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# **The Development Approach of a Pedagogically-Driven Serious Game to support Relationship and Sex Education (RSE) within a classroom setting**

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## **Abstract**

Didactic approaches to Relationships and Sex Education (RSE) have been shown to yield limited outcomes when compared to approaches that stimulate peer discussion and debate. Creating effective interventions, which stimulate peer involvement, remains a demanding task and finding a solution that is not only engaging but also pedagogically sound is vital. A case thus exists for exploring how game technology might facilitate more feasible solutions. This paper presents the development approach of a digital game: PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships), designed by a cross-disciplinary team of UK researchers from Coventry University's Studies in Adolescent Sexual Health (SASH) research group and the Serious Games Institute (SGI). Psychological targets for game content were identified through Intervention Mapping (IM) and the game design process was based on the Four-Dimensional Framework of Learning (4DF) emphasizing the context of deployment, learner profiling and the pedagogical perspective that influence the mode of representation of the learning content. Early efficacy testing of the game solution was validated through a cluster-randomized controlled trial in local schools (n=505) indicated some positive outcomes in favour of the game-based approach, based on self-reported measures of psycho-social preparedness for avoiding coercion ( $F[3, 501] = 15.306, p < .001, \eta_p^2 = .084$ ). Analysis of observation data suggests that blending this interactive game-based approach with traditional classroom delivery encouraged the teachers and students to engage in communal discussions and debriefing during and after game play. Together, the results demonstrated real benefits for pedagogy-driven game-based approaches to support the delivery of RSE within a classroom setting.

## **Keywords**

Serious Games, Game Development, Game Design, Relationships and Sex Education, Sexual Coercion, Intervention Mapping, Pedagogy

## **1 Introduction**

The application of digital games to support pedagogical goals often seeks to capitalize on growing trends amongst a wide range of target audiences to engage with digital media recreationally. The advances have led to wider uses of games for a range of non-entertainment purposes. The emergence over the last ten years of serious – or educational –

games has been built upon wider access to broadband connectivity, advances in computing and the pervasiveness of entertainment games in everyday life: a survey across 5 European countries (n=13,000), showed 74% of 16 to 19 year olds from the UK considered themselves gamers (ISFE, 2010). By definition, Serious Games (SG) refers to applications developed using computer game technologies that serve purposes other than pure entertainment. The term has been used to describe a variety of game types, particularly those associated with e-learning, military simulation and medical training. Games on the topic of sexual health such as 'Privates' have been commissioned by UK's Channel 4 TV Company to engage and educate young people. Other entities, such as the Parliamentary Education Group, DEFRA and the US government (who held a competition around games for health) are increasingly commissioning games for learning purposes (Ulricsac, 2010).

There is also a shift in the use of games to support delivery of formal education. *Consolarium*, a game-based learning (GBL) initiative of Education Scotland involved teachers across Scotland exploring and disseminating the efficacy of using computer games in terms of their positive impact on teaching and learning. Other initiatives include the Institute of Play's *Quest to Learn Middle School* in New York, North West Learning Grid's *DiDa* program in England and Futurelab's *Teaching with Games* project.

Games used with sufficient support were shown to be motivational and an aid to learning high level or complex skills (Hailey, Connolly, Stansfield & Boyle, 2011). To support this shift, practical advice on games use in the classroom has been developed from the framework of European Schoolnet's Games in Schools project (Felicia, 2009). Twenty-first century skills, such as problem solving and collaboration can be supported if serious games can provide appropriate assessment and complement existing lesson structures. To compare the effectiveness between a GBL approach and traditional learning, Yang (2012) carried out a quasi-experiment over a full semester (23 weeks) in two ninth-grade Civic and Society classes (n=44, age=15-16). The study demonstrates that a game-based approach using commercial entertainment games was effective in promoting students' problem solving skills. Kim and Chang (2010) carried out an empirical study on the effects of playing computer games on mathematics achievements for 4<sup>th</sup> graders and they found that the intervention group compared to the control group achieved higher mathematics performance.

Games are more likely to be used if they can be seen to inspire, or there is a direct link to the curriculum and teachers play an important role in the adoption and effective use of a GBL approach (Bourgonjon, De Grove, De Smet, Van Looy, Soetaert & Valcke, 2013). Ulricsac (2010) argues that in the majority of cases, the criterion for using a game is influenced by the teachers' need for assistance. When delivering lessons on topics such as personal relationships and sexual health, this benefit of assistance from a relevant professional can be substantial and the benefits of encouraging discussion amongst peers have been demonstrated (Mellanby, Phelps, Crichton, & Tripp, 1995).

With the context of formal classroom based secondary education in mind, this paper discusses the development approach of a digital game PR:EPARe (Positive Relationships: Eliminating Coercion and Pressure in Adolescent Relationships) aiming to assist the delivery of Relationship and Sex Education (RSE). RSE in the UK is typically taught as part of a broader Personal, Social and Health Education (PSHE) curriculum and remains a non-statutory element of learning and teaching in secondary schools (Brown & Mackay, 2012; HM

Government, 2010). Although most schools in the UK do include RSE in their curriculum delivery, the nature and content of what is taught can vary widely and is often dependent on the skills and dedication of PSHE leads and their colleagues (e.g. Sewell, 2011). Using digital resources presents an opportunity for supporting a certain level of consistency of delivery, under the proviso that its design ensures students and teachers find it engaging and rewarding to use and the solution is pedagogically sound. In this case, a game-based learning approach was explored capitalizing on its engaging nature with early research indicating efficacy for learning.

The development of a practical strategy to ensure RSE health objectives are realised and achieved through GBL requires an *iterative and collaborative* approach throughout each stage of the preparation, design and implementation processes. Various issues have to be considered when adapting game-based approaches for learning and health purposes, such as adjusting to the multi-disciplinary methodologies to approach application, delivery as well as the acceptance of content from the perspectives of the stakeholders (i.e. end users, game designers, health practitioners and educationalists). In addition to the potential issues concerning disciplinary convergence, considerations have to be made for the functional aspects in the development of a serious game and how easy it is to facilitate into an educational setting. Adapting game mechanics, aesthetics, user interfaces and technological deployment within a learning environment contributes to the various sub-divisional levels of the production processes required to execute efficacy in GBL approaches.

With these perspectives, section 2 discusses the deployment and pedagogical considerations of a game-based approach. The specific design and development methodology of the PR:EPARe game is then documented in Section 3. Section 4 discusses the methods implemented to achieve qualitative student and teacher feedback and delivery of the cluster Randomized Control Trials (C-RCT). Section 5 concludes the outcomes of the development and the pilot deployment of the game and identifies areas for future work.

## **2 Background: Games and Learning**

Traditional approaches to technology acceptance advocate a combination of perceived usefulness and ease-of-use (Davis, 1993), though in the case of a game, “usefulness” can exist in terms of either its entertainment or educational value. Furthermore, perception can change between audiences: for learners, the entertainment value may be paramount; whilst for the teacher, proven value in delivering educational outcomes can be essential, as can the ability to blend the resource into established practices (Tsai, Hong, & Ho, 2009). Games, which are more readily blended with existing educational techniques and practices, are more likely to be accepted by teachers as useful resources, and therefore it is worth considering how designs might support such blending. This can range from pragmatic considerations, such as how well an intended play session fits within a teaching schedule, to pedagogical designs, which seek to address shortcomings in didactic instruction.

Hence where SGs are concerned, game play is paramount. If the user does not engage with the game, its value as a learning object may be less effective (Zyda, 2005). By the same token, however, players may not necessarily be averse to playing games with an explicit educational agenda that may reduce its entertainment factor. This is borne out by a recent wide-scale survey of school-children in which the majority of those questioned stated that

they did not mind using games with overtly educational objectives in an informal setting (Dunwell, Christmas & de Freitas, 2011). Evidently what counts first and foremost is the expectation of playing a game that features good playability and offers a rich and engaging gaming experience, irrespective of whether there are overtly educational objectives or not. Indeed, the question of expectation is an important one both for SG design and deployment.

In relation to the role of teachers, Dewey (1916) considered that “education is not an affair of telling and being told, but an active, constructive process”. Therefore, enthusiasm for using games can be blended with knowledge to be constructed so as to create a complex learning experience for individual students. To support the learning outcomes of a curriculum in the 21st Century, it is important to scaffold the teaching and learning of students, building on a basis of knowledge recall and comprehension to use and apply skills as well as to analyse and evaluate process, outcomes and consequences (Popescu, Stanescu, Arnab, Berta, de Freitas, Earp et al., 2011). Arnab, Berta, de Freitas, Earp, Popescu, Romero et al. (2012) emphasise that not only should teachers know the game well, propose specific trajectories to the students and verify effectiveness, but teachers should also be mediators and prompt positive discourse subsequent to the game. For instance, the teacher can highlight themes from the game scenarios and encourage students to participate in interactive discussions leading to reflection (Whitton, 2010).

Hence, in the case of PR:EPARe, blended learning is supported through a variety of in-game mechanisms, expanded in more detail in Section 3. This section presents two key concepts derived from past experience of researchers in implementing game-based learning solutions, which influence the game design in Section 3.

## **2.1 Pedagogical considerations when creating effective game-based learning solutions**

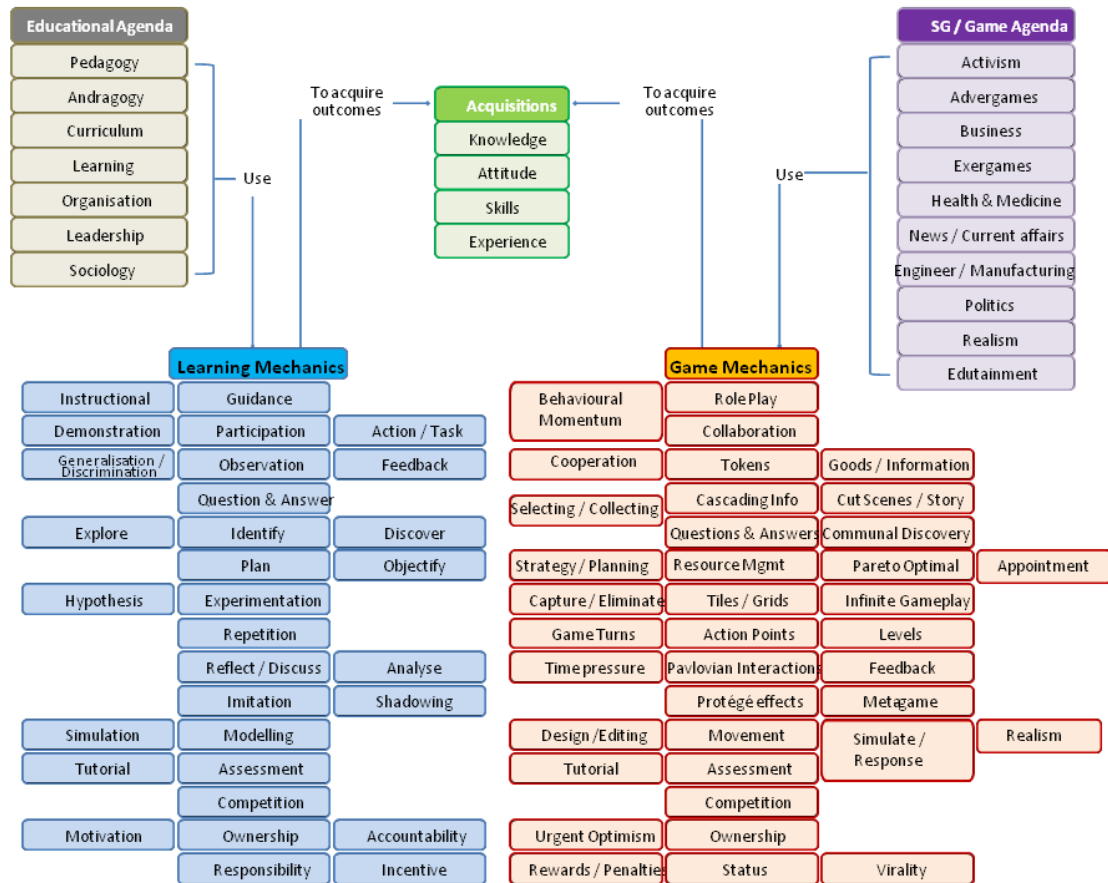
In Kolb (1984)’s experiential model of learning, individuals are encouraged to reflect on their actions and consequences, so as to foster understanding and re-application of this understanding in future actions. Kolb’s experiential learning model has been revisited in order to support the development of virtual environments and serious games, for instance the exploratory learning model (de Freitas & Neumann, 2009) that promotes reflections and debriefing motivated by the use of a virtual learning environment. To conceptually support issues of game design using pedagogically driven approaches, de Freitas and Oliver (2006) proposed the Four Dimensional Framework (4DF) of learning. This model proposes to inform game design by referring to four discrete dimensions including: the context within which learning takes place (e.g. disciplinary context, blended or standalone, place of learning, formal or informal), learner profiling (e.g. demography, ICT skills, gaming experience), selection of pedagogies used (e.g. learning methods, models and mechanics) and mode of representation (e.g. game concepts, game engines, mode of deployment, level of fidelity, interactivity). The consideration of the individual characteristics of each dimension contributes towards the creation of a successful game-based learning experience (Bellotti, Arnab, Ott, de Freitas & De Gloria, 2011).

By following the 4DF model, game developers should be able to deconstruct SG design into key components by taking into account the characteristics of learners and the different pedagogical and contextual constraints to enact effective absorption, promote reflection on knowledge and transfer these learning variables into real-world scenarios. Deployment choices are very important adhering to the context dimension of learning. In terms of RSE, a

formal setting is a requirement and a blended approach is a solution that may support delivery of the RSE programme taking into account the role of a teacher and the exploratory nature of the learning process. In this sense, it is important to highlight that SGs, rather than an “all comprehensive” teaching tool, look particularly suited as “an instrument for motivating beginners to new topics and as a practicing tool to apply and test knowledge acquisition” (Bellotti et al., 2011, 28). This consideration should help designers to optimise the efforts and the expected results. This four-dimensional approach thus encourages pedagogical selection in light of existing constraints in the remaining dimensions, an important exercise in early-stage design.

## **2.2 Pedagogical and game constructs**

In order to bridge the gap between the learning outcomes and engaging game content in support of the RSE delivery, it is essential to define the appropriate mechanisms to promote both learning and game play. Game mechanics are well understood within the context of entertainment games (Sicart, 2008). There are many uncertainties as to what serious game mechanics are and if they operate at the same level of abstraction as those found in conventional entertainment games. Hence, a pedagogy-game mechanic mapping will be particularly beneficial when considering the purpose and design of serious games. As part of the work under the European Union-funded Games and Learning Alliance (GALA, [www.galanoe.eu](http://www.galanoe.eu)), the learning-game mechanics (LM-GM) model (figure 1) has been proposed (Lim, Louchart, Suttie, Ritchie, Aylett, Stanescu et al., 2013), which can be used to either aid serious game design or game analysis. Based on mechanics common in educational philosophies and games (both serious and otherwise) these elements form the framework of a variety of educational theories and the backbone of many game theories. Any one combination of these mechanics can be applied to classical laboratory classes or teaching science through to Humanities and Arts. The model provides a concise means to map how ludic elements link to pedagogy intent directly related to a player’s actions and game play, i.e. serious game mechanics.



**Figure 1:** Common mechanics in learning and games are used to construct the learning-game mechanic (LM-GM) model

For simplicity, the reading of the LM-GM model can be viewed top down, with core components running vertically down from the lead nodes of *Learning mechanics* and *Game mechanics* respectively. The LM-GM framework is generic in the sense that one can easily overlay onto or match different learning models. The reasoning is that learning depends on the context and learner profiling (e.g. topic, objective, circumstances, learning mode and the type of learners). In relation to the 4DF, the context of learning using SGs will be influenced by the educational and SG agenda, learning mechanics will support the pedagogy and learner dimension, and mode of representation will take the SG mechanics into account. Using this model, the game play design takes into account the learning mechanics relevant for the objectives of the RSE programme.

### 3 Game Development Approach

#### 3.1 Methods and Material

The general design and development of PR:EPARe adopted by the SGI was driven by the 4DF emphasising the *context* of deployment, *learner* profiling and *pedagogical* perspective that influence the mode of *representation* of the learning content. To support the 4DF's dimensions, the Intervention Mapping (IM; Bartholomew, Parcel, Kok, & Gottlieb, 2001; 2006; 2011) approach was implemented by SASH to ensure that the factors associated with what puts young people at risk of sexual coercion (the topic for the game) were addressed. The IM approach is commonly used to guide the development of health promotion interventions/programmes and involves six activities ('steps'): IM1- needs assessment; IM2-

developing programme objectives (and related performance and change objectives); IM3- developing theory-based methods and practical strategies to meet those objectives; IM4- developing a programme plan; IM5- programme implementation (the complete RSE intervention programme including the teachers manual and implementation of the game-based learning content) ; and IM6- programme evaluation (see Brown et al., 2012).

While the 4DF model provided the overall structure and considerations for the development of the game, the IM approach provided identification and analysis of the needs of the end-user relevant to experience of sexual coercion (IM1), objectives or targets for change (IM2), and strategies and plan (IM3, IM 4) for the game-based solution. The game was implemented as part of IM5. IM6 involves the deployment and evaluation discussed in section 4.

### **3.2 Specifying Context and Learners: Identifying needs (IM1) and objectives (IM2)**

To extract the needs and specification related to the 4DF's context of deployment and learners profiling, steps IM1 and IM2 were implemented. These steps involved drawing together a number of major stakeholders including sexual health and sex education professionals and four different groups of young people to discuss what the serious game should cover, who it should be aimed at and what it should be like. Extensive discussions across all stakeholder groups led to the identification of sexual coercion in adolescent relationships as a major current issue for young people for which there are currently very few resources available for RSE. The decision was made to focus the game on this issue. All stakeholders agreed that young people aged 13 to 14 years of age (and in Year 9 of UK secondary school) were the most appropriate targets for an intervention resource on this topic (discussion was published in Brown et al., 2012).

Decisions relating to blended deployment versus an individual gaming experience emerged as a consequence of further stakeholder engagement and literature review in the needs assessment stage. Specifically, needs analysis with stakeholders, particularly young people, and evidence review (IM1) enabled identification of five types of psycho-social determinant that places individuals at greater risk of experiencing or perpetrating sexual coercion. Table A.1 gives a summary of performance objectives mapped against psycho-social determinants which helped us to elicit specific change objectives (i.e. what we want to change for players) for the game (IM2)(see Brown et al. (2012) for more detail).

IM1 identified determinants including attitude, knowledge, self-efficacy or skill, subjective norms and optimistic biases about the risk of experiencing or perpetrating coercive behaviour. The aim of the game therefore was to reduce likelihood of being coercive towards others or allowing others to successfully coerce by targeting these determinants as they align to behaviours (performance objectives; see table A1). Please note that there is a broad range of factors that influence risk in this context, including previous experience of sexual abuse, but we were interested in psycho-social factors that could be directly targeted by the game.

The subjective norm determinant was of particular relevance to the decision to employ a blended learning context for game deployment. Subjective norm is a term used to describe perceptions people hold about whether they believe important others think they should perform a particular behaviour (Ajzen, 1988; 1991). Methods (drawn out in IM3, see subsection 3.3) that might be used to target game objectives relating to subjective norm include; *delivering information about others' approval of a proposed behaviour*, and



*stimulating communication to mobilise social support for a behaviour.* In order to put across messages that for example, related to *others' approval of saying no to a request for sexual activity when it is unwanted*, using teacher-led facilitation and discussion amongst peers in small groups or pairs represented the most appropriate method for achieving this.

### 3.3 Pedagogy-driven design: Developing theory-based methods, practical strategies (IM3) and a programme plan (IM4) to meet the objectives

To move from IM3 to IM4, researchers in SASH and the SGI investigated how to translate theory-based methods and practical strategies into a programme (or game) plan. The decision was to pursue a scenario-based game with two main parts. Part one focuses on introducing the topic, developing knowledge, and understanding relative risk. Part two involves more immersive scenarios designed to address more complex psychological determinants associated with sexual coercion, such as attitude and self-efficacy. With this perspective, PR:EPARe is an intrinsic (endogenous) (Kenny and Gunter, 2007) educational game facilitated by a teacher within a classroom setting. Therefore, the learning of content is highly related to (i.e. highly immersed in) the game's narrative elements and the consequential exploratory learning activities, such as communal discourse and debriefing.

To evaluate the mechanics of PR:EPARe with regards to pedagogical relevance, the change objectives identified in IM2 and the methods/practical strategies identified in IM3 (Brown et al., 2012) for the RSE game were analysed and decomposed using the LM-GM model (see table 1). This table highlights the learning and game mechanics, which are relevant to the change objectives (see also appendix table A.1). The complete analysis of the PR:EPARe game flow is discussed in section 3.5.

**Table 1:** Original change objectives for the RSE game and the proposed Learning and Game Mechanics

| Change objectives   | Learning Mechanics   | Game Mechanics   |
|---|--|--|
| <p><b>Performance Objective:</b> Respond effectively to coercive sexual behaviour to achieve outcome in line with own preferences</p> <p><b>Attitude:</b> Expect there to be negative consequences of allowing unwanted sexual advances to continue</p> <p><b>Knowledge:</b> Identify nature and levels of sexual coercion</p> <p><b>Self efficacy/skill:</b> Express confidence in ability to recognise all types of sexual coercion</p> <p><b>Subjective norm:</b> Explain that peers and older others recognise and respond effectively to coercion to avoid it</p> <p><b>Optimistic Bias:</b> Understand the risk of sexual coercion and the need to respond as personally relevant</p> | <ul style="list-style-type: none"> <li>• Identification</li> <li>• Generalisation/Discrimination</li> <li>• Discover</li> <li>• Analyse</li> <li>• Repetition</li> </ul> | <ul style="list-style-type: none"> <li>• Selecting</li> <li>• Questions and answers</li> <li>• Information</li> <li>• Story</li> <li>• Competition</li> <li>• Time pressure</li> <li>• Response</li> </ul> |
|   | <ul style="list-style-type: none"> <li>• Observation</li> <li>• Guidance</li> <li>• Participation</li> <li>• Reflect/discuss</li> <li>• Explore</li> </ul>               | <ul style="list-style-type: none"> <li>• Role play</li> <li>• Simulate</li> <li>• Response</li> <li>• Communal discovery</li> <li>• Cooperation</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Incentive</li> </ul>  | <ul style="list-style-type: none"> <li>• Rewards/penalties</li> <li>• Feedback</li> <li>• Action points</li> </ul>   |

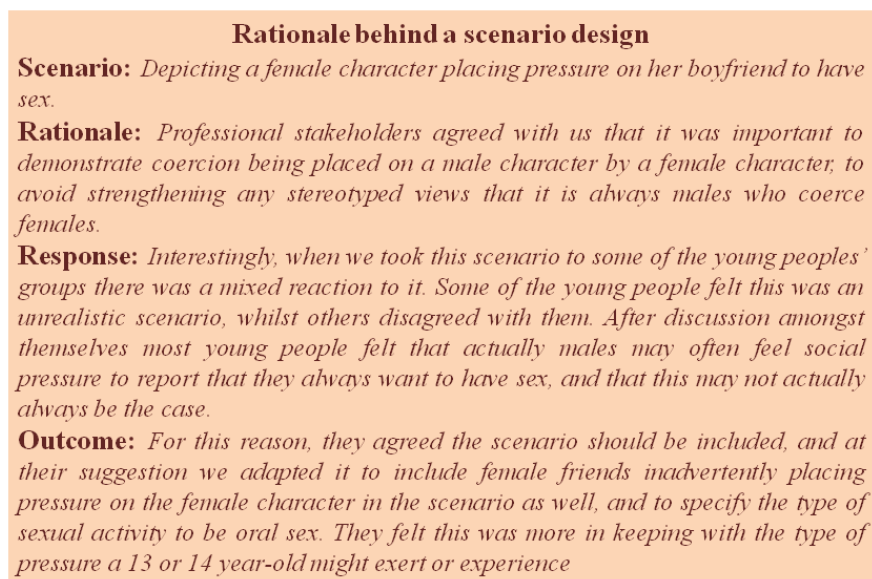
|  |   |  |
|--|---|--|
| <p><b>Performance Objective:</b> Deal with temptations to use sexual coercion</p> <p><b>Attitude:</b> Express the belief that coercive sexual behaviour has negative consequences for those that coerce others and those who are coerced</p> <p><b>Knowledge:</b> Identify nature and levels of sexual coercion</p> <p><b>Self efficacy/skill:</b> Express confidence to recognise incongruence in desire to progress or engage in certain behaviours between self and partner, Express confidence in ability to stop and demonstrate confidence in asking a partner to suggest what they would prefer to do.</p> <p><b>Subjective norm:</b> Appraise peers and older others as experiencing incongruence in desire for sexual activity and State that peers and older others would ask partner to suggest an alternative.</p> <p><b>Optimistic Bias:</b> Recognise that anyone can potentially exert coercion on someone else, and see it as personally relevant.</p> | <ul style="list-style-type: none"> <li>• Identification</li> <li>• Generalisation/ Discrimination</li> <li>• Discover</li> <li>• Analyse</li> <li>• Repetition</li> </ul> | <ul style="list-style-type: none"> <li>• Selecting</li> <li>• Questions and answers</li> <li>• Information</li> <li>• Story</li> <li>• Competition</li> <li>• Time pressure</li> <li>• Response</li> </ul> |
|  | <ul style="list-style-type: none"> <li>• Observation</li> <li>• Guidance</li> <li>• Participation</li> <li>• Reflect/discuss</li> <li>• Explore</li> </ul>                | <ul style="list-style-type: none"> <li>• Role play</li> <li>• Simulate</li> <li>• Response</li> <li>• Communal discovery</li> <li>• Cooperation</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Incentive</li> </ul>   | <ul style="list-style-type: none"> <li>• Rewards/ penalties</li> <li>• Feedback</li> <li>• Action points</li> </ul>  |
| <p><b>Performance Objective:</b> Seek support from an appropriate place when sexual coercion is causing difficulty</p> <p><b>Attitude:</b> Describe seeking support in relation to sexual coercion as positive and value the opportunity to get assistance on this issue highly.</p> <p><b>Knowledge:</b> List organisations, known and trusted adults and friends who could offer support and advice about experience of coercive behaviour.</p> <p><b>Self-efficacy/skill:</b> Express confidence in ability to discuss experience of coercion with identified appropriate source of support.</p> <p><b>Subjective norm:</b> Appraise peers and older others as experiencing incongruence in desire for sexual activity and State that peers and older others would ask partner to suggest an alternative.</p> <p><b>Optimistic Bias:</b> State that peers and others seek advice about coercion if it becomes a difficulty.</p>                                     | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Guidance</li> </ul>  | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Information</li> <li>• Action Points</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>• Reflection/discussion</li> <li>• Participation</li> <li>• Explore</li> <li>• Discover</li> </ul>                                 | <ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Communal Discovery</li> <li>• Information</li> <li>• Action points</li> </ul>  |

### 3.4 Mode of Representation: Game implementation (part of IM5)

A pre-production discussion (part of moving from IM3 to IM4) between the SASH and SGI teams produced an account of the central functional elements to be considered, indicative to producing an easily accepted and accessible game for RSE deployment in schools. Core concerns raised in this account included classroom integration, technology integration and acceptance, participatory design and testing and user design for facilitators and end users.

Following decisions to create a scenario-based two-part game, the SASH team drew up a game concept document containing scenarios designed to incorporate all of the change objectives that had emerged through the IM1 to IM4. The document was reviewed by the

stakeholder groups (both the professional and young people), who helped to identify any inclusivity issues, and provided suggestions to ensure scenarios reflected the types of real-life scenarios and conversations 13 and 14 year-olds might have. Figure 2 illustrates the reasoning behind one of the scenarios.



**Figure 2:** Rationale behind a scenario design

Once the concepts for scenarios were agreed with stakeholders, members of the SGI research team considered how game mechanics and learning mechanics could usefully be integrated. Developing on from the preliminary ideas outlined within the high concept document, the needs evaluation and subsequent design proposals put forward, specified technical requirements that formed the basis for the selection process of the development engine and target platforms. Referring to the Game Engine Selection Framework (Petridis, Dunwell, Arnab, Protopsaltis, Hendrix & de Freitas, 2012), the developers chose the Unity engine for its capacity to support users with limited conversance in technological applications alongside its proficiency to integrate and be sustainable across several platforms with unknown and varying hardware and software limitations. Further considerations in preference to this engine included ease of use, future development opportunities and distribution to a wider audience via the internet.

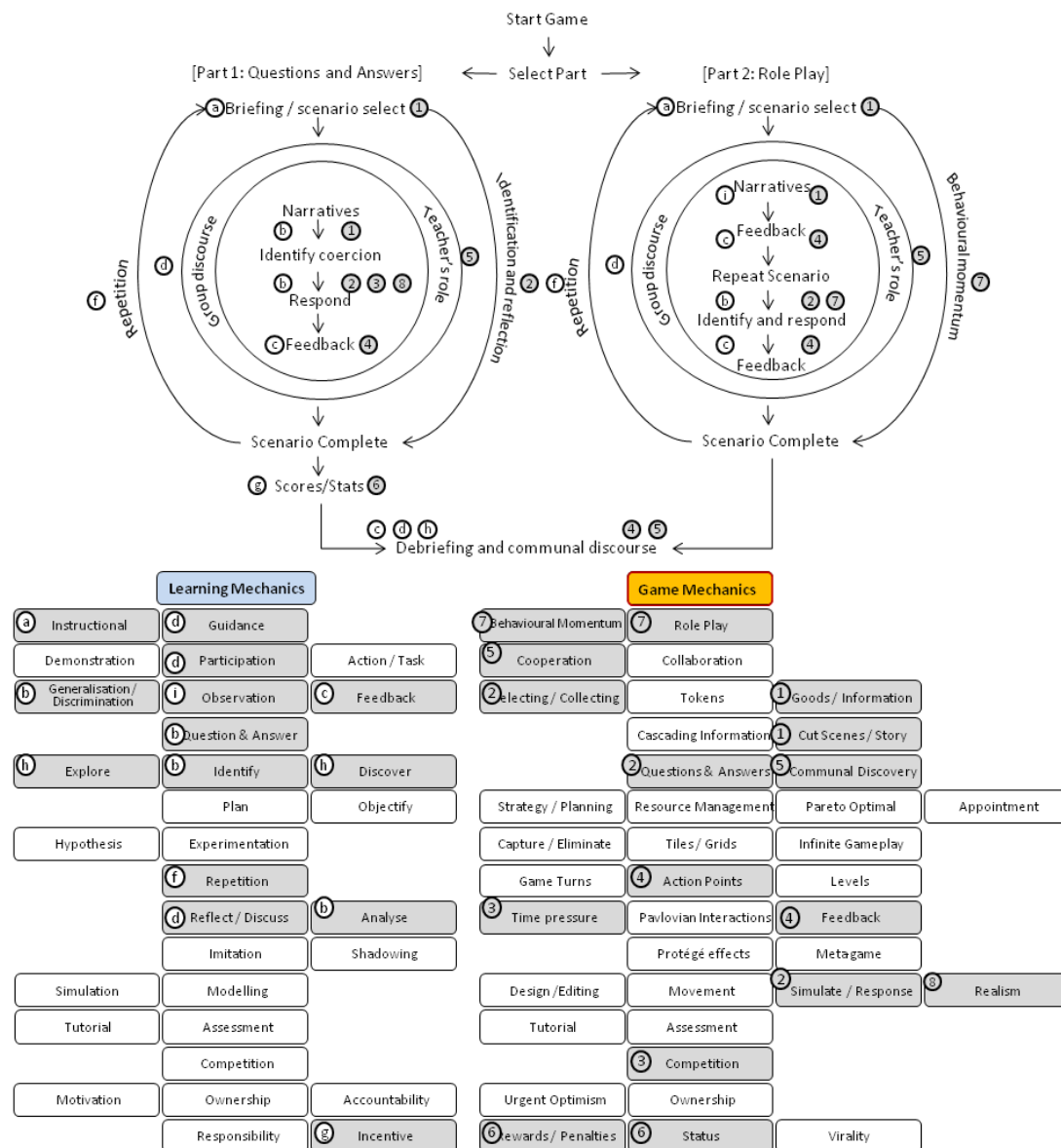
Considerations were drawn as to the technical implications of integrating the game alongside existing technologies in schools, and the psychological impact facilitators may experience through using this method of RSE delivery. To avoid the facilitator being inundated with information, navigation and interaction elements of the game were designed to support the use of smart board technology already widely accepted and used in education alongside that of a conventional keyboard and mouse application. Adopting this strategy minimises the requirement of additional hardware and complications in facilitator training.

With the Unity Game engine providing support for the cross combination of 2D and 3D graphical assets, PR:EPARe's aesthetic design adopted a blended approach to the visual style. Using a combination of assets created within 3D Max and Photoshop, the aesthetic design reflected a shift towards a fantasy game show environment with elements of realism, rather than a fully simulated. Moreover, taking into account the classification of games by Prensky (2003), the content of the game should relate to factual elements, judgement/identification,

and positive and negative behaviours, where the possible types of games that would best relay these contents include the *game shows* and *role-playing* genres. Developing the visual design in this way allowed an emphasis of a light and user-friendly tool, by providing relief from photo-realistic 3D graphics that could potentially overwhelm and discourage non-technological users. In correlation to the principle concept of usability, the narrative element provides the user with an audio guide via two Non-Player Characters (NPC) or ‘host’ characters that run throughout the entire game, offering guidance and providing the educationalist key opportunities to facilitate discourse.

### 3.5 Play testing: Mechanics, dynamics and aesthetic

In this section, we discuss the pedagogical perspective of the game flow and the efficacy of learning and engagement, which demonstrate the potential of PR:EPARe in supporting the RSE programme. PR:EPARe game play was analysed using the LM-GM model taking into account the initial mapping in Table 1. Figure 3 illustrates the key mechanics relevant to the implemented game flow.



**Figure 3:** The LM-GM mapping of the PR:EPARe game flow

Table 2 summarises the implementation of the identified game and learning mechanics based on the game flow. Based on the objectives in Table 1, the key dynamics that the game is targeting include:

**O1:** Discovery, analysis and identification – The ability to identifying the nature and levels of coercion is a key target of PR:EPARe, which are supported by the different scenarios on coercive behaviour.

**O2:** Competition and feedback - As part of the game mechanic, competition and feedback promotes real-time and positive interaction and engagement within game play.

**O3:** Active participation and reflection – exploratory learning is promoted by encouraging communal discourse, reflection and debriefing during and after game-play. Cooperation and teamwork is promoted by blending technology into the traditional classroom setting.

**Table 2:** Learning and Game Mechanics for PR:EPARe

| Targets  | Learning Mechanics  | Game Mechanics   | Implementation  |
|--|---|--|---|
| <b>O1:</b> Discovery analysis and Identification | <ul style="list-style-type: none"> <li>• Identification</li> <li>• Generalisation/ Discrimination</li> <li>• Discover</li> <li>• Analyse</li> <li>• Repetition</li> </ul> | <ul style="list-style-type: none"> <li>• Selecting</li> <li>• Questions and answers</li> <li>• Information</li> <li>• Story</li> <li>• Response</li> </ul> | <p><b>Part 1:</b> Question and Answer</p> <ul style="list-style-type: none"> <li>• The host characters narrate the scenarios (1-6). The mechanics involve ‘point and clicking’ on the NPCs representing a YES, NO and a MAYBE.</li> <li>• A pause button allows the teacher to pause the game to allow time for communal discussions. This promotes teamwork and exploratory learning. The group of pupils will learn how to analyse the scenarios, identify and recognise coercive behaviours and consider how to respond from a range of perspectives.</li> </ul>   |
|  | <ul style="list-style-type: none"> <li>• Observation</li> <li>• Guidance</li> <li>• Participation</li> <li>• Reflect/discuss</li> <li>• Explore</li> </ul>                | <ul style="list-style-type: none"> <li>• Role play</li> <li>• Simulate</li> <li>• Response</li> <li>• Communal discovery</li> <li>• Cooperation</li> </ul> | <p><b>Part 2:</b> Roleplay</p> <ul style="list-style-type: none"> <li>• Each scenario (1-2) starts with a first person roleplay that ends up with a negative consequence. The player is allowed to point and click on the dialogue boxes. This encourages players to identify negative behaviours and experience negative consequences but from a safe position.</li> <li>• The player can then repeat the scenario and is given the opportunity to give an alternative response to avoid being coerced or acting coercively towards someone else. A text-box allows the teacher and the pupils to decide on a response as a team, establishing peer support for the alternative response.</li> <li>• Roles include the coerced and the coercer.</li> <li>• A pause button can be used to stop at any time during the role-play to allow communal discourse.</li> </ul> |

|   |  |  |  |
|---|--|--|--|
| <b>O2:</b><br>Competition and feedbacks         | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Incentive</li> </ul>  | <ul style="list-style-type: none"> <li>• Competition</li> <li>• Time pressure</li> <li>• Rewards/penalties</li> <li>• Feedback</li> <li>• Action points</li> </ul> | <p><b>Part 1:</b> After response to the scenarios are given, feedback and information summary (action points) are provided:</p> <ul style="list-style-type: none"> <li>• A timer is used to instil a sense of urgency for a response to be provided.</li> <li>• Each correct answer will give the player 300 points and the incorrect ones will cost the player 100 points. Scoring system is to promote active participation and competitiveness (e.g. between classrooms).</li> <li>• Feedback for wrong and correct answers using appropriate sound effect and visual</li> <li>• Explanation on appropriate responses is delivered by the host characters (NPCs)</li> <li>• The key feedback points are listed on the screen as guidance</li> <li>• Scores are rewarded or deducted.</li> </ul> <p><b>Part 2:</b> After going through the 2-part scenarios:</p> <ul style="list-style-type: none"> <li>• Feedback for negative and positive consequences are given using an art visual</li> <li>• Explanation on the scenarios is delivered by the host characters (NPCs).</li> </ul> |
|   | <ul style="list-style-type: none"> <li>• Participation</li> <li>• Competition</li> </ul>                                       | <ul style="list-style-type: none"> <li>• Role play</li> <li>• Realism</li> <li>• Competition</li> <li>• Time pressure</li> </ul>                                   | Positive participation is encouraged via mechanics that promotes competition, such as scoring and time pressure. The competition is however between classrooms within the same school. The communal discourse and debriefing made possible by the pause button add another dimension to realism of the topic. The scenarios are very direct and based on potential coercive experiences.   |
| <b>O3:</b> Active participation and reflections | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Guidance</li> </ul>   | <ul style="list-style-type: none"> <li>• Feedback</li> <li>• Information</li> <li>• Action Points</li> </ul>   | <p>After responses to the scenarios are given, feedbacks and information summary are provided:</p> <ul style="list-style-type: none"> <li>• Feedback for wrong and correct answers using appropriate sound effect and visual</li> <li>• Explanation on appropriate responses is delivered by the host character (NPC)</li> <li>• The key feedback points are listed on the screen as guidance</li> </ul>   |
|   | <ul style="list-style-type: none"> <li>• Reflection/discussion</li> <li>• Participation</li> <li>• Explore Discover</li> </ul> | <ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Communal Discovery</li> <li>• Information</li> <li>• Action points</li> </ul>                      | <p>Communal discourse on each scenarios are supported by:</p> <ul style="list-style-type: none"> <li>• A pause button within each scenario (both Part 1 and 2)</li> <li>• The key feedback points listed on the screen assist discussions and reflection (during game-play when it is paused and as part of a debriefing activity)</li> </ul>  |

Based on a ‘Game Show’ concept (Figure 4) and the deployment context of PR:EPARe, the dynamic of the game interaction involves: (1) group participation on the correct response to the ‘questions and answers’ round, where six scenarios on potential coercive behaviour are narrated by the game show host (see Figure 5), and (2) the ‘Role-Playing’ round, where as a group, the pupils will play a role in two scenarios with the opportunity to be the coerced and the coercer (see Figure 6). The “role-playing” in this case is for the pupils to identify with the

coerced and coercer in two separate scenarios and to be able to make the right option and response at each key decision stage of the scenarios. Throughout the game, the teacher has the option to 'pause' game play, allowing time for communal discovery and discourse on the matter at hand. To promote communal responsibility and encourage practical thinking in the role-playing round, editable text boxes are provided to allow the pupils and the teacher to decide on a mutually agreeable response for avoiding coercion, aiming to promote positive participation from all class members.



**Figure 4:** PR:EPARe game with a 'game show' concept



**Figure 5:** Question and Answer round, with the hosts narrating the scenario represented by the screen art and a pause mechanic (pause button) to allow the scenario to be discussed by the pupils and teacher





**Figure 6:** Role-Playing round

The pedagogical perspective of the game mechanics evident by the LM-GM highlights a participative and interactive dynamic encouraging identification of behaviours via explicit scenarios, reflection of negative and positive attitudes via communal discourse and exploration of related subjects via debriefing.

## **4 Deployment and Evaluation**

The previous sections discussed game design approach and considerations from technical and pedagogical perspectives. This section outlines the approach taken to evaluate the prototype game and early findings (part of IM6) are discussed.

The evaluation described below was set up to assess whether improvements on change objectives aligned to performance objectives 1 and 2 (see table A.1) were observed. It was expected that improvements would be seen for game players at post-game follow-up, but that these improvements would not be seen in controls after receiving standard RSE. Delays with the game development meant that only part 1 (Question and Answer) of the game was ready for testing in time for the organised cluster randomised controlled trial (c-RCT). Randomised Controlled Trials (RCTs) are considered the gold standard in intervention evaluation, and where true randomisation is not possible (as in classroom settings in schools), cluster randomisation is applied. Qualitative feedback collated from students and teachers who had used the game during the c-RCT and during later testing is also reported below.

### **4.1 Methods**

#### ***4.1.1 Quantitative c-RCT Design***

A 2 (time points: baseline measures vs. follow-up measures) x 2 (condition: standard RSE control groups vs. Game play groups) mixed design was used to assess whether there were any changes in questionnaire measures recorded over time and between groups. Cluster randomisation was by classes within schools. Each participating class had an equal chance of being randomised to the control or game play condition.

#### ***4.1.2 Qualitative Design***



Live feedback during game play in classes was recorded by viewing lessons and making detailed records of interaction and comments. Feedback from students and teachers was also sought on their experience of playing the game in class at the end of the teaching sessions. Their responses were recorded.

**4.1.3 Participants**

All schools across two local authorities were invited to participate in the evaluation study. Three schools representing a range of socio-demographic backgrounds and with pupils from non-white as well as white ethnic backgrounds responded positively to invites and provided a total of 17 Year 9 classes to take part in the trial. This has resulted in a total of 505 participants (males = 253; females = 247; no information re: gender = 5). All participants were in school year 9 and aged either 13 or 14 years (one participant reported being 15 years) with a mean age of 13.5 years (Standard deviation = 0.5 years). Data re: age was not provided by 9 participants. Of the 17 classes, 8 were randomized to the control group resulting in N = 207. Nine classes were randomized to the intervention group resulting in N = 298.

**4.1.4 Measures**

Self-report questionnaire measures based on performance objectives 1 and 2 only and associated change objectives (see table A1 and note relating to objective 3) were devised. The items measured are listed in table 3 below.

As an example, the change objective, ‘Demonstrate confidence in saying no to low level coercion’ which can be seen in table 3 (item 8) was translated into a measure as illustrated in figure 7.

I feel confident about saying 'no' if someone tries to get me to do something I am unhappy about. Please place a tick ✓ in the box under the words that best show what you think about this.

|                     |       |                                 |          |                        |
|---------------------|-------|---------------------------------|----------|------------------------|
| Strongly agree<br>😊 | Agree | Neither agree nor disagree<br>😐 | Disagree | Strongly disagree<br>😞 |
|                     |       |                                 |          |                        |

**Figure 7:** Example of a self-report question

All questionnaire items were positively phrased, and the responses provided by participants were scored from 1 (strongly agree) to 5 (strongly disagree) when the data were input into statistical analysis software. Thus, a lower score on each item represents a lower risk of being coerced or putting pressure on someone else to do something they are unhappy with and greater psychological preparedness for responding appropriately to potentially coercive situations.

**4.1.5 Procedure**

Ethical approval was sought through the Faculty of Health & Life Sciences at Coventry University before data collection began. Once schools had agreed to participate in an evaluation study, they were provided with letters about the research to send to parents of those being invited to take part. Parents who did not want their child(ren) to participate were given the opportunity to withdraw them from the study. After receiving full information about the study requirements, schools provided loco parentis consent by signing ethically approved

forms and pupils were given Participant Information Sheets to read and keep so that they could consider whether or not they wished to participate. School students were given up to a week to think about their participation before being asked to make a decision and sign a consent form. Two students were either withdrawn by a parent or decided not to participate. Those who were willing were asked to complete the questionnaire. After baseline data had been collected from students each participating class was randomly allocated to either the control (standard RSE lesson) or intervention condition (Serious Game based lesson) using a computerized dice. Those randomised to the intervention condition played the game in the next available sex education class for one hour. All of these sessions were viewed by researchers and delivered by the teacher who would normally teach the class in that session. In the week following the delivery of the RSE session participants were asked to complete questionnaire measures again. Teachers were then free to use the game with classes in the control condition should they wish to. De-brief sheets were provided to all participants to explain more about the research and provide sources of further advice, support and information.

## 4.2 Early deployment testing c-RCT Results for part 1 of the game

### 4.2.1 Descriptive statistics

Table 3 shows mean and standard deviation scores of participants on questionnaire measures by condition (control vs. game) and by time (baseline vs. follow-up) based on players of part 1 of the game. For some variables scores appear reduced in the game condition at follow-up.

**Table 3:** Means and (standard deviations) for questionnaire measures by condition and time.

| Questionnaire measure  | Control (no game) condition |             | Game condition |             |
|--|-----------------------------|-------------|----------------|-------------|
|  | Baseline                    | Follow-up   | Baseline       | Follow-up   |
| 1. Confidence in knowledge about coercion                        | 1.75 (0.71)                 | 1.38 (0.21) | 1.93 (0.64)    | 1.72 (0.55) |
| 2. Perceived personal relevance for possibility of being coerced | 2.54 (0.97)                 | 2.90 (0.45) | 2.78 (0.76)    | 2.79 (0.69) |
| 3. Personal relevance for possibility of coercing others         | 3.36 (1.17)                 | 3.27 (0.44) | 3.35 (0.95)    | 3.22 (0.86) |
| 4. Perception that being coerced has negative consequences       | 2.45 (0.96)                 | 2.25 (0.34) | 2.50 (0.80)    | 2.43 (0.69) |
| 5. Perception that coercing others has negative consequences     | 2.73 (0.80)                 | 2.6 (0.32)  | 2.83 (0.68)    | 2.58 (0.67) |
| 6. Positive attitude to saying 'no' if being coerced             | 1.59 (0.70)                 | 1.4 (0.28)  | 1.57 (0.62)    | 1.64 (0.61) |
| 7. Positive attitude to others saying 'no' to you                | 1.52 (0.67)                 | 1.58 (0.29) | 1.62 (0.56)    | 1.69 (0.67) |
| 8. Confidence to say 'no' if being coerced                       | 1.93 (0.91)                 | 1.92 (0.32) | 1.99 (0.73)    | 1.89 (0.63) |
| 9. Confidence to recognize self as                               | 2.01 (0.76)                 | 2.03 (0.35) | 2.13 (0.67)    | 2.01 (0.52) |

|   |             |             |             |             |
|---|-------------|-------------|-------------|-------------|
| <b>coercer</b>  |             |             |             |             |
| <b>10. Confidence to recognize coercion against self</b>                        | 1.89 (0.70) | 1.77 (0.29) | 1.92 (0.65) | 1.87 (0.58) |
| <b>11. Communication confidence if being coerced</b>                            | 2.12 (0.75) | 2.13 (0.34) | 2.14 (0.69) | 2.14 (0.56) |
| <b>12. Communication confidence if being coercive</b>                           | 2.32 (0.86) | 2.25 (0.34) | 2.24 (0.68) | 2.20 (0.66) |
| <b>13. Believing others experience pressure too</b>                             | 2.51 (0.89) | 3.80 (3.84) | 2.62 (0.77) | 2.48 (0.62) |
| <b>14. Believing others say no to pressure</b>                                  | 2.42 (0.79) | 2.38 (0.29) | 2.34 (0.64) | 2.23 (0.58) |
| <b>15. Believing others would approve of responding assertively to pressure</b> | 2.11 (0.88) | 2.13 (0.28) | 2.10 (0.74) | 2.17 (0.65) |
| <b>16. Believing others would approve of you saying 'no'.</b>                   | 2.02 (0.74) | 2.00 (0.28) | 1.87 (0.61) | 2.04 (0.60) |

#### 4.2.2 Measure refinement

In order to prepare the data for analysis, the questionnaire responses for the 16 change objectives taken at baseline were subjected to exploratory factor analysis, to identify the underlying structures being measured by the questionnaire. The analysis suggested that there were 5 underlying factors represented in the data but questionnaire items only actually loaded onto the first 3 factors. Therefore, the data was reanalyzed using principle components analysis with a forced three factor solution and varimax rotation. This has resulted in the identification of three factors which represent underlying structures measured by the questionnaire. These structures can be broadly said to represent:

- Confidence to recognise coercion and act to stop (factor 1)
- Knowledge and positive attitudes towards saying no/others saying no (factor 2)
- Understanding of personal risk and consequences for all (factor 3)

All factors demonstrated reasonable internal reliability with Chronbach's alpha scores of 0.573 and above (e.g. Coolican, 2004). Split half reliability analysis also showed reasonable levels of correlation indicating scale reliability – Spearman Brown 0.612 (e.g. Coolican, 2004).

#### 4.2.3 Further descriptive statistics

Table 4 below shows the means and standard deviations of participants scores for each underlying factor by game condition (control vs. game) and by time (baseline vs. follow-up). A lower score on each measure represents greater psychological preparedness for sexual coercion and a potentially lower risk of being coerced or coercing someone else into doing something they do not want to do or feel happy with.

**Table 4:** Study 1 means and (standard deviations) for questionnaire factors by condition and time

| Questionnaire factor | Control (no game) condition | Game condition |
|----------------------|-----------------------------|----------------|
|----------------------|-----------------------------|----------------|

|   | Baseline    | Follow-up   | Baseline    | Follow-up   |
|---|-------------|-------------|-------------|-------------|
| <b>Confidence to recognise coercion and act to stop Factor 1</b>                    | 2.12 (0.53) | 2.08 (0.23) | 2.13 (0.42) | 2.06 (0.43) |
| <b>Knowledge and positive attitudes towards saying no/others saying no Factor 2</b> | 1.79 (0.47) | 1.70 (0.17) | 1.82 (0.39) | 1.85 (0.44) |
| <b>Understanding of personal risk and consequences for all Factor 3</b>             | 2.72 (0.55) | 2.97 (0.82) | 2.82 (0.50) | 2.70 (0.45) |

#### 4.2.4 Inferential data analysis

A 2(condition: control vs. game) x 2(time: baseline vs. follow-up) mixed multivariate analysis of variance (MANOVA) was applied to the data to assess whether the PR:EPARe game had any impact on the psychological factors identified in the questionnaire data.

The MANOVA demonstrated a significant main effect of time ( $F [3, 501] = 2.847, p = .037, \eta_p^2 = .017$ ), a significant main effect of condition ( $F [3, 501] = 7.27, p < .001, \eta_p^2 = .048$ ), and a significant time by condition interaction ( $F [3, 501] = 15.306, p < .001, \eta_p^2 = .084$ ). This finding suggests that the PR:EPARe game does have an impact on the identified change objectives. In particular the time by condition interaction indicates that there may be changes over time in the game condition compared with the controls that are important.

Follow-up analysis of variance (ANOVAs) produced in the analysis were consulted to identify which psychological factors were affected.

For factor 1: *confidence to recognise coercion and act to stop*, there was a significant main effect of time ( $F [1, 501] = 4.746, p = .030, \eta_p^2 = .009$ ) but no significant time\*condition interaction ( $F [1, 501] = 0.406, p = .524, \eta_p^2 = .001$ ).

For factor 2: *knowledge and positive attitudes towards saying no/others saying no*, there was no significant effect of time ( $F [1, 501] = 1.902, p = .168, \eta_p^2 = .004$ ) but there was a significant time\*condition interaction ( $F [1, 501] = 7.808, p = .005, \eta_p^2 = .015$ ).

For factor 3: *understanding of personal risk and consequences for all*, the main effect of time approached significance ( $F [1, 501] = 3.35, p = .068, \eta_p^2 = .007$ ) and there was a significant time\*condition interaction ( $F [1, 501] = 27.717, p < .001, \eta_p^2 = .052$ ).

These findings suggest that for *confidence to recognise coercion and act to stop* (factor1), an improvement is seen for both conditions over time. The improvement is better for the game condition (see table 6) but this difference in improvement is not significant. For *knowledge and positive attitudes towards saying no/others saying no* (factor 2) the control group appear to improve over time compared with the game group. For *understanding of personal risk and consequences for all* (factor3) the interaction effect demonstrates an improvement for the game condition and not for the control group.

### **4.3 Discussion of C-RCT findings relating to part 1 of PR:EPARe**

Overall, the quantitative data analysis from the small-scale cluster randomised controlled trial assessing impact of the PR:EPARe game on psychological preparedness for dealing with sexual coercion, offers promising findings. The c-RCT suggests that *Confidence to recognise coercion and act to stop* (factor 1) increased for those involved in the study, with a suggestion (though not currently statistically significant) that this may increase more for game players compared with the control group. In relation to *Knowledge and positive attitudes towards saying no/others saying no* (factor 2), the decrease effect on scores may at first seem somewhat concerning, as they suggest that knowledge and positive attitudes towards saying 'no' decreased after game play. However, when it is considered that the young people who engaged with the game are extremely unlikely to have ever had a formal teaching session or open discussion about the issue of sexual coercion and what it means before, it is perhaps unsurprising that their reports about knowing what coercion is and feeling positive about saying 'no' to it actually decreased at follow-up. By raising this issue with them, it is possible the effect was to make them realise that coercion is far more complex than they might have at first realised (see qualitative data analysis below) and that given this complexity, saying 'no' is not such a straight forward thing to do. Consequently, we see this reflected in the self-report data.

Conversely, the measure of *Understanding of personal risk and consequences for all* (factor 3) shows a significant increase for game players (when compared with the control). This is undoubtedly a positive finding and suggests that the game meets its objectives relating to raising the personal relevance and risk appraisals of the young people who engaged with it and makes them understand the consequences associated with coercion and taking positive action to avoid it.

On the basis that this is a small-scale early beta test of the game, we have reason to be positive about the potential impact that use of the game could have in RSE lessons. Clearly, the finding relating to measures around knowledge and positive attitudes suggests there is a need to provide more specific support and focus for teachers and facilitators of the game on ensuring messages and content targeted at those aspects are clearly put across. These findings will be incorporated into communications and developments relating to the game as we move forward and work to engage in further larger-scale evaluation. One of the limitations of this analysis is that it is based on part 1 only game play. This needs to be addressed in future evaluation work which should involve a larger-scale cluster randomised controlled trial of the full and complete game.

### **4.4 Qualitative feedback**

Researchers viewed the pilot deployment of the PR:EPARe game in a total of 11 classes across three schools in Warwickshire. Most classes were made up of between 25 and 30 students of mixed gender, with the exception of one class, which contained only four male students. The detailed notes recorded during viewing of game deployment and consultation with students and teachers were analysed and organised into common themes. Major themes emerging from this process are set out below and discussed in relation to development decisions and desired change and learning objectives.

#### **4.4.1 Acceptability**

The game was overwhelmingly given positive feedback by all classes except one. The single class who gave less positive feedback felt that it would be better targeted at the school year below them. Other than this one exception, all classes felt that it was targeted appropriately at their age group, and one class from an older age group (14-15 years) who had played the game with a teacher in a session not viewed by researchers (under teacher's own volition) were reported to have felt that it was appropriate for their age group. This suggests that there may be classes who find it less acceptable than others, and judgements about which groups to use it with will always need to be at a teacher or facilitator's discretion.

Students made occasional comments or criticisms about certain visual aspects of the game, and wherever possible these were adjusted by game developers as part of improvements. For example, the male host character within the game was perceived to have particularly large hands in early development builds and these were made smaller in response to feedback. Overall however, the players found the game visuals and the use of a game show format as the game play context to be both acceptable and appealing.

The level of acceptability and apparent appeal amongst the end users that we observed and that was reported to us during feedback suggests that the time taken to engage with young people and other stakeholder groups during development was a worthwhile investment of time and resources. In particular, teachers consistently reported that the topic of the Serious Game, with its focus on sexual coercion and pressure in relationships, was particularly useful from their perspective. Several teachers reported that students had identified this as a topic they wanted more focus on in RSE, and although we may have recruited a sample of schools attracted to the deployment testing because of this identified need, we also believe this reflects positively on the needs analysis and stakeholder engagement that we engaged in early on in the process of game development for helping to identify a particular resource gap.

#### ***4.4.2 Engagement***

Viewing lessons where the PR:EPARe game was used certainly suggested to researchers that the students were highly engaged with the game. This impression was consistently supported by teachers' comments following the lessons. All remarked how well engaged the class had been with the game and associated discussions and activities. Clearly, this is important if the game is to achieve learning goals and change objectives identified and targeted in the content. We observed in every class, students responding positively to the element of competitiveness that part 1 of the game involved. It meant they had a vested interest in getting the answers about whether scenes depicted coercion or not, correct. They cared about their responses and this meant that they thought about, discussed and rationalised their decisions. We observed players changing their minds about the answer following discussions. They celebrated when they got the answer correct and displayed disappointed responses when they got answers wrong. From a deployment perspective, the use of a 'question and answer' round with scoring for part 1 certainly seemed to encourage engagement and 'buy in' from class-based players.

#### ***4.4.3 Novelty***

One of the reasons PR:EPARe may have been received well by students and teachers is its novelty for them. Both students and teachers commented that it was better than and more interesting as a resource for use in RSE classes than anything else they had access to. The use of computer technology for teaching in schools is variable in our experience, and one teacher who did make use of laptops for delivery of learning and teaching in classroom settings

commented that students are often bored with independent interaction with a laptop/netbook on their own, and appreciated the novelty of the approach taken involving group interaction with the game, facilitated by the teacher. Again, the positive responses here suggest that our needs analysis and stakeholder engagement in development and decisions made during development has paid off.

#### ***4.4.4 Contributions and Inhibition***

Students who contributed to whole-class group discussions often commented during feedback that they liked the opportunity to discuss what they thought and find out what others had to say about a particular issue. It is via such discussion that we would want players to learn about their peers' views about avoiding coercion and being coercive towards others. This can be a positive influence on their beliefs about what they should do to respond to pressure and to avoid exerting pressure on others.

Those who had not spoken in front of the whole class group had been witnessed offering their views and opinions in smaller groups or pairs, and it seems likely that this dynamic of the game set-up (i.e. providing opportunities for small group and whole-group interaction) is important for generating contributions and engagement from the maximum number of pupils possible. The pause mechanism and the direction to facilitators to support discussion around scenarios were observed to work effectively. Particularly interesting were comments from the small group of four male students who made up one of the classes participating. They commented that it was good to play the game with just a few of them present because they felt more able to express their views in front of one another, and more listened to, than they do in larger classes. Although the PR:EPARe game was developed for use in classrooms with larger numbers of students, the engagement of this smaller group and their response to the game is promising in terms of its potential for use with smaller, specialist classes of students who may have been excluded from some or all mainstream school classes.

#### ***4.4.5 Complexity appreciation***

From the perspective of a researcher viewing the class participation in part 1 of the game, an apparent outcome in terms of student learning was their development of an understanding of the complexity of the issue of coercion and sexual coercion. A major change objective for part 1 of the game was to support learners or players in developing an understanding of what coercion is and that it can come in many forms and that to develop an understanding that they may be at risk of coercion or may be at risk of acting coercively towards someone else. As part of the game mechanics, part 1 asks players to decide whether the scenario they have seen is an example of sexual coercion; they can answer 'yes', 'no' or 'maybe'. In every case researchers' observed the class was divided in their responses, providing the opportunity for discussion and debate; and with guidance from the teacher, the students frequently demonstrated that they could see the complexity related to whether or not a situation is considered coercive. For example, students were observed making comments such as, 'Yeah, but it's not that simple is it?' and 'It really depends on if he keeps asking.' They also talked about different ways in which the example scenarios could develop differently from the information provided in the on-screen scenarios demonstrated they understood that situations may become coercive or may remain non-coercive dependent on what followed.

Students also consistently demonstrated an understanding of the different perspectives of people depicted in scenarios and debated the different ways those individuals might feel and

therefore respond. Although we cannot from the qualitative responses observed and recorded, be sure that risk perceptions were altered or enhanced, it did appear that understanding about coercion developed for players. This theme further supports the decisions made to include a 'pause' button to support discussion and discourse within the classroom setting.

#### ***4.4.6 Consistency of delivery***

Teachers were given a facilitator's manual in addition to the game to support them in delivering classes using PR:EPARe. Each teachers' approach to delivery (five different teachers participated) differed considerably however as they brought their own approach and experience to delivery and facilitation. It is likely that every new teacher or facilitator may bring slightly different approaches to bear on delivery. These will range from the way they organise the class to select answers and responses, to ad lib stories or illustrative examples that they feel are relevant to getting across a certain point they want to make. It must therefore be accepted that whilst the game and manual provide a certain level of consistency to delivery, there are limits to the extent to which this can be achieved by a learning resource.

## **5 Conclusions**

The development of the PR:EPARe serious game for relationships and sex education drew on a multidisciplinary approach, where the Four Dimensional Framework for learning (game-based learning design) and the Intervention Mapping approach (for health intervention) inform all decisions made about the design and development of content and game play. By applying these approaches, the research team has ensured that the end-product is wanted by and acceptable to end-users, and can demonstrate a clear rationale for each decision made during development. Identification of change objectives also provided distinct evaluation measures to assess its effectiveness when implemented in classroom settings. The specific topic and content were firmly based in what end-users and the theory and evidence base suggested was needed and would work. The game play mechanics were incorporated with the intention of maximising engagement and likelihood of message delivery and learning for players. The blended deployment involving interaction with the computer-based game play and the requirement for facilitator-led discussion and classroom discourse, maximise the potential for IM change objectives to be met, and for the full range of learning mechanics to be implemented to meet those learning objectives.

This paper provides evidence for the pedagogical perspective of the game development established by the mechanisms of the game flow that encourage learning efficacy, which has been supported to some extent by the early c-RCT outcomes. Analysis of observation data suggests that blending this interactive game-based approach with traditional classroom delivery encouraged the teachers and students to engage in communal discussions and debriefing during and after game play. Together, the results demonstrate real benefits for blended game-based learning interventions used to support the delivery of RSE.

This paper also highlights the feasibility of deconstructing game development into four key dimensions using the 4DF model, which also involves a participatory-driven context and learner's profiling using the IM approach. The active involvement of teachers, pupils and other stakeholders throughout the development and evaluation of PR:EPARe ensured that the design and delivery received a positive level of acceptance. This demonstrates the importance of a participatory approach throughout the project. In order to guide the assessment of the



game design, development and deployment, the LM-GM model emphasises the importance of analysing a game-based learning approach based on its pedagogical and game constructs.

Future publications will demonstrate the full extent to which the game's change objectives were met, and provide further discussion about the extent to which game mechanics may have influenced these outcomes. Following any further amendments to the game in light of those findings, future larger scale trials and evaluation work should explicitly consider the role game mechanics versus non-game based approaches play in achieving intervention objectives for learning and change in psychological preparedness for dealing with sexual coercion.

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## Appendix A

**Table A. 1:** Matrices of change objectives for the RSE Serious Game

| Performance objectives   | Attitude  | Knowledge                                     | Self efficacy / skill  | Subjective norm  | Optimistic bias   |
|--|---|---|--|--|---|
| <b>1. Respond effectively to coercive sexual behaviour to achieve outcome in line with own preferences</b> | Expect there to be negative consequences of allowing unwanted sexual advances to continue | Identify nature and levels of sexual coercion | Express confidence in ability to recognise all types of sexual coercion                      | Explain that peers and older others recognise and respond effectively to coercion to avoid it          | Understand the risk of sexual coercion and need to respond as personally relevant.                      |
| 1a. Identify discomfort with sexual request or behaviour   | Identify low level coercion as negative   | Label low levels of coercion as coercion      | Express confidence in identifying low level coercion   | State that peers and older others feel uncomfortable with coercive sexual requests and behaviour       |   |
| 1b. Say no or clearly indicate discomfort with request or behaviour  | Evaluate saying no to low level coercion as positive                                      | Identify saying no as a possible response     | Demonstrate confidence in saying no to low level coercion                                    | Explain that peers and older others say no when they experience discomfort with a request or behaviour |   |
| 1c. Identify any further manipulative responses/requests to a clear “no” or indication of discomfort       | Identify persistence with coercion as particularly negative                               | Recognise how coercion levels may increase    | Express confidence in ability to identify continued or increased coercion                    |  |   |
| 1d. State adamance about not wanting to go along with request or behaviour, whatever tactic is used        | Evaluate persistence with a negative response as positive                                 | Identifying continuing to say no as possible  | Demonstrate confidence in saying no in the face of resistance to earlier negative responses. | State that peers and older others persist with making their negative response clear                    |   |
| <b>2. Deal with temptations to use sexual coercion</b>   | Express the belief that coercive sexual behaviour has negative                            | Identify nature and levels of sexual coercion |  |  | Recognise that anyone can potentially exert coercion on someone else, and see it as personally relevant |

| Performance objectives  | Attitude  | Knowledge  | Self efficacy / skill   | Subjective norm   | Optimistic bias |
|---|---|--|---|---|-----------------|
|   | consequences for those that coerce others and those who are coerced           |  |   |   |                 |
| 2a. Recognise own desires for sexual activity might be incongruent with others  | Assess a partner's desire not to do something as a positive.                  | State that a simple incongruence in sexual arousal could lead to coercion.   | Express confidence to recognise incongruence in desire to progress or engage in certain behaviours between self and partner | Appraise peers and older others as experiencing incongruence in desire during sexual activity |                 |
| 2b. Stop making a request or performing a behaviour when a negative response is received  | Evaluate stopping in response to a no response or aversive action as positive | Identifying stopping as an option  | Express confidence in ability to stop   |   |                 |
| <b>3. Seek support from an appropriate place when sexual coercion is causing difficulty*</b>  | Describe seeking support in relation to sexual coercion as positive.          | Identify nature and levels of sexual coercion  |   |   |                 |
| 3a. Identify an organisation, trusted adult or friend with whom to discuss concerning or repetitive coercive behaviours or requests |   | List organisations, known and trusted adults and friends who could offer support and advice about experience of coercive behaviour |   | State that peers and others seek advice about coercion if it becomes a difficulty.            |                 |
| 3b. Discuss and decide on appropriate action  | Value the opportunity to get assistance on this issue highly.                 |  | Express confidence in ability to discuss experience of coercion with identified appropriate source                          |   |                 |

| <b>Performance objectives</b> | <b>Attitude</b> | <b>Knowledge</b> | <b>Self efficacy / skill</b> | <b>Subjective norm</b> | <b>Optimistic bias</b> |
|-------------------------------|-----------------|------------------|------------------------------|------------------------|------------------------|
|                               |                 |                  | of support.                  |                        |                        |

\*NB. Please note that performance objective 3 is not directly addressed within game play but is offered as an additional component after game play through facilitator guidance in the facilitator handbook and by provision of a de-brief sheet which gives players sources of advice, support and further information relevant to their own geographical location. This objective is part of the complete intervention programme.