involves a prolonged grooming process by someone known to the child and their family rather than a "stranger".	*Name's* overarching narrative gradually unfolds to reveal that a game character was abused by a familiar adult who misused his authority using a grooming process.
CSA usually involves an extended grooming process – Some prevention programs depict abuse as a sudden attack by a perpetrator. Grooming is a process where the child is desensitised to sexual touch over a period of time. Grooming is often accompanied by other perpetrator tactics such as offering bribes, making the child feel special, and ingratiating themselves with the child's family.	Most scenarios used within the scenario-based mini-games describe sexual abuse as being perpetrated by someone known to the child who misused adult authority and used a grooming process.
Inappropriate use of adult authority – Perpetrators of CSA will often misuse adult authority in order to abuse children.	One of the mini-games ("*Name*" machine mini-game) helps players understand the tactics used by perpetrators of CSA, with each level dedicated to a different tactic.
Sexual abuse may not involve touch – Some prevention programs do not recognise that CSA may not involve touch (e.g., exposing children to pornography, exhibitionism),	Some mini-game scenarios describe abuse involving non-touch.
Sexual abuse may feel pleasurable – Touch associated with sexual abuse may feel pleasurable and increase feelings of guilt and shame.	Some scenarios in one of the mini-games ("*Name*" mini-game) describe the confusing feelings that arise from sexual touch that feels pleasurable.
Child safety is the responsibility of adults – Many CSA prevention programs put the onus of responsibility onto children.	*Name* engages adults in the program by providing: information for adults on its website; opportunities for adults to get involved in the program through trusted adult codes and side-by-side play; virtual representations of the players' trusted adults within the game; and opportunities for the player to reflect on the suitability of the adults in their support network. The player creates in-game likenesses of adults from their real life and these likenesses help the player character with game tasks. One of the mini-games ("*Name*" mini-game) depicts adults in the role of protecting children.
Encouraging disclosure to safe adults – There are significant emotional barriers to disclosing CSA. There is a need to encourage purposeful disclosure to responsible and safe adults. Many programs do not discuss the disclosure process.	Each level in one of the mini-games ("*Name*" mini-game) concludes by depicting a child character disclosing abuse to his/her trusted adults. Before the child character will disclose the abuse, however, the player must break down the emotional barriers to disclosing. The overarching narrative culminates in the protagonist disclosing abuse to his/her trusted adults. *Name* present some mini-game scenarios where the child discloses abuse to an adult who does not respond appropriately. In these cases the child proceeds to tell all of his/her trusted adults until someone does respond appropriately or the child contacts a helpline service. An in-game utility called the "relationships board" encourages players to reflect on the quality of the relationships with their trusted adults.
No fault – Those who have been abused often experience feelings of guilt and shame and self-blame associated with the abuse and long-term psychological harm can ensue. Therefore, CSA prevention programs should emphasise that sexual abuse is never the fault of the child and include additional elements to improve children's self-esteem and resilience, as children with low self-esteem are more likely to be abused and believe it is their fault.	The guilt and shame felt by children who have been abused is expressed within the overarching narrative and the levels of one of the mini-games ("*Name*" mini-game). *Name* consistently explains that abuse is never the fault of the child. Subject matter experts provided guidance on the language to use. *Name* includes other features that help to improve children's self-esteem. These include in-game rewards that can be used to decorate the player's rooms on the spaceship as well as an "I am good at" board where players, their classmates, and their trusted adults can leave messages describing what the player is good at.

Borrelli (2011). Examples of the 30 items covering 40 components of the fidelity checklist include information about content and dose for both the treatment and control conditions (length of each contact, number of contacts, duration of contact over time), information on the type of provider needed to successfully implement the intervention (credentials, experience), and articulation of a theoretical framework or clinical guidelines on which the intervention is based. *Name* was piloted with students which involved playtests in classrooms and formal trials in selected schools. Lynas and Hawkins (2017) reported in their systematic review of school-based CSA prevention programs, that only 5 of 17 studies included specific instruments or processes within the study design to measure fidelity, with three involving observation of sessions. Prior to the release of *Name*, weekly play-testing was conducted at two different schools. Game-play was observed and video recorded by researchers, and focus groups were conducted at the end of each game-play session. Analysis of observations of students playing the game and student feedback was used to iteratively design and fine-tune the game, including balancing game challenge to skill level. We were able to achieve 'high' program fidelity (Stieler-Hunt & Jones, 2019) as defined by the NIHBCC as 80 % or more adherence to the checklist (Borrelli, 2011) (cognisant that this is a self-assessment). Table 1 and Table 2 provide overviews of research based key considerations for a serious-games approach to CSA prevention and how *Name* responds to these findings. Table 1 specifically addresses content that is seen as being problematic when teaching CSA concepts. Table 2 explores the problematics associated with the delivery of CSA prevention.

Based on key considerations for games-based approaches to CSA in Table 1 and Table 2, *Name* was mapped on to key learnings

Table 2
How problematics associated with delivery of CSA prevention was addressed in *Name*.

Problematics associated with delivery of CSA prevention	How problematics were addressed in *Name*
Catering for segments of our target audience – Many prevention programs are criticised for not catering well for boys whilst interactive digital games have been criticised for alienating women and girls. Other important segments of our target audience include children with disabilities and children that have experienced or are experiencing sexual abuse.	*Name* is an adventure game, a genre which is engaging to both boys and girls. It is set in a fantastical setting to appeal to players and to introduce concepts of CSA in a less threatening way. Character and game-world customisations are provided in the form of in-game rewards and motivate players. The player can choose to play as a boy or girl, and further, the character Sammy, who is the focus of the narrative, is automatically given the same gender as the player character to help the player identify with Sammy. The player can customise their character including selecting to use a wheelchair. The mini-games feature sexual abuse scenarios, and the children and adults depicted in the scenarios represent a varied range of backgrounds and cultures to illustrate that sexual abuse can occur anywhere in society..
Encouraging active participation – Programs actively involving children are more effective than those using passive methods.	Active participation is required to progress the game. *Name* aims to use immersion, excitement, reward, and challenge as motivation for playing. The game teaches knowledge and skills to recognise and report sexual abuse, and the player must demonstrate correct understanding of this learning to progress through the game.
Explicit training – Programs are more effective if they offer ways for children to rehearse appropriate behaviours including practising and planning for disclosure.	*Name* provides explicit training through the story and mini-games. The story has the main character Sammy being sexually abused by one of the other game characters. As the story progresses the player helps Sammy to recognise what is going on and to tell their trusted adults (rehearsing appropriate behaviours). The player also recognises that they have been the target of grooming from the in-game perpetrator, and they too must disclose this information (rehearsing appropriate behaviours in-game). There are five chapters in the game, and at the start of each the player creates a trust adult game character to help them complete that chapter. They are told that this should be someone from their real-life and from specific distinct domains (such as a teacher from school). The game requires the player to ask this person to be their trust adult in real-life, and at the end of the game the player has talked with, and compiled, five real people with whom they can share things that are worrying them (rehearsing appropriate behaviours in real-life). *Name* has over 40 different scenarios to provide explicit training in identifying situations of abuse and overcoming barriers to telling trusted adults.
Standardised training – More effective programs have standardised training materials and are provided by trained instructors.	The *Name* game provides a standard experience for players, including standardised teacher training materials. The development team included officers from the child protection and investigation unit (situations in *Name* are based on victim and perpetrator statements), counsellors and psychologists from victim support services (*Name* uses appropriate language and supports for disclose), and governement departments of education and teachers in schools (*Name* is aligned and embeded into State curriculum and installed on all State computers). Extensive teacher training materials are available from the *Name* website, and which were developed by teachers for teachers. However no synchronous teacher training is currently offered. The impact of teacher training in CSA prevention on child skills and knowledge should be explored with future funding.
Integrated into school curriculum – More effective programs are integrated into school curriculum.	Games can be integrated flexibly into the curriculum because they can be used in multiple modes. For example, students can play at the same time or separately, and can play in their free time at school or home. *Name* is designed to be played as a stand-alone game or complemented with classroom lesson plans.
Repeat presentations and follow up training – Longer programs are more effective than one-off presentations.	*Name* has a minimum play-time of 5 h. The game saves as it progresses, so that it can be played across a number of sessions and a number of devices and locations. The game has five chapters and it is recommended that students complete a chapter a week, or every two weeks (10 week school terms). Each chapter introduces new learnings but also revisits previous material (within the main story and mini-games), and the player must demonstrate in game competence with all materials before progressing. Considering the mini-games alone, in Chapter 1 the player plays *Name_mini_game_1* (which covers body safety, privacy and respect); in Chapter 2, *Name_mini_game_2* (importance of telling multiple people of your concerns) and also extra levels of *Name_mini_game_1*; in Chapter 3, *Name_mini_game_3* (overcoming offender tactics that might prevent you from disclosing) and extra levels of *Name_mini_game_2*; Chapter 4, *Name_mini_game_4* (children are never to blame for abuse) and extra levels of *Name_mini_game_3*; and Chapter 5, *Name_mini_game_5* (not your fault and you must tell) and extra levels of *Name_mini_game_4*. Similarly the game story revisits earlier learnings, which are collated in the game epilogue.

(*continued on next page*)

Table 2 (*continued*)

Problematics associated with delivery of CSA prevention	How problematics were addressed in *Name*
Involve parents and teachers – More effective programs feature parent involvement and teacher education.	Throughout *Name*, children build their adult support network consisting of five adults from different aspects of their life. At least one adult must be someone in their family and at least one must be someone from their school. The game asks the child player to give a distinct login code to each of their real-life trusted adults as a way of establishing their real network of people to disclose to. The login gives access to all the learning resources, story, mini-games, and specific information for how as a trusted adult they can support the child (eg how to receive a disclosure of sexual abuse, including practical information such as printable wallet card containing example supportive sentences). The *Name_mini_game_3* is specifically designed to build trust and communication skills between the child (player) and the real-life trusted adults. This two-player platformer game allows the child and trusted adult to play the game side-by-side to overcome psychological barriers to disclosing abuse. Multiple levels explain to the trusted adult the importance of togetherness, listening, understanding, believing and courage to act. Students' game progress is saved to the internet so children can also play the game at home or elsewhere.
Knowledge decay – Decay in knowledge occurs over time.	Knowledge is built gradually over the 5 -h plus play-time of the game, typically 1 -h (one chapter) a week/fortnight for 5 − 10 weeks. Each chapter refreshes learnings from the previous chapter. The player can also revisit the game at any time of their choosing. *Name* can be played at home, at school, or elsewhere. The player can choose to replay an element of the game they have already completed (mini-games and overarching story). Even after all chapters are completed (5 − 10 weeks) players are encouraged to replay the mini-games through extra unlocked optional levels that provide the player with in-game rewards. Recognising that knowledge may decay over time, *Name* aims to mitigate some impacts by repeating rehearsal of learnings and allowing replaying for more rewards. With further funding, new resources for later school years could be developed to recap on learnings and improve knowledge.
Negative side effects – Programs may increase fear and anxiety in children.	Some children experience fear and anxiety as a result of prevention programs, although of those that do, their caregivers have indicated that the program was still useful. During the design process edits were made based on potential fear/anxiety as highlighted by subject matter experts, prior to children playing the game. The researchers also observed game-play and conducted semi-structured interviews with the students who played early versions of *Name* to gauge game-play difficulties, conceptual difficulties, and fear and anxiety levels. There were no observations of fear or anxiety in children playing the game.
Positive and supportive program – It can be challenging to present CSA prevention in an empowering way. However, children with low self-esteem are more likely to be abused. Therefore, CSA prevention programs should also aim to improve children's self-esteem and resilience.	*Name* has many positive and supportive features including: building a support network of adults whose in-game representations help the player character; providing "I am good at" boards for players; and providing in-game achievement rewards that players use to decorate customisable spaces. In addition, the game has been designed to provide challenges for children and be a game that all children can complete. The game rewards players for completing in-game quests within each chapter and mini-game level. Feelings of achievement and accomplishment can increase children's self-esteem and resilience. As the child progresses in the game, they observe their achievements through helping Sammy reconnect with the crew.

and skills, building on student's prior knowledge. A core consideration for the game development was the need to develop relationships, trust, well-being, self-worth, esteem and confidence, support networks and community knowledge and responsibility. Furthermore, the game was specifically built in collaboration with counsellors, social workers, psychologists and educationalists to ensure the development of key positive and practical learnings for children, parents and teachers. Teachers can access a dedicated section of the *Name* website which contains additional resources, classroom activities, information about CSA and prevention, and training materials to assist in the facilitation of *Name* in the classroom. The *Name* program is designed to be integrated with classroom activities over a period of 5–10 weeks. The computer game is designed to be played weekly alongside the classroom activities that extend and reinforce key learnings from the game. Activities are provided in the *Name* Teachers' Guide along with additional classroom activities in the Classroom Activities section of the website.

2. The study

The evaluation of *Name* builds on a program of work (Scholes et al., 2014; Scholes, Jones, & Stieler-Hunt, 2014; Stieler-Hunt et al., 2014; and Scholes, Jones, and Nagel, 2014) to investigate the following research question: Does students' knowledge of sexual abuse prevention significantly change between pre and post-test and between conditions (playing *Name*, playing *Name* and engaging in

associated curriculum, control)?

It was hypothesised that playing *Name* (the online game) with curriculum support (game and lesson), as opposed to not playing the *Name* game (control), would increase students' knowledge of child abuse concepts and their ability to recognize and respond in hypothetical abuse situations. It was hypothesised that playing *Name* with curriculum support (game and lesson) would increase students' knowledge of child abuse concepts significantly compared to playing the game without curriculum support (game only). It was also hypothesised that playing *Name* without curriculum support (game only), as opposed to not playing the game (control), would increase students' knowledge of child abuse concepts.

Name received ethical approval for each stage of its development, play testing and formal school trials in Queensland, Australia. Ethical approval was granted by the University of the Sunshine Coast Human Research Ethics committee, the *Queensland* Department of Education and Training Human Research Ethics Committee and the Brisbane Catholic Education Human Research Ethics Committee. Student, parent, teacher and school consent was received. *Name* is freely available from *orbit.org.au*. Classes participating as a control group had could access *Name* after the evaluation was completed.

2.1. Participants

139 students (female = 78; male = 61) aged 8–10 years (mean age = 9.7 years at the pre-test date), from six year 4 classes in one elementary school in *Queensland*, Australia, took part in the evaluation of *Name* – the child abuse sexual abuse prevention program. The 6 teachers involved in running the program ensured that students had time to play the game independently in class and that for children involved in the curriculum there were scheduled regular times to run the lessons and hold debrief discussions with students. Curriculum resources are freely available online (*orbit.org.au*). Approximate times required for each chapter are:

Chapter 1. Togetherness – 1 h 40 min. (1 h game +40 min lesson)
Chapter 2. Listening – 1 h 40 min. (1 h game +40 min lesson)
Chapter 3. Understanding – 2 h (1 h 40 min. game +20 min discussion)
Chapter 4. Belief – 1 h 40 min. (1 h 20 min. game +20 min discussion)
Chapter 5. Courage – 1 h 20 min. (1 h game +20 min discussion)

The game addresses ten key concepts relating to child sexual abuse prevention. These include building of a support network of 5 trusted adults from a variety of segments of the child's life, understanding which parts of the body are private, knowing that it is not okay for others to touch or look at their private parts (the body rules), tactics used by perpetrators, tell and keep on telling, and barriers to telling.

The school was a co-educational, government-run school in metropolitan *State*, Australia. In its year 3 and 5 national testing under The National Assessment Program – Literacy and Numeracy (NAPLAN), results were close to "average of all Australian schools" (Australian Curriculum, Assessment and Reporting Authority, www.myschool.edu.au). The school also scored (1019) close to average (1000) on the Index of Community Socio-Educational Advantage (ICSEA) scale (Australian Curriculum, Assessment and Reporting Authority, https://acaraweb.blob.core.windows.net/resources/About_icsea_2014.pdf).

2.2. Method

Children (n = 139) from 6 classes participated in the evaluation. Classes were randomly assigned to one of three groups - Group 0, 1, or 2. Group 0 were assigned as a control group and did not play the game or engage with the support curriculum (control group, n = 34); Group 1 were assigned to the group to play the CSA prevention game *Name* (game only group, n = 50). Group 2 were assigned to the group to play the CSA prevention game and engage with related curriculum lessons (game and lesson group, n = 55).

Children in group 1 played the game *Name* using school computers (game only group). Children in group 2 played the game *Name* using school computers and engaged with the curriculum (game and lesson group). Teachers of groups 1 and 2 were given a short briefing about the game by researchers, were helped to set up class logins to the game, and were asked to provide time in class for students to play *Name* whenever and however they saw fit. All teachers were given the *Name* Teachers' Guide and were instructed that only teachers of group 2 were to administer the lesson plans as outlined in the guide.

Students with missing data were removed from the analysis. Total number of students in the final evaluation were n = 126: Group 0 (control), n = 33; Group 1 (game only), n = 45; Group 2 (game and lessons), n = 48.

2.3. Instrument: the CKAQ-R-III test

A modified version of the knowledge of abuse prevention concepts was tested using the 33-item *Children's Knowledge of Abuse Questionnaire-Revised* (CKAQ-R-III), a standardized measure with strong psychometric properties (Tutty, 2003). CKAQ-R-III items were specifically developed for children in elementary school and ask questions about different kinds of touches. Questions are answered T for "True", NT for "False", and "?" for "Don't Know". A score of 1 is recorded for a correct response, and 0 for incorrect or Don't Know.

The CKAQ-R-III was administered by the students' normal classroom teacher. Students were given the questionnaire. The teacher was instructed to read each question out to the class and then allow time for students to write their response. The CKAQ-R-III was administered over two time points – pre, and post-test 3 months later. Teachers administered the test (one teacher to the entire class), with each session taking approximately twenty minutes.

2.4. Analysis overview

Several types of analyses of the data were completed. Each is outlined below.

Analysis 1. CKAQ-R-III (minus 2 questions). In our initial analysis of the CKAQ we removed items 17 ("You can trust your feelings about whether a touch is good or bad") and 33 ("If you get separated from your parents in a shopping mall, it's OK to ask a sales clerk or a security guard for help, even if they are strangers"). Item 17 was removed because research informing the *Name* program (Stieler-Hunt et al., 2014; Scholes et al., 2012; Scholes, Jones, & Stieler-Hunt, 2014) suggested that item 17 is problematic because sometimes abusive touch can feel pleasurable. Item 33 was removed because research information from our previous game, Being Safety Smart, indicated that there have been instances where people have used these positions of authority as a way of building trust with children to perpetrate abuse. All other items were scored as for the original CKAQ.

Analysis 2. CKAQ-R-III as related to *Name* learning objectives (CKAQ SF). The *Name* program was developed to achieve a number of learning objectives (LOs). These learning objectives were derived from best practise and research (Scholes, Jones, & Stieler-Hunt, 2014; Scholes et al., 2012; Stieler-Hunt et al., 2014). However not all items on the CKAQ were explicitly covered by the learning objectives and thus the *Name* program. A mapping of the CKAQ items to the *Name* learning objectives created a Short Form (SF) version (17 items). CKAQ SF uses items 1, 2, 5, 6, 9, 10, 11, 12, 13, 15, 18, 19, 22, 25, 27, 31, 32 from CKAQ-R-III.

Analysis 3. Game Completion and Non-Game Completion. Not all students in the game only and game and lesson groups completed the *Name* game within the classroom time allocated by the school. Foundational learning concepts for sexual abuse prevention are covered in the earlier chapters of the *Name* program and then are unified in the final two chapters. Therefore a threshold was set when considering whether a student had 'completed' *Name*. Students who had completed chapter 1, 2 or 3 only were classified as 'not completing' *Name*. Students who had in addition completed chapters 4 and/or 5 were classified as 'completing' *Name*. Individual student progress in the *Name* game was tracked automatically by the software. Both the test scores for CKAQ-R-III (minus 2 questions) and CKAQ SF were examined for game completers and non-game completers.

3. Results

Four sets of analyses were completed. First, an analysis of CKAQ scores for all students in each of the three conditions (control, game only, and game and lesson). Second, an analysis of a short form (SF) of the CKAQ instrument for all students in each of the three conditions. After which CKAQ and CKAQ SF scores were analysed comparing students in each of the three conditions who completed the game against those who did not complete the game.

3.1. Analysis 1. CKAQ-R-III results (all students)

CKAQ analysis was completed using a two-way mixed ANOVA. The data was normally distributed, as assessed by Shapiro-Wilk's test of normality ($p > .05$). There was homogeneity of variances ($p > .05$) and covariances ($p > .001$), as assessed by Levene's test of homogeneity of variances and Box's M test, respectively.

There was no statistically significant interaction between groups and time on CKAQ, $F(2, 123) = 1.403$, $p = .25$, partial $\eta^2 = .022$. The main effect of time showed a statistically significant difference in mean CKAQ score at the different time points, $F(1, 123) = 35.718$, $p < .001$, partial $\eta^2 = .225$. The main effect of group showed that there was no statistically significant difference in mean CKAQ score between groups, $F(2, 123) = .861$, $p = .425$, partial $\eta^2 = .014$, Fig. 1.

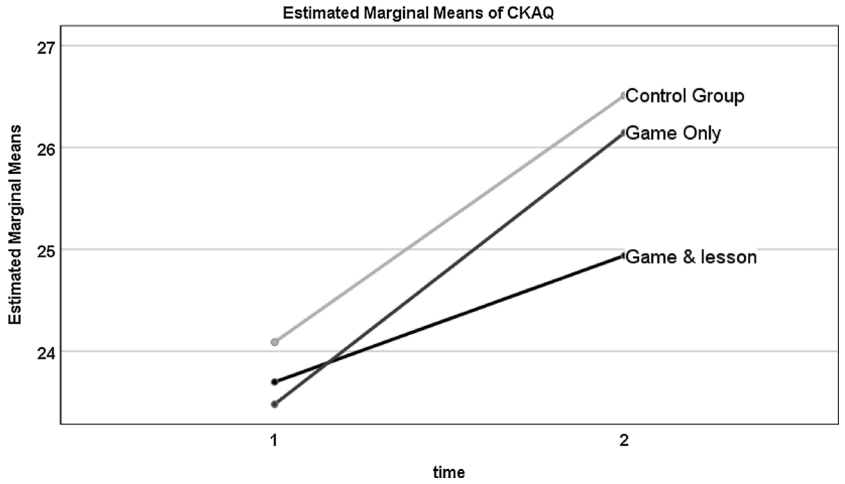

Fig. 1. CKAQ pre (time 1) and post (time 2) scores.

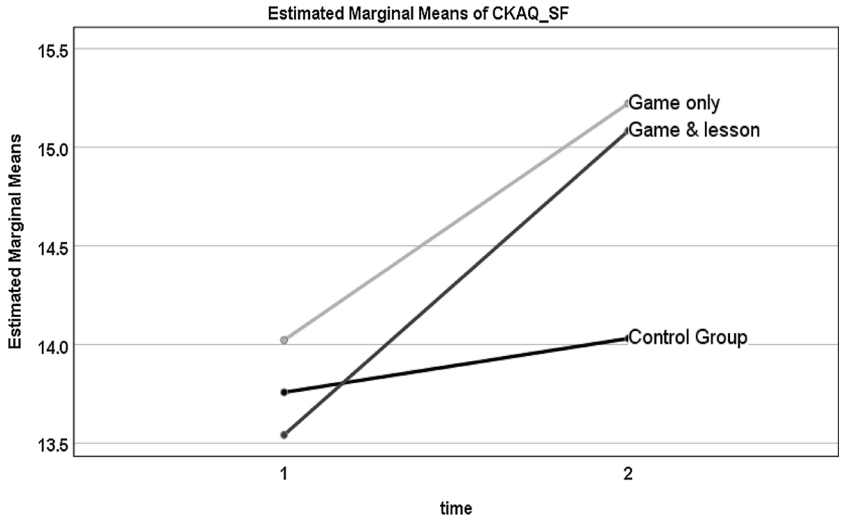

Fig. 2. CKAQ SF pre (time 1) and post (time 2) scores.

3.2. Analysis 2. Short form CKAQ (all students)

The data was normally distributed, as assessed by Shapiro-Wilk's test of normality ($p > .05$). There was homogeneity of variances at time 1 ($p > .05$) but violated at time 2 ($p = .002$), and there was homogeneity of covariances ($p > .001$), as assessed by Levene's test of homogeneity of variances and Box's M test, respectively. The analysis was continued due to the robust nature of the ANOVA.

There was a statistically significant interaction between groups and time on CKAQ SF, $F(2, 123) = 3.745$, $p = .026$, partial $\eta^2 = .057$. The main effect of time showed a statistically significant difference in mean CKAQ SF score at the different time points, $F(1, 123) = 28.656$, $p < .001$, partial $\eta^2 = .189$. The main effect of group showed that there was no statistically significant difference in mean CKAQ SF score between groups, $F(2, 123) = 1.573$, $p = .212$, partial $\eta^2 = .025$. The CKAQ SF score was statistically significantly greater in the game (MD = 1.209, SE = 0.449, $p = .022$) compared to the control group. The CKAQ SF score was not statistically significantly different between the game, and game and lesson, groups (MD = 0.198, SE = 0.404, $p = .876$), and the game and control group and game and lesson (MD = 1.011, SE = .443, $p = .062$).

CKAQ SF scores did not significantly improve (MD = 0.273, SE = .423) for students in the control group (group 0) between time 1 (pre) (M = 13.758, SE = .374) and time 2 (post) (M = 14.030, SE = .470), $F(1,32) = 0.417$, $p = .523$, partial $\eta^2 = .013$, Fig. 2. CKAQ SF scores significantly improved (MD = 1.200, SE = .282) for students in the game only group (group 1) between time 1 (pre) (M = 14.022, SE = .302) and time 2 (post) (M = 15.222, SE = .260), $F(1,44) = 18.137$, $p < .001$, partial $\eta^2 = .292$, Fig. 2. CKAQ SF scores also significantly improved (MD = 1.542, SE = .287) for students in the game and lesson group (group 2) between time 1 (pre) (M = 13.542, SE = .331) and time 2 (post) (M = 15.083, SE = .222), $F(1,47) = 28.840$, $p < .001$, partial $\eta^2 = .380$, Fig. 2. However tests of reliability for this Short Form of the CKAQ are poor, with Cronbach's alpha values of $\alpha = 0.492$ for time 1 and $\alpha = 0.588$ for time 2.

Only results from the Short Form of the CKAQ showed any significant interaction effects. Furthermore the increases in CKAQ SF for game only (group 1) and game and lesson (group 2), although statistically significant, represent only one or two additional answers correct at time 2 compared to time 1. It should also be noted that students at time 1 are already attaining great than 75 % of CKAQ and CKAQ SF answers correct, indicating a good starting knowledge of sexual abuse.

Our hypothesis was not confirmed by CKAQ or CKAQ SF that the students from the game and lesson group would significantly out-perform students from the game only group as there was no notable difference between the performance of students in the game and lesson group and the game-only group. This could indicate that teachers need more training to be able to deliver *Name* key messages more effectively.

3.3. CKAQ results (game completed/not completed)

For each of the game only, and game and lesson groups, there were two conditions (completed and not completed), resulting in the following coding. Note that 0 represents didn't complete *Name*, and 1 represents completed *Name*, for the second digit below:

Group 0 = control group (didn't use *Name*) (n = 33)

Group 10 = students in the game only group who **didn't** complete the game (n = 14)

Group 11 = students in the game only group who **did** complete the game (n = 31)

Group 20 = students in the game and lesson group who **didn't** complete the game (n = 6)

Group 21 = students in the game and lesson group who **did** complete the game (n = 41)

The analysis of CKAQ scores (31 items and SF 17 items) was repeated comparing students who completed *Name* against those who

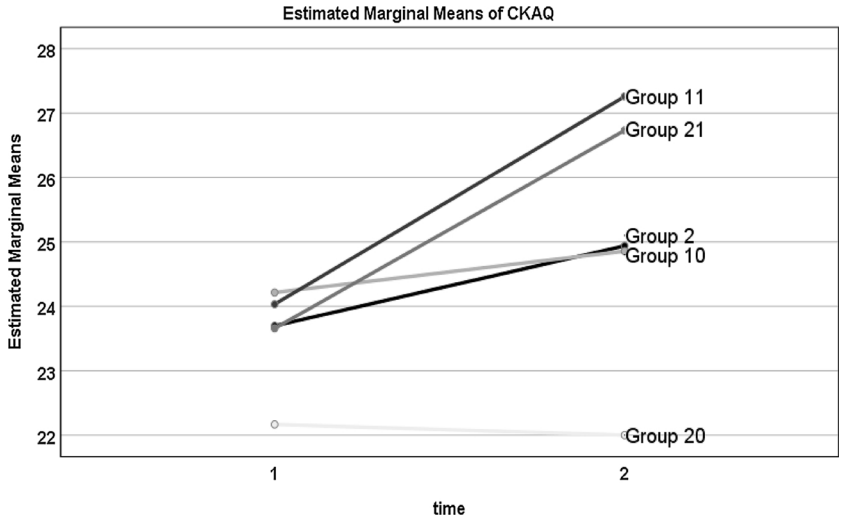

Fig. 3. CKAQ pre (time 1) and post (time 2) scores for game complete/not complete groups.

did not. Students in the game and lesson group who didn't complete the game (group 20) were not included in the statistical analysis as their numbers were low (n = 6) and it was unclear whether they were present for the in-class lessons.

There was homogeneity of variances ($p > .05$) at time 1 (pre-test) and time 2 (post-test) and covariances ($p > .001$). There was a statistically significant interaction between groups and time on CKAQ, $F(3, 115) = 2.770$, $p = .044$, partial $\eta^2 = .068$. The main effect of time showed a statistically significant difference in mean CKAQ score at the different time points, $F(1, 115) = 27.896$, $p < .001$, partial $\eta^2 = .195$. The main effect of group showed that there was no statistically significant difference in mean CKAQ score between groups, $F(3, 115) = 1.133$, $p = .339$, partial $\eta^2 = .029$.

Students who did not complete the game. First, we consider those students who didn't complete the game: those students in the control group (group 0) and those students in the game only group who didn't complete the game (group 10).

CKAQ scores did not significantly improve (MD = 1.242, SE = .818) for students in the control group (group 0) between time 1 (pre) (M = 23.697, SE = .664) and time 2 (post) (M = 24.939, SE = .822), $F(1,32) = 2.309$, $p = .138$, partial $\eta^2 = .067$, Fig. 3. CKAQ scores did not significantly improve (MD = .643, SE = 1.107) for students who didn't complete the game in the game only group (group 10) between time 1 (pre) (M = 24.214, SE = .820) and time 2 (post) (M = 24.857, SE = 1.016), $F(1,13) = .337$, $p = .572$, partial $\eta^2 = .025$, Fig. 3.

Students who did complete the game. Next, we consider those students who did complete the game: those students in the game only group who completed the game (group 11); and those students in the game and lesson group who completed the game (group 21).

CKAQ scores significantly improved (MD = 3.226, SE = .642) for students who completed the game in the game only group (group 11) between time 1 (pre) (M = 24.032, SE = .652) and time 2 (post) (M = 27.258, SE = .581), $F(1,30) = 25.240$, $p < .001$, partial $\eta^2 = .457$, Fig. 3. CKAQ scores also significantly improved (MD = 3.073, SE = .513) for students who completed the game in the game and lesson group (group 21) between time 1 (pre) (M = 23.659, SE = .590) and time 2 (post) (M = 26.732, SE = .445), $F(1,40) = 35.955$, $p < .001$, partial $\eta^2 = .473$, Fig. 3. There were no significantly different CKAQ score between groups at time 1 (pre) or at time 2 (post) (post hoc tests).

3.4. CKAQ SF results (game completed/not completed)

There was no statistically significant interaction between groups and time on CKAQ SF, $F(3, 115) = 2.538$, $p = .060$, partial $\eta^2 = .062$. The main effect of time showed a statistically significant difference in mean CKAQ SF score at the different time points, $F(1, 115) = 24.282$, $p < .001$, partial $\eta^2 = .174$. The main effect of group showed that there was no statistically significant difference in mean CKAQ SF score between groups, $F(3, 115) = 1.364$, $p = .257$, partial $\eta^2 = .034$ (Fig. 4).

These results showed that completing *Name* was more important to learning of sexual abuse prevention knowledge than which of the game only and game and lesson groups students were assigned. In fact students within the game only, and the game and lesson groups who didn't complete *Name* (only completed to chapter 1, 2 or 3) did not significantly increase their knowledge as measured by CKAQ (31 items). However students within the game only, and the game and lesson groups who did complete *Name* (completed chapters 4 and/or 5) did significantly increase their knowledge as measured by CKAQ (31 items). It should be noted that completing the game (with or without the lessons), resulted in two to four more correct answers at time 2 (or don't know to correct) for CKAQ and one or two more correct answers at time 2 (or don't know to correct) for the CKAQ SF. Furthermore, at time 2 ceiling effects may be present, as on average students are correctly answering over 85 % of CKAQ questions and over 90 % of CKAQ SF questions.

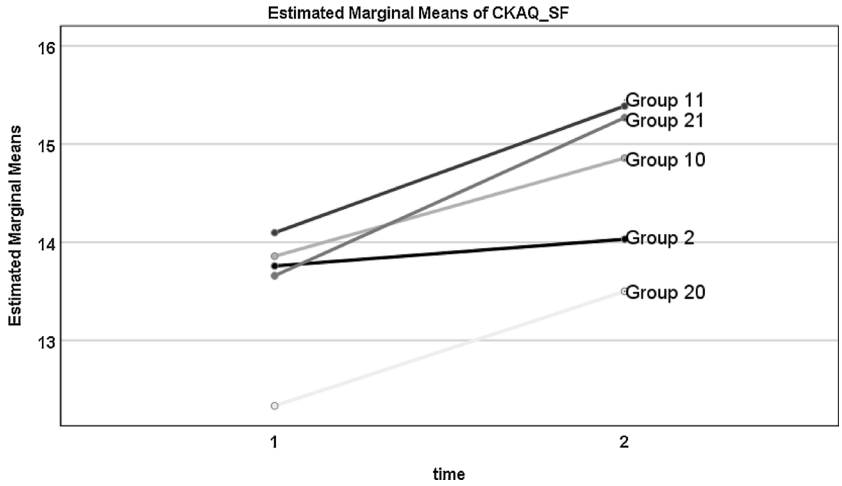

Fig. 4. CKAQ SF pre (time 1) and post (time 2) scores for game complete/not complete groups.

4. Discussion

If playing *Name* and engaging in support curriculum successfully taught children abuse prevention concepts the CKAQ post-test scores should improve more than the scores of those children who had not engaged in game play and related curriculum.

In the study of 139 children aged 8–10 years in a Queensland (Australia) school, those students who played the *Name* game (game only), and those students who played the *Name* game and also used the *Name* classroom learning materials (game and lesson), had increases in their scores on the amended Children's Knowledge of Abuse Questionnaire (CKAQ) (non-significant increases of 2.42 ± 0.58 and 2.67 ± 0.47 respectively for 31 items, and significant increases of 1.20 ± 0.28 and 1.54 ± 0.29 for the short form 17 item version). Furthermore, student knowledge of sexual abuse prevention as measured by the CKAQ (31 items) significantly increased for those students who completed *Name* (completed chapters 4 and/or 5), compared to those students who did not complete *Name* (only completed to chapter 1, 2 or 3), irrespective of which of the participation groups they were assigned (game only, or game and lesson). Whereas those students in the control group who did not use the *Name* game (or *Name* classroom learning materials) did not significantly increase their CKAQ scores (increase of 1.2 ± 0.82 for 31 items, and increases of 0.27 ± 0.42 for the short form 17 item version).

CSA programs are often not evaluated (Sanderson, 2004). If they are evaluated, the impact of the CSA program on participant knowledge is measured but often not compared to a control. Furthermore evaluations typically assume participants complete the CSA program, without understanding the impact on learning of not fully completing the program.

This study included two intervention groups (game only, and game and lesson) and a control, and was able to show that some statistically significant increases in knowledge of sexual abuse prevention was achieved only for students in the intervention groups, albeit corresponding to only an additional two or three more correct answers. However not all students in the intervention groups fully completed the *Name* game and students who had completed chapters 1, 2 or 3 only were classified as 'not completing' *Name*, whereas students who had in addition completed chapters 4 and/or 5 were classified as 'completing' the *Name* game. In the game group, 14 (31 %) of 45 students did not complete the game, whereas in the game and lesson group, only 6 (13 %) of 47 students did not complete the game. The *Name* classroom lessons complement chapters in the game, and thus it could be expected that teachers encouraged children in game and lesson classes to keep pace, which resulted with fewer students in these groups not competing the game. Students who did not complete the game did not significantly improve their knowledge of CSA prevention as measured by CKAQ and CKAQ SF, whereas students who did complete the game did show statistically significant increases. Again these results should be considered in relation to the small number of additionally correct answers and potential ceiling effects.

Child sexual abuse prevention is a sensitive subject area to teach children, particularly in the case of *Name*, teaching children aged 8–10 years. Whereas our anti-abduction game for children age 6–8 years (*Being Safety Smart*) was rule-based, perpetrators of CSA often use more subtle grooming techniques to confuse their victims. Furthermore, elements of other CSA prevention programs are not appropriate, such as stranger danger, trusting feelings, and protective behaviours, as most perpetrators are known to the victim and their family, perpetrators focus on making their victims feel 'good' or 'special', or that it is their 'fault', and some child-based protective behaviours such as 'crying' or self-defensive can escalate the danger to the children. Therefore it was imperative that *Name* was clear in explaining to children what sexual abuse is and the importance for the child to tell trusted adults if this had happened. *Name* was structured such that important learnings were repeated actions across the game. For example, the Robot Factory mini-game required children to build robots for the spaceship by 'touching' and moving parts of robots for construction, whilst 'not touching' other parts (mouth, chest and area covered by the underpants). In the Need to Tell Machine mini-game, the child is required to identify which scenarios must be told to their trust adults, and which do not need to be told, and in the Speak Up mini-game the child plays alongside one of their trusted adult to help an 'in-game child' overcome their fear of disclosing abuse to their trusted adult. The child must play these three mini-games during the first three chapters of *Name* in order to progress the overall game and help the

spaceship's computer, Sammy. Although these three mini-games are important to explain sexual abuse and the need to disclose, and to whom, our findings suggest that learnings are not being solidified, nor related to the behaviour of Sammy and other crew members on the spaceship. It is possible that the learning is only fully consolidated when pieces of the story are united in Chapter 4, when it is obvious to the child player that Sammy has been sexually abused by a crew member, and during Chapter 5 when the child player helps Sammy tell all their trusted adults of the abuse. In Chapters 4 and 5 the child player becomes aware that the perpetrator had been using techniques on them too, such as treats, bribes, secrets, coercions, tricks, blackmail, making them feel special, making their feel it was their fault, isolating them from those who can help, making them feel no one will believe them, and making them believe something that isn't true. In fact the first interaction between the child player and the 'in-game' perpetrator sees the perpetrator giving them a communication device but telling them to keep it a secret from the rest of the crew. Adults (teachers and parents) who have played or watched this sequence have commented immediately on the inappropriateness of asking the child to keep a secret, challenging the *Name* design team, and threatening to remove their child(ren) from the study. However no child player in the study were concerned in Chapter 1 by the gift of the communicator or the need to keep it a secret, further highlighting the need for these offender grooming techniques to be integrated throughout the game. It should be noted that we have been able to explain to the satisfaction of the adults the importance and need for the perpetrator to use techniques on the player.

In this study some children did not complete all of the *Name* program, and these students did not significantly improve their knowledge of CSA prevention. However these student did not significantly decrease their knowledge of CSA prevention. Possible reasons for some students not completing the game include absence from school which coincided with *Name* play and lesson sessions; lack of interest in the *Name* game; lack of interest in computer games more generally, or school; the subject matter was challenging; and/or these student typically struggle with learning.

Although games have been produced for child safety, most are aimed at a younger audience and very few, if any, target the prevention of child sexual abuse. This study indicates that a game such as *Name* can be used to teach CSA prevention topics. However, our findings indicate that students must engage with the game and continue far enough into the game to receive knowledge gains.

Sexual abuse prevention programs are not "quick fix" solutions and resources need to be incorporated ongoing into the school curriculum providing more exposure to the concepts, attitudes and beliefs associated with prevention. As prevention concepts can be difficult for children to integrate due to culturally endorsed beliefs about relationships with others, especially between children and adults, ongoing participation in CSA prevention programs provides an opportunity to educate children to safeguard them from the often long-term and severe consequences of such abuse. The *Name* game is designed to be played over a 5–10 week period, gradually building children's knowledge as they play. It has been designed so that it can be incorporated as part of classroom learning or at home.

In both of the CKAQ analyses (31 items and 17 items) there was no statistically significant differences between scores for the game only group and game and lesson group. This could indicate that teachers need more training to be able to deliver *Name* key messages more effectively. Teachers may not have felt confident or comfortable presenting some of the subject matter. However it can also be argued that children aged 8–10 years can learn sexual abuse prevention knowledge from playing the *Name* game without needing to participate in teacher-led lessons. Removing teacher facilitation in the learning, allows the *Name* game to be played beyond the classroom, and thus providing more opportunities for children to use the game and access the associated learning. The results also showed that completing *Name* significantly increased knowledge of sexual abuse prevention as measured by CKAQ. Since this evaluation, the reach, accessibility and ease of use of *Name* has been improved through the release of a tablet version of *Name* (named *Orbit Rescue*) that is available on the Google Play and Apple's App Store.

Although the evaluation was conducted in a classroom, providing additional lessons as per the *Orbit Teachers' Guide* did not have a significant impact on knowledge gains. This indicates that children who play the game until the end are likely to have knowledge gains regardless of whether extra classroom activities are conducted around the game. However given the nature of the content, we recommend that the game be played with knowledge of a parent or teacher.

4.1. Strengths and limitations of the study

The evaluation of *Name* involved working with six teachers and 139 students aged between 8 and 10 years over 4 months. In itself this represented a logistical success and provided some strengths but also limitations to the research. Working with one school and one year group within that school removed any potential variances introduced by multiple schools, geographical locations, socio-economic status, and education systems. However the results here cannot be generalised to a wider population. Students from six classes participated and although these classes were not streamed for academic performance it is possible that the different teachers created different teaching environments, including a priori knowledge of sexual abuse prevention and personal motivations which may have affected the evaluation results.

A standardised measure of child sexual abuse prevention knowledge was used: CKAQ (Tutty, 2003). However our prior research contradicts answers for two of the original 33 items from the instrument (Q17 and Q33). Thus 31 items from the CKAQ instrument were used. Not all concepts and knowledge in the CKAQ were explicitly covered in *Name*, and the learning objectives of the program mapped to only 17 items. These were used to form a short form of the CKAQ for this study. However this short form CKAQ had poor reliability as measured with Cronbach's alpha values of 0.492 for time 1 (pre) and 0.588 for time 2 (post). The 31-item CKAQ used in this study had good and adequate reliability as measured with Cronbach's alpha values of 0.726 for time 1 (pre) and 0.664 for time 2 (post) respectively.

The interactions effects differed between CKAQ and the short form CKAQ for the analysis of all students and the analysis of game complete/game incomplete. As discussed, the foundational messages of CSA prevention are presented in the first three chapters of

Name, and it is possible that learning is only fully consolidated when the narrative is unified in Chapter 4 and Sammy discloses in Chapter 5. The 17 item short form of CKAQ is mapped to the core CSA prevention messages presented in the early chapters of *Name*. Thus the no significant finding between students who complete the game and those that do is understandable as all students will have experienced the learnings measured by the short form by Chapter 3. Therefore the 31 item CKAQ score may be a better measure of CSA prevention knowledge between those students who complete the game and those that do not. Conversely, as 22 % of students did not completed *Name* in the game only and game and lesson groups, the analysis for all students has shown that the short form version of CKAQ has a significant interaction effect whereas the 31 item CKAQ does not.

The Children's Knowledge of Abuse Questionnaire (CKAQ) is a series of statements which the child answers as being true, false or don't know, thus demonstrating knowledge of CSA prevention but not skills. It is an ongoing challenge to measure CSA prevention skills with children, and methods typically used to assess skills in other domains such as role-play and vignettes can be less appropriate in CSA, particularly with children aged 8–10 years. However *Name* builds in rehearsals of CSA preventions skills throughout the game, eg as the player supports Sammy to disclose (rehearsal of skills in-game); player discloses grooming techniques (rehearsal of skills in-game); player establishes a real-life network of 5 trusted adults (rehearsal of skills in real-life); and player communicates with real-life adults (side by side play) about CSA in-game situations and scenarios (rehearsal of skills in real-life), see Table 2. The child must successful complete each of these aspects of the game for the game to progress, and thus will have demonstrated CSA prevention skills both in-game and out-of-game with their trusted adults. Future work could consider whether progress in-game could represent CSA skill development, separating out those children who didn't complete the game because of poor CSA skills with those who didn't play the game due to absence or lack of interest.

The Children's Knowledge of Abuse Questionnaire (CKAQ) does not test the likelihood to disclose and does not help us to understand why some children don't tell. It continues to be difficult to understand why some children don't disclose, however unlike other locations (eg some US States, Blakeya, Glaudea, & Williams Jennings, 2019), schools in *Queensland*, Australia are mandated to inform the Queensland Police Service of sexual abuse, and future studies could monitor the numbers of disclosures before, during and on completion of the *Name* program. The Australian Bureau of Statistics Personal Safety Survey (Australian Bureau of Statistics, 2017) found that 11 % of women and 5% of men in Australia report having been sexually abused before the age of 15 years, and that move than 30 % of victims never disclose the abuse to anyone. We would expect the number of disclosures from children to increase if children not only acquire knowledge through *Name* but also apply this knowledge with confidence to disclose.

4.2. Implications

The aim of *Name* is to help young children to develop relationships, trust, wellbeing, self-worth, esteem and confidence, and to build supportive networks, community knowledge and responsibility. *Name* provides children and adults with an opportunity to be supported, to discuss child sexual abuse, and break the silence that serves to protect perpetrators.

5. Conclusion

Grounded in empirically-based attributes and best practice of effective CSA prevention programs for schools, and coupled with contemporary pedagogies for learning, including a serious-gaming paradigm, *Name* has been designed to overcome many of the challenges identified in other CSA prevention programs, to engage and educate children aged 8–10, their parents, and the wider community, about issues of sexual abuse.

Measuring efficacy was two-fold. *Name* was developed iteratively and continuously appraised against a measure of treatment fidelity, and subsequently formally evaluated with a sample of 139 students, randomly assigned to one of three experimental conditions (play *Name* only; play *Name* and lessons; and control), and learnings afforded were measured pre- and post- intervention using the Children's Knowledge of Abuse Questionnaire-Revised (CKAQ-R-III), and a short form (SF) of the CKAQ mapped to the learning objectives of *Name*. Children in the *Name* play, and *Name* play and lesson groups, significantly ($p < .001$) increased their scores post-test with CKAQ SF, whereas those in the control group did not. Furthermore, those children who completed all of *Name* significantly ($p < .001$) increased their post-test CKAQ scores, whereas those who didn't complete the game did not.

Findings of this study provide better understandings of how child and teacher engagement and completion of school CSA prevention programs can impact learnings, whilst recognising and evidencing the strength of a serious-games approach to achieve significant CSA knowledge gains for young children.

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References

Abt, C. (1987). *Serious games.* University Press of America.
Australian Bureau of Statistics (2017). *Personal safety survey, Australia, 2016. Cat. No 4906.0.* Canberra: ABS.
Accessed 6 January 2020. Games-based learning, Digital Technologies Hub, https://www.digitaltechnologieshub.edu.au/teachers/topics/game-based-learning, 2020.
Baranowski, T., Buday, R., Thompson, D. I., & Baranowski, J. (2008). Playing for real: Video games and stories for health-related behavior change. *American Journal of Preventive Medicine, 34*(1), 74–82. https://doi.org/10.1016/j.amepre.2007.09.027.

Bellg, A., et al. (2004). Enhancing treatment fidelity in health behavior change studies: Best practices and recommendations from the NIH Behavior Change Consortium. *Health psychology: Official journal of the Division of Health Psychology, American Psychological Association, 23*, 443–451. https://doi.org/10.1037/0278-6133.23.5.443.

Blakeya, J., Glaudea, M., & Williams Jennings, S. (2019). School and program related factors influencing disclosure among children participating in a school-based childhood physical and sexual abuse prevention program. *Child Abuse & Neglect, 96*. https://doi.org/10.1016/j.chiabu.2019.104092.

Borrelli, B. (2011). The assessment, monitoring, and enhancement of treatment fidelity in public health clinical trials. *Journal of Public Health Dentistry, 71*, S52–S63. https://doi.org/10.1111/j.1752-7325.2011.00233.x.

Briggs, F. (2007). The challenge of protecting boys from sexual abuse. *Australian Institute of Criminology Conference*.

Connolly, T., Boyle, E., MacArthur, E., Hainey, T., & Boyle, J. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education, 59*(2), 661–686. https://doi.org/10.1016/j.compedu.2012.03.004.

Davis, M., & Gidycz, C. (2000). Child sexual abuse prevention programs: A meta-analysis. *Journal of Clinical Child Psychology, 29*(2), 257–265. https://doi.org/10.1207/S15374424jccp2902_11.

De Freitas, S., & Jarvis, S. (2007). Serious games—Engaging training solutions: A research and development project for supporting training needs. *British Journal of Educational Technology, 38*, 523–525. https://doi.org/10.1111/j.1467-8535.2007.00716.x.

Department for Education (2017). *Child sexual exploitation: Definition and a guide for practitioners, local leaders and decision makers working to protect children from child sexual exploitation.* Accessed 30 November 2019https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/591903/CSE_Guidance_Core_Document_13.02.2017.pdf.

Department of Health, Social Services and Public Safety (DHSSPS) and Department of Justice (2016). *Stopping domestic and sexual violence and abuse in Northern Ireland: A seven year strategy*. Accessed 30 November 2019https://www.health-ni.gov.uk/sites/default/files/publications/dhssps/stopping-domestic-sexual-violence-ni.pdf.

Finkelhor, D. (2009). The prevention of child sexual abuse. *The Future of Children, 19*(2), 169–194. https://doi.org/10.1353/foc.0.0035.

Futurelab (2014). *Serious games.* Accessed 1 November 2019 https://www.futurelab.net/tags/serious-games.

Gee, J. (2003). What video games have to teach us about learning and literacy. Technology Pedagogy and Education. *Computers in Entertainment, 1*(20), https://doi.org/10.1145/950566.950595.

Gee, J. (2008). Learning and games. The ecology of games: Connecting youth, games, and learning. In K. Salen (Ed.). *MacArthur foundation series on digital media and learning* (pp. 21–40). Cambridge, MA: The MIT Press. https://doi.org/10.1162/dmal.9780262693646.021.

International Society for the Prevention of Child Abuse and Neglect [ISPCAN]. (2020). Accessed 7 January 2020, https://www.ispcan.org/.

Ito, M., et al. (2009). *Hanging out, messing around, and geeking out: Kids living and learning with new media.* Cambridge, Massachusetts, London, England: The MIT Press.

Jenkins, H., Clinton, K., Purushotma, R., Robinson, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century.* Chicago, IL: MacArthur Foundation.

Johnson, L., Smith, R., Willis, R., Levine, A., & Haywood, R. (2011). *The 2011 horizon report*Austin, TX: The New Media Consortium.

Kenny, M. (2009). Child sexual abuse prevention: Psychoeducational groups for preschoolers and their parents. *The Journal for Specialists in Group Work, 34*(1), 1–19. https://doi.org/10.1080/01933920802600824.

Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward, the education arcade.* Massachusetts Institute of Technology.

Litrownik, A., English, A., Briggs, E., Newton, R., Romney, S., & Dubowitz, H. (2005). Measuring the severity of child maltreatment. *Child Abuse & Neglect, 29*(5), 553–573. https://doi.org/10.1016/j.chiabu.2003.08.010.

Lynas, J., & Hawkins, R. (2017). Fidelity in school-based child sexual abuse prevention programs: A systematic review. *Child Abuse & Neglect, 72*, 10–21. https://doi.org/10.1016/j.chiabu.2017.07.003.

MacIntyre, D., & Carr, A. (2000). Prevention of child sexual abuse: Implications of programme evaluation research. *Child Abuse Review, 9*(3), 183–199.

Mathews, B., Walsh, K., Dunne, M., Katz, I., Arney, A., Higgins, D., et al. (2016). *Scoping study for the first Australian national survey of the prevalence of child abuse and neglect.* Accessed 30 November 2019Sydney: Royal Commission into Institutional Responses to Child Sexual Abuse1–256. https://aifs.gov.au/cfca/publications/prevalence-child-abuse-and-neglect.

National Centre for Missing and Exploited Children [NCMEC]. (2019). Accessed 5 November 2019. http://www.missingkids.com/.

Renk, K., Liljequist, L., & Steinberg, A. (2002). Prevention of child sexual abuse: Are we doing enough? *Trauma, Violence & Abuse, 3*(1), 68–84. https://doi.org/10.1177/15248380020031004.

Sanderson, J. (2004). *Child-focused sexual abuse prevention programs. Crime and misconduct commission: Research and issues paper series. No 50.* Brisbane: CMC.

Scholes, L., Jones, C., Stieler-Hunt, C., Rolfe, B., & Pozzebon, K. (2012). The teachers' role in child sexual abuse prevention Pprograms: implications for teacher education. *Australian Journal of Teacher Education, 37*(11)https://doi.org/10.14221/ajte.2012v37n11.5.

Scholes, L., Jones, C., Stieler-Hunt, C., & Rolfe, B. (2014). Serious games for learning: games-based child sexual abuse prevention in schools. *International Journal of Inclusive Education, 18*(9), 934–956. https://doi.org/10.1080/13603116.2013.860195.

Scholes, L., Jones, C., & Nagel, M. (2014). Boys and CSA prevention: issues surrounding gender and approaches for prevention. *Australian Journal of Teacher Education, 39*(11)http://ro.ecu.edu.au/ajte/vol39/iss11/1.

Scottish Government (2018). *National action plan to prevent and tackle child sexual exploitation: Progress report 2017/18*Access 30 November 2019https://www2.gov.scot/Resource/0053/00534135.pdf.

Smallbone, S., & Wortley, R. (2001). *Child sexual abuse: Offender characteristics and modus operandi. Trends & issues in crime and criminal justice, No. 193*. Canberra: Australian Institute of Criminology.

Stieler-Hunt, C., Jones, C., Rolfe, B., & Pozzebon, K. (2014). Examining key design decisions involved in developing a serious game for child sexual abuse prevention. *Frontiers in Psychology, 5*(73), https://doi.org/10.3389/fpsyg.2014.00073.

Stieler-Hunt, C., & Jones, C. (2015). Educators who believe: understanding the enthusiasm of teachers who use digital games in the classroom. *Research in Learning Technology, 23*https://doi.org/10.3402/rlt.v23.26155.

Stieler-Hunt, C., & Jones, C. (2017). Feeling alienated ? teachers using immersive digital games in classrooms, Technology. *Pedagogy and Education, 26*(4), 457–470. https://doi.org/10.1080/1475939X.2017.1334227.

Stieler-Hunt, C., & Jones, C. (2019). A professional development model to facilitate teacher adoption of interactive, immersive digital games for classroom learning. *British Journal of Education Technology, 50*, 264–279. https://doi.org/10.1111/bjet.12679.

Trewin, D. (2005). *Personal safety survey (Catalogue No 4906.0).* Canberra: Australian Bureau of Statistics.

Tutty, L. (2003). *Children's knowledge of abuse questionnaire - revision III. Received via E-Mail by L.M. Tutty.* University of Calgary Unpublished questionnaire.

United Nations Children's Fund [UNICEF] (2020). *United nations, creative community outreach initiative (CCOI).* Accessed 7 January 2020https://www.un.org/en/ccoi/unicef-united-nations-childrens-fund.

Walsh, K., Berthelsen, D., Hand, K., Brandon, L., & Nicholson, J. M. (2019). Sexual abuse prevention education in Australian primary schools: A National Survey of Programs. *Journal of Interpersonal Violence, 34*(20), 4328–4351. https://doi.org/10.1177/0886260519869246.

Welsh Government (2019). *National action plan preventing and responding to child sexual abuse.* Accessed 5 November 2019https://gov.wales/sites/default/files/publications/2019-07/national-action-plan-preventing-and-responding-to-child-sexual-abuse.pdf.

Whetsell-Mitchell, J. (1995). *Rape of the innocent: Understanding and preventing child sexual abuse.* Washington, DC: Taylor & Francis.

World Health Organization (2019). *Violence against children.* Accessed 20 December 2019https://www.who.int/news-room/fact-sheets/detail/violence-against-children.

Wurtele, S. (2002). School-based child sexual abuse prevention. In P. A. Schewe (Ed.). *Preventing violence in relationships: Interventions across the life span* (pp. 9–25). Washington, DC: American Psychological Association.

Wurtele, S. (2009). Preventing sexual abuse of children in the Twenty-First Century: Preparing for challenges and opportunities. *Journal of Child Sexual Abuse, 18*(1), 1–18. https://doi.org/10.1080/10538710802584650.

Wurtele, S., & Owens, J. (1997). Teaching personal safety skills to young children: An investigation of age and gender across five studies. *Child Abuse & Neglect, 2*(8), 805–814. https://doi.org/10.1016/S0145-2134(97)00040-9.