

AB ERRANTRY: A GAME TO BUILD AWARENESS OF THE ABERRANT AND ABHORRENT IN TEENS AND YOUNG ADULTS WITH AUTISM

A game to build awareness of the aberrant and abhorrent in teens and young adults with autism

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Abstract

Diagnoses of autism continue to climb, with incidence levels reported as 1 in 59 for 8-year-old children. Persons with autism prefer to socialize online where they risk encountering online predators. Online social environments can be used to build skills needed to make them more risk aware. The team created a medieval-themed Unity game with a fantasy storyline. In this game, the player/knight needs to navigate past non-playing characters who misrepresent their identities/goals, and who try to manipulate choices and behaviors of the knight trying to complete traditional game challenges (e.g. battles and puzzles). The game mechanics were designed to show common behaviors and linguistic patterns used by online sexual predators: social grooming, inappropriate trust building, and social distancing from trusted communities. Play-testing was performed by middle-school and college students (some with disabilities). A strong majority of the play-testers provided positive feedback and expressed willingness to play the game again.

Context and Project Need

The core concepts driving the Ab Errantry project are the prevalence of the online environment and gaming in the lived experience of many with autism, the risks which accompany the benefits of the online environment, and our perception of the potential to use the same kind of environment to address the risks.

Autism and the Online Experience

Diagnoses of autism continue to climb, with the most recent incidence levels reported as 1 in 59 8-year-old children (Baio et al, 2018). Persons with autism sometimes prefer to socialize online, as this can minimize sensory overload and reduce the stress of social interactions (Davison & Orsini, 2013), as well as providing access to communities such as online forums, communities devoted to “autistic culture,” and social media which focus on the often niche special interests which are an integral part of the autism experience (Jordan & Caldwell-Harris, 2012) (Davidson, 2008) (Brosnan & Gavin, 2015). This preference holds true across age groups and genders (Haney & Cullen, 2017), and is significantly higher in children with autism than those without (Mazurek & Wenstrup, 2013). The importance of the internet for those in the autism community has been described in such strong terms as “[t]he impacts of the Internet on autistics may one day be compared to the spread of sign language among the deaf” (Singer, 1999).

Autism and Online Games

It should be no surprise to find that the importance of online community for those with autism extends to online games and virtual environments, many of which have been tested and proven effective for many in this community. For younger children, modalities included games, “computer-delivered instruction (including games), iPad-type apps, virtual environments, and robots” (Gillespie-Lynch et al, 2016) (Abirached, 2011) (Ke, Moon, 2018) (Zakari, Ma, Simmons, 2014), while for older children, teens, and young adults, and adults examples include Minecraft, Second Life, social networks, MMORPGs, virtual reality (Gallup, 2016) (Kidney, 2015) (Ringland et al, 2016) (Smith et al, 2014) (Stendal & Baladin, 2015). In some tests, video games and online gaming has proven more successful in engaging teens and young adults with autism spectrum disorders (Bahiss, Cunningham, Smith, 2010) (Cole, Griffiths, 2007) (Mazurek, Engelhardt, Clark, 2015) (McEvoy, 2016), both socially and therapeutically (Wilkinson, Ang, Goh, 2008).

Autism and Risks of Online Environments

Persons with autism may be more at risk from online predators, experiencing bullying, insults, threats, being the targets of lies or rumors, and/or sexual cyber-solicitation (Normand & Sallafranque-St-Louis, 2016) (Sallafranque-St-Louis & Normand, 2017) (Sevlever, Roth, & Gillis, 2013). Part of this is due to the innate social skills and communication challenges associated with spectrum disorders (Lough & Flynn, 2015), in particular difficulties distinguishing lies and jokes (Leekam & Prior, 1994), as well as a general tendency to be more trusting or naive and susceptible to deceit (Yi et al, 2013) (Li et al, 2011). Another aspect of increased risk is due to children with disabilities being preferred targets for some online predators, and children with autism being specifically susceptible due to vulnerabilities derived from social isolation, loneliness, naivety, low self-esteem, insecurity, and related qualities (Whittle et al, 2015) (Wells & Mitchell, 2013) (Quayle, 2016). High levels of internet use have also been identified as a factor associated with increased vulnerability to online predators (Whittle et al, 2013).

The World Wide Web Consortium (W3C) Cognitive Accessibility Roadmap and Gap Analysis (COGA) has synopsized the specific qualities that enhance these risks in the following way.

“People with cognitive disabilities may be more at risk of being a victim of a sexual crime. This is more likely if:

- they tend to be unaware of someone using a fake identity or misleading information;
- they are dependent on care givers and family who they are afraid of disappointing, which makes them susceptible to blackmail;
- they tend to believe false information and find it harder to validate facts;
- they are less likely to identify unreasonable requests.”

(Cooper & Bernard, 2017)

Because of the preference for online social environments, to address skills-building around these risks, the approach taken was to develop an online game. Online resources, virtual environments, and video games have previously been utilized for autism social skills education and soft skills training

(Gallup et al, 2017), while edutainment and online training have been used as tools for the prevention of sexual abuse (Gesser-Edelsburg et al, 2017) (Paranal et al, 2012).

Relevant Aspects of Online Predation

A key factor in social engagement in online environments is communication and community building, both areas in which persons with autism tend to struggle in both offline and online contexts. Cyber-predators twist standard modes of communication in subtle ways to elicit specific responses and behaviors in the vulnerable whom they target. Identifying these differences was critical for game planning and scripting, especially with respect to social and sexual grooming behaviors to be modeled in the game.

A number of studies have used text-mining and various forms of algorithmic analyses to extract these patterns from text chatlogs and other resources (Bogdanova et al, 2012) (Bogdanova et al, 2014) (Ebrahimi et al, 2016) (Egan et al, 2011) (Pendar, 2007) (McGhee et al, 2011) (Kontostathis et al, 2010) (Gupta et al, 2012) (Drouin et al, 2017). Perverted Justice (<http://www.perverted-justice.com>) is a site which compiles chatlogs from online conversations with sexual predators, and is a resource which can serve to inform and model patterns of language to be used in scripting dialog. Text patterns of primary importance to the project were language used for gaining access (“luring”), compliments, reframing, building trust in the predator, undermining trust in prior relationships and friendships, iterative desensitization, and isolation. Those purposes were achieved through patterns of fixations and repetition in conversation, shifts in language toward familiarity and colloquialisms, and similar linguistic strategies.

There are many models defining stages of sexual grooming, as well as work to extract themes and define typologies of offenders (Gupta et al, 2012) (O’Connell, 2003). Specific concepts repeated across virtually all of these and which proved essential to designing the game experience were in many ways parallel to the language patterns — building a friendship; forming a special relationship; minimizing risk to the predator through secrets-keeping; creating isolation by undermining other relationships, building dependence, and exclusivity, with the various parts of relationship forming being central.

Project Process

Often game developers use a story line, game mechanics, or desired technology as their starting point. In our case we began with the goal of creating a game that would help older autistic adolescents and young adults recognize the strategies used by cyber-predators to groom and seduce their victims. We created a storyline focused on a knight completing a quest for the king. During this quest the player would need to choose to interact with several non-playing characters (NPCs) who may or may not be good individuals. In fact, some of them would lie with the intention of harming the player in the future, and the player’s best choice might be to approach strangers with caution or avoid them altogether.

The team examined the relevant literature on games for educational purposes, gamification strategies, and the use of games with our target audience. The literature findings, along with our previous experiences in building serious games, influenced the design of our game and the player interactions. We did not want this game to be text heavy, so the team decided to create a single-player 2D side-scrolling platformer using artificially intelligent (AI) NPCs.

Super Mario ([https://www.mariowiki.com/Super_Mario_\(series\)](https://www.mariowiki.com/Super_Mario_(series))) was selected by the design team as a model for game play. Super Mario is a single player game with the goal of rescuing a lost family member. The game requires no test input. Obstacles are puzzle that add to the entertainment values of the game play. Combat is simple (jump on the NPC blocking the player's progress or jump over the NPC). A complete game has several levels before the final boss battle.

The reason we choose to create a 2D platform game with animated characters was to reduce the system requirements for players' mobile devices. Cartoon like characters were created to lighten the ambience of what could be a very dark and scary experience (the dangers posed by cyber predators). We wanted to emphasize player decision making and focus on the quality of the game AI instead of using high resolution graphics. Multi-player gaming was rejected to allow students opportunities to engage the game in private.

Scoring is being done unobtrusively based on the players' interaction with the NPCs. The NPC dialog is presented as a multiple-choice menu and only displayed if the player chooses to interact with the NPC. Assessment of the player's performance (e.g. how often did you give out too much information to the NPCs?) is done after the final boss battle. In the final boss battle the where the player is asked to choose which of two character is the lost prince or princess and which of the boss characters is the pretender.

This game was implemented as using the Unity game engine. The reason for using Unity is the ease with which games can be exported to multiple platforms (the web, PC, Mac, and mobile – both IOS and Android). We decided to implement Lynx, Mac, and Win10 PC versions of the game and to deploy the game on the Steam platform. Our game scripting is being done using C#, making it easy to interface with external software libraries as needed. An XML editor was created to allow fine tuning of the scripts without rebuilding the game itself.

Story

The game was developed in Unity 3D as a 2d side scroller with a medieval-themed fantasy quest storyline. We created a storyline focused on a knight completing a quest for the king. The king's children, a son, and a daughter, have run away from the castle, and the king is offering a reward for their safe return. The king's children do not want to be found or returned, and are hiding their identities, while there are other characters who wish to get into the castle or to disrupt the rescue for their own reasons. The knight has to navigate past characters who misrepresent their identities and goals, along with more traditional game challenges such as battles and puzzles. The knight character includes minimal player customization for gender, and the player can also choose which of the king's children they wish to focus on rescuing.

The game contains several scenes (e.g. forest, cave, castle, etc.) to allow the introduction of several different types of cyber predators. We tried to use game characters whose appearance as fantasy beings or animals which personified specific types of predator grooming behaviors.

Mechanics and Development

The game mechanics were designed to address specific target common behaviors of online sexual predators, such as social grooming, inappropriate trust building, and social distancing from

previously trusted communities. The dialog scripting was developed, in part, to model language extracted from linguistic patterns of actual predators (Olson et al, 2007), as well as to further the game storyline. The game concept and design were developed in collaboration with a person with autism. The scripting and game mechanics were developed in conjunction with a consultant in online sexual predators. The game was designed to be enjoyable for a broad audience, not just the original target audience, with the underlying purpose presented as subtext, with the specific lessons to remember brought out in a post-game 'debrief' that is made available to the player.

The player is given the initial quest (find the missing prince or princess) and it free to undertake the quest using either a male or female avatar. Avatar is controlled using the keyboard. Players are taught how to use special keys during the in-game tutorial level.

After completing the tutorial level, the player advances through each level by solving puzzles required to get past each obstacle. Puzzles are solved by deploying the right combination of player actions. NPCs and boss characters are present in each level. Game pickups (e.g. better armor) are scattered throughout the levels. Players must to decide to ask for help by talking to an NPC or to run away from the NPC. Each boss character exhibits a different grooming behavior or seduction strategy towards the player. In the final boss battle the player must decide which of the two characters is the prince or princess the player was trying to save.

In-game rewards provide powerful motivation for players to continue to play the game and replay levels. The rewards included in our game are a high score list and feedback on how well the player avoided risky choices.

Connecting Game Mechanics to Behavior and Purpose

For game design purposes, it was necessary to limit the number of online safety concepts to be explored in the game. For this early version of the game, the core concepts selected were appropriate information sharing; social grooming; social distancing and isolation; and appropriate and inappropriate trust building. Some of the ways in which these were integrated into the game mechanics included character development and situational tasks, beyond the previously mentioned design of bosses to match predator types or grooming behaviors.

Example One

Appropriate information sharing is addressed at one point through a scenario in which the knight had promised the King or the King's representative to keep his quest private. The knight then, early in the quest, encounters a village where other characters ask him for information about his visit. Depending on what information and how much information is shared by the knight, the villager(s) respond differently, ranging from being welcoming to an attack.

Example Two

Social grooming and trust building are negotiated in one version of the game through two characters which play "good cop" / "bad cop" roles. One character is the General, who represents the King's interests in the quest, and the character will be randomized to be either. The knight must decide whether or not to trust the General or the King, and both characters make requests of the knight which can model social grooming types of decision points. This means that the knight is asked

to perform tasks or behaviors which either break conventions or promises already made by the character, and that the requests escalate over time.

Development

Students taking the Computer and Information Science (CIS) capstone design course at the University of Michigan-Dearborn provided the majority of the software engineering effort for this project. They were assisted by a group of professionals working without pay. The authors served as mentors for this team.

The CIS capstone design experience is organized as two, two credit-hour courses (CIS 4961 and CIS 4962) which students complete over two semesters. These courses are required of all computing majors. Most students taking these courses complete projects for off campus clients as part of their capstone design projects. Students enroll in the capstone design experience after they complete all required software engineering courses. For this project it was expected that they had completed the two course Game Design sequence as well.

The capstone experience projects generally require about 800+ hours of student effort to complete. The major activities in the capstone experience involve: requirements gathering, project planning, risk management, product design, product implementation, quality assurance, and testing. Serious game projects usually make use of an agile, rapid prototyping process, so a clear distinction between the analysis and design phases of a project may not exist.

Ideally students work in four-person teams. Students select their own teammates and determine their own plan for rotating team leadership. For game project students tend to work as agile teams, though often one team member takes charge of documentation and one team member takes charged of the asset creation (2D art, animation, and audio design).

Game Testing

The planned evaluation of the game consists of a technical assessment of the game's usability, as well as an assessment of the student learning resulting from game play. Both assessments were accomplished by having game play testers complete paper survey forms. As part of the usability assessment, several software engineering students reviewed the game and provided verbal feedback to the development team. The development team ran a large number of test cases to insure conformance with the user stories defined for the game by their client. Testing was done early and often. Regression testing was done after every biweekly build. We ended up with a total of 80 usable surveys, 10 of which were from autistic individuals and 5 from persons having physical challenges.

The game was tested with a diversity of communities representing the target audiences, including middle school children, college students, and persons with a wide variety of physical and cognitive disabilities. Middle school testing was performed more in large groups, with quantitative results, while the play-testing for college students and persons with disabilities was done in more of a focus group approach, with qualitative results. Gender balance of the play-testers tended slightly towards male but was close to being balanced for gender. Game play testing addressed both specifics (such as interface, satisfaction with specific game elements, willingness to play again), and less tangible elements (such as perceived lessons in the game, and ability to identify the underlying purpose of the

game). A strong majority of the play-testers provided positive feedback and expressed willingness to play the game again.

The first play-testing session took place at a local middle school during the seventh month of the project. We had classes of sixth and seventh grade students test the game's first two levels; the plains and water levels. The goal of this play test was both mechanics and function: Is it fun? Is it too hard? Is it too long? We asked questions that gave us an idea of how the project was developing as a game, as opposed to just focusing on dialogue and social "status". We received almost 80 completed surveys that served as developer feedback, as well as identifying a large number of bugs and glitches. We noted the problems and created fixes for each of them.

The second play-testing session was held a three weeks later during the final month of the project. This time the play test took place in the University of Michigan Shapiro Design Lab. We had three university students with a range of cognitive and physical disabilities spend an hour each playing the game. This test focused on the game as a whole; functionality, dialogue, UI, design, animations, accessibility, etc. Using older testers and smaller sample size, this play test was much more personal in nature. We were able to take more detailed notes. We performed immediate hotfixes for small issues and rebuilt the game on the fly and let our play testers verify that we fixed the game problems they identified.

Future Directions & Next Steps

As the project progressed, we received feedback that the game was of interest for other audiences in addition to those with autism. We were encouraged to make the game available for testing with groups such as teens and young adults with cochlear implants, persons with mental illness and their therapists, seniors, and the elderly, and other vulnerable populations at risk of online predation. The game code and assets are being made available in GitHub in the hope that others may choose to modify the game for some of these other populations, or to expand upon the core which has been developed.

Future directions for the project include seeking partnerships with researchers working in the autism community or related populations to further validation and testing, and to work with researchers and clinicians working with persons with disabilities to improve the accessibility of the core game. It would also be desirable to build out the game to include additional tests, encounters, puzzles, or battles to reinforce the specific concepts from different perspectives, and to provide alternate scenarios to allow for replay variations or to facilitate randomization of roles assigned to characters.

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