Creating MindGamers™: Building Communication, Design and Development Process with Clinicians, Game Faculty and Students

Stephen Jacobs

Rochester Institute of Technology

Laurence Sugarman, MD

Rochester Institute of Technology

Robert Rice, PhD

St. John Fisher College

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Abstract

In 2010, the authors (Jacobs, a game design professor, Sugarman, a pediatrician, and Rice, a psychotherapist) started meeting to brainstorm design and play concepts for a therapeutic, physiologically-controlled videogame intended for use by people diagnosed with anxiety and/or autism spectrum disorder (ASD). The goal was to combine cognitive behavioral therapy (CBT), narrative therapy (NT) and biofeedback supported psychophysiological self-regulation (PSR) into a game that would engage adolescents and provide hard data on a player's physical and emotional states during a therapy session. The game concept that emerged is "MindGamers™ in School" (MG), a therapeutic game prototype being developed and tested across two 6-month sessions by the authors and two teams of undergraduate game design and development students at the Rochester Institute of Technology.

Pursuing the design required half the team to learn principles, terms and methods of strength-based, client-centered psychotherapy and their application to psychophysiological self-regulation and biofeedback theory and practice. The other half of the team needed to engage in understanding the current state of role-playing videogames, avatar creation systems and game design/development processes.

This paper will describe the current game prototype and then focus on MG's design and development process by looking at how the initial design period brought the game design to its current state and how it has continued to influence the production process.

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A player of MG, in collaboration with their therapist, first creates three game avatars in a process shaped by CBT and NT. The avatar creation and customization process includes processes that help identify a player's relationship with a repetitive behavior (Rice & Williams, under review), as well as a "strengths assessment" that both evokes and characterizes inner resources the player brings to address their conditions (Madsen, 2007).

The first avatar created represents the player as they see themselves at the time of gameplay. Initial avatar creation follows role playing game norms: selection of sex; physical characteristics; clothing, but no equipment, armor or weapons, a divergence from convention.

After the initial avatar is finalized, a scaled-down duplicate (an IMP, for *I*nner *M*otivational *P*rojection) is created automatically. This second avatar is the "Goal-Directed IMP" (GDIMP) and represents the player's idealized self that is fully in control of their behaviors and thoughts. The player equips the GDIMP with their selection of clothes and/or armour. They then select weapons or tools for the GDIMP to use. In NT, these symbolize the player's self-identified strengths and learned therapeutic strategies they use in real life to cope with anxiety and related repetitive thoughts or behaviors. They are then named by the player with whatever terms makes sense to him or her. For example, a player might label a sword the "Sword of Sharp Intellect" (thinking through situations) or the "Pocket Watch of Slo Mo" (pausing and counting to five before acting). These are then added to the GDIMP's utility belt by the player. It is important to note that these items are not playable within the game, they

serve more as reminders, badges and/or achievements for reasons that will become clearer as gameplay is described.

The third avatar created by the player is the Problem-Based IMP (PBIMP). In CBT, the PBIMP is an externalized construct for anxiety or repetitive behavior. The PBIMP also provides valuable information to the therapist, as it speaks to the relationship between the player and his or her repetitive behavior. For example, a player who's repetitive behavior is characterized by a more risk-avoiding or intrusive process (e.g., someone who is fearful of germs, like that experienced by many diagnosed with an obsessive-compulsive disorder (OCD)) is likely to have a PBIMP that looks like some sort of swamp monster or similarly scary character. On the other hand, a player who's repetitive behavior is characterized by a more pleasure-seeking process (e.g., someone who chews paper to cope with stress like that experienced by many people diagnosed with an ASD) might create a character that looks more like the buddy that always gets them into trouble. In game, the IMPs will follow and influence the player's avatar and gameplay. For example, the PBIMP may push the player's avatar off-track, impeding his or her progress in the game. On the other hand, as the player calms, the GDIMP pulls the player's avatar in the direction of their mission (for example, get to class on time) unhindered.

For the final step in game set-up, the therapist and the player identify conditions that trigger the player's anxiety and impairing repetitive behaviors. These are represented as icons that depict social and inanimate stressors that the player encounters in real life. They can be pulled into the game environment and strategically placed at several locations within the school level for the player to encounter during gameplay. The player and their therapist will also set the avatar to be attracted to (e.g., in order to clean-up, straighten, etc.) or avoid these triggers during

gameplay. It should be noted that while the description of this process seems drawn out and laborious, in practice it involves a dynamic and engaging give and take between therapist and player.

Gameplay requires two sets of inputs. The first is via standard PC game controllers like keyboard and mouse. The second input device is a NeXus-10 wireless transducer that reads respiratory rate (RSP), peripheral skin temperature (TMP), skin conductance level (SCL) and blood volume pulse (BVP) as proxies for autonomic nervous system balance (ANSB: stressed *versus* calm), which are then dynamically summed and represented as a "Stressmeter" on the game's display. This portion of the game is derived from Dr. Sugarman's work (Wester & Sugarman, 2007, Sugarman 2000, Reaney, Sugarman, & Olness 1998, Sugarman, Garrison & Williford, in preparation) with PSR and PSR with autism.

As everyone's physiological responses vary, and a given individual's autonomic state may change during gameplay, MG incorporates an original Dynamic Feedback Signal Set (DyFSS) system that allows the game to bias toward whatever signal(s) (RSP, TMP, etc) are most dynamic and adaptive at the moment. As the player's avatar engages the previously identified triggers for anxiety and repetitive behaviors in the game, their ANSB will be displayed on the Stressmeter. These technologies are employed to drive the game's core mechanic, self-regulation of ANSB: the more the ANSB trends towards being calm, the more influence the GDIMP has over the player's Avatar and the easier it is to succeed in the game.

In our initial prototype level, the triggers that can be selected are related to dirt and germs. The level is populated with overflowing garbage cans, restrooms with open doors and

similar symbols. The goal of the game is for the player to avoid getting distracted by their old tendencies and behaviors that these would trigger and get their avatar to class on time.

As the player starts the game, a baseline reading of his or her ANSB is processed by the NeXus-10 through the DyFSS and displayed on the Stressmeter in the game interface. As the avatar approaches triggers in the environment (e.g., the garbage can) ANSB shifts towards increased stress. The Stressmeter will reflect this and the PBIMP will drag them off track; either towards the can if their repetitive behavior would attract them to it or away from it if they tend to avoid such objects. Succumbing to either impulse will delay the player's avatar and prevent them from getting to class on time. As the player moves thei ANSB towards being calm by employing a particular stress reduction strategy (represented by the GDIMP's apparel and utility belt equipment) the GDIMP intervenes, by distracting the PBIMP, allowing the player's avatar to get free and make their way to class. So skill development in PSR through biofeedback is joined with CB and NT as characterization and control in the gameplay.

This covers the core mechanic of MindGamers, the interplay between game environment, avatar control and player's internal state. Once a player successfully reaches a goal within the game (for example, getting to class on time) gameplay shifts to a secondary mechanic of minigames that represent "daydreaming" in class. While in the real-world of classroom behavior, this is seen as detrimental, in the therapeutic world daydreams offer another opportunity to rehearse and review strategies. So the minigames are a "reward" and "add fun" to MG at several levels. First, they offer a less therapeutically directed opportunity for play. Second if the player scores well at them the minigames will award buffs like extra time, increased, etc to enhance player's avatar capabilities in the core game. Last, but not least, they

offer an opportunity for a little "illicit" fun at no consequence, by allowing players permission to do something in the game in a place where they would normally be peanlized if they were caught.

The first functional prototype, and the results of the initial patient usability studies and project timeline have been presented at the American Society of Clinical Hypnosis, Charlotte, March 2012 the International Meeting for Autism Research, Toronto, May 2012 and Games for Health, Boston, June 2012. The second phase of production, to develop a wider and deeper prototype, began in June and will conclude in November of 2012.

Getting From There to Here. The Design Process for MindGamers.

Since the project began, the team has been built as a three-legged stool. Jacobs has been much more of a "Guide on the Side" in this process, allowing the design and development to emerge more organically as a collaborative project between the clinical and development teams.

After the initial meeting, Sugarman and Rice were provided with models of game high-concept and treatment documents to help them formulate their concepts in ways that would be clear to undergraduate game developers. When RIT provided the initial seed funding for development in 2011, the first of two 6-month waves of development began with the recruitment of three student developers who would work as full-time co-ops for that period. The first three months were dedicated almost exclusively to research, conceptual design and physical prototyping. Much of the first six weeks was devoted to ensuring that the clinical team (Sugarman and Rice) and the student development team achieved a common understanding of each other's roles and expertise, as well as a common understanding of the therapeutic and technical needs of the project.

Speaking Each Other's Language and Walking in Each Other's Shoes.

As a first step, Sugarman arranged for each of the production team members to experience customary aspects of clinical biofeedback sessions related to autonomic balance. Using the NeXus -10 and the sensors (RSP, TMP, SCL, BVP), students first experienced the different reaction rates and directions of response for each of these physiological proxies to both novel external stimuli (hand clap, sudden movements, calming music) and internal processes (movement, calming and stimulating thoughts). Next, both fixed and dynamic (fast and slow averaging) thresholds were explored so that students could experience the difference in use-response to this feedback. For example, attempting to lower stress towards a fixed threshold is increasingly more stressful and less supportive than interacting with a dynamic threshold that follows the user's progress. Through this experiential learning the development team expanded their understanding of the design characteristics for the DyFSS Specifically, (1) they evaluated their own responses; (2) experienced concrete physical and interactive constraints of the system; (3) learned about movement restrictions imposed by the sensors; and, (4) got a sense of performance lags, imposed by system processing, between psychological changes and feedback display.

Next, Rice introduced the development team members to the therapeutic techniques that he uses to assess and treat repetitive behaviors in young people diagnosed with OCD and/or ASD. These approaches, based in CBT and NT, have demonstrated an exceptional capacity to help young people: 1) better understand their repetitive behavior and what sustains it (Rice and Williams, under review); 2) develop a sense of hope and agency (Madsen, 2007); and 3) establish control and skills for coping (Wagner, 2003). It should be noted that these approaches

are especially well suited for integration into a videogame, as they emphasize externalization and metaphor in case conceptualization. Specifically, Rice works with young people to help them: 1) achieve a future focus that is based on a client's strengths and preferred outcomes; 2) externalize and rename a behavior that is being worked on in therapy; 3) identify situations where a client can begin to insist that he or she is in charge; 4) defy repetitive behavior (e.g., do the opposite of what OCD is telling one to do); and 5) celebrate small and large successes.

Both clinicians provided the team with readings (e.g., selected chapters from Schwartz M.S. & Andrasik F.,2005; Andreassi J.L., 2006; Cacioppo J.T., Tassinary LG & Berntson G, 2007; Madsen, 2007) and led discussions on the material to ground the team in the concepts and language required to navigate the theory and practice.

Likewise, the clinical team needed to develop their understanding of some aspects of videogames with which they were less familiar. As character customization is key to MindGamers, the team all acquired trial licenses for *City of Heroes,* from NCSoft, Inc *(*NCsoft, 2012) recognized as having a ground-breaking and deeply-detailed system for this in modern computer games. (Lafferty, 2004) The teams went through character customization, training levels and some initial missions to get a feel for those aspects of games. They were also introduced to *Rockett's New School* a video game/interactive story hybrid produced by the now defunct Purple Moon studios. (Purple Moon, 1997) The title has a deep narrative and gameplay is characterized by making choices for the lead character on how to react to the other student's behavior towards her and by going through lockers of students and faculty to learn more about their backstories and understand their motivations. While these behaviors are key to the therapeutic aims of MindGamers, the design team moved away from the type of direct approach

evinced by the title, but viewing it was key to moving MG in its current direction. Additional games reviewed that proved useful to the therapeutic team's shaping of MindGamers included PSR-based videogame *Journey to the Wild Divine*, (Wild Divine, 2002) and game aspects of the *HeartMath EmWave* (Heart Math, 1991) and *MindMedia Biotrace+ (*Mind Media, 2004) systems.

Defining Design

Once the team members had an understanding of each other's concepts, vocabulary and roles they began to move forward by revisiting the therapeutic team's original High Concept Document for MG. Prototyping was done both by physical prototype and, often more successfully, via role-playing and enactment of what would happen in the game, Role-playing as a prototyping method became key to the team's gaining a clear understanding of gameplay and goals. This was clearest in the following example.

The team was discussing how a player's avatar and IMPs might react to a trigger in the game. There was a deadlock in the discussion. The clinical and development teams were unable to communicate a potential scenario from the game prototype. So they acted it out together. The example used was a dirty trash can in the hallway of the school and how a player's avatar and IMPs might react to it. By identifying a chair as the dirty trashcan and acting out the scenario in the meeting, it became clear that the sticking point had been the development team's difficulty in understanding that there would be different player's reactions to the trashcan and subsequent behavior. What the clinical team was trying to communicate was that some players might be compulsively attracted to the can out of a need clean it up, while others might go all the way around the school in order to avoid it. The PBIMP would therefore drag the player's avatar

toward the can or away from it depending on the player's real-life tendencies in a similar situation. In either case, the GDIMP would need to overcome the PBIMP's infuence over the player's avatar as the player became calmer. By acting the gameplay out, the difference in players ' reactions became clear in a way they hadn't before. This led to the creation of another layer of refinement in the game set-up between player and therapist before the game begins.

As the game design process progressed, several other issues emerged that were not made evident by the board game prototype. As a result, the team acted out several more scenarios in their efforts to refine gameplay and ensure clinical relevance. For example, the interaction between the IMPs was refined to be one of influencing the player's avatar and engaging each other in non-combative ways rather than directly battling with each other. This was done to keep the game's focus primarily on the player's internal state. Furthermore, the role of the devices, weapons and armor on the "utility belt" were refined to be representational rather than actual aids to combat, shaped by the understanding that game players expect the use of these items to be immediate and direct, and that goes against the time required for a player to "calm down." The daydreaming mini games, an addition to the game above and beyond the original ideas from the clinicians HCD, was devised by the game development students and came from their greater understanding of "more fun" and additional rewards in the game to increase player engagement and enthusiasm for MG.

Placing the game development faculty member in a "Guide on the Side" role, rather than a hierarchical leader, allowed both teams, Clinical and Development, to work more organically as two halves of a whole, each treating each other as experienced experts in their fields.. The goal of creating a game for health that utilizes "evidenced-based game design" required this

diversion from "a lead designer" in more traditional approaches in order to maximize communication and limit barriers caused by differences in expertise and professional language.

Setting Process and Scope

Scoping and tiering development of games is a crucial piece of the development process. The teams quickly identified five major areas of the game's development: 1) the connectivity and communication of sensors to the Unity Game Engine that would be the development environment; 2) the patient/therapist preferences (selecting conditions and triggers); 3) the avatar customization process; 4) the core gameplay mechanic of interplay between player internal state 5) the IMPs and the game level environment; and 6) the day dreaming mini-games. The team as a whole, after in-depth discussions, ranked those in importance as;

1. Connectivity
2. Core Mechanic
3. Avatar Creation
4. Player Preferences set-up
5. Mini-Games

While it was clear that the first two were critical to the concept of the game overall, and the most challenging technical aspects of development, it was important to the clinical team to also begin prototyping the avatar selection. It was key for them to evaluate the overall approach with their target population to ensure the game concept was on the right track. To accomplish those goals, the decision was made to do some rapid prototyping of the avatar creation portion of MG with Adobe Flash, rather than trying to also build that in the Unity engine as well. This decision proved fortuitous as this allowed the avatar-creation prototype was able to stand alone allowing

Dr. Rice to begin using it regularly with his patients. As a result, the team was able to gain valuable feedback from Rice's clients on the avatar customization module. Furthermore, the team is moving toward testing it with other therapists and releasing it as a stand-alone app while development of the main game continues. This will allow the team to engage in several IRB-approved studies looking specifically at client preferences related to avatar and IMP customization, further enhancing MG's evidenced-based design efforts.

Conclusions and Future Study

1. Putting significant upfront time and effort in ensuring that all members of all teams develop an understanding of each other's roles and language is key to game development outside of entertainment games. Ensuring that each group learns from, and plays with, the other, i reduces tensions and misunderstanding that can occur in a more traditional "Contracted SME" environment.
2. A flatter, less hierarchical team structure, (while harder to achieve when one team consists of professors and the other consists of undergraduate students) leads to additional, and unexpected, avenues for innovations in the game.
3. For the clinical team, game development concepts learned in this interactive process informed therapeutic processes. The clinicians were able to play virtual, imaginary games with the young people in their care with the ideas and dynamics to be employed eventually in the prototype. So, even before there was a completed game, the game changed therapy.
4. University-based games for health development teams must remain especially cognizant of issues related to intellectual property and protection of human subjects. This is because these projects tend to rely on grant funding and institutional support for success, and always involve issues related to client confidentiality and related rights.
5. Evidenced-based game design requires that all team members keep client preferences and related research at the forefront of their efforts. It is not enough to make a game that you

think will help people. A successful game for health must start and end with those you intend to help.

In addition to continued work on MG itself, and due to the positive feedback from colleagues in the field who the authors have discussed their process with, we are interested in working with other professionals and creating/reviewing other case studies to do further research on best practices in the design and development of games for health.

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