The Aiming Game: Using a Game with Biofeedback for Training in Emotion Regulation

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ABSTRACT
This paper discusses the development of the Aiming Game, a serious game intended to be used as a tool for training emotion regulation. The game is part of an intervention package designed to support training of financial investors in becoming aware of their emotional states as well as providing them with a toolbox which can be used for training to counteract cognitive biases which may interfere with their trading activities. The paper discusses how such a game can be implemented as well as how it can be effectively evaluated. The evaluation is mostly focused on the effectiveness of the induction of emotional arousal by the game, which is supported by standardized game design methods and patterns.

Keywords
Serious Games, Emotion Regulation, Emotiv EPOC, Shooter, Arousal

INTRODUCTION
In the last few years, computer games have started to become valuable tools for different kinds of skill training (Garris et al., 2002). These types of games, or serious games, can be designed very differently depending on the type of training they are intended to provide. Simulation games generally try to replicate a real life scenario, such as pilot training or stock trading, in order to give the player direct training and transferable skills. Some serious games, like the one described in this paper, aim at training a specific skill in a game setting, which in turn is hypothesized to be transferable into a real world setting. Using serious games in this manner has the obvious advantage of being both cheap and risk-free in comparison to practice in real life settings as well as specifically targeting specific cognitive skills and processes.

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This paper describes a serious game called the Aiming Game (2D), which is used to train players in becoming aware of and controlling their own states of emotional and physiological arousal. The Aiming Game is a two-dimensional shooter game where the player tries to aim and shoot down airplanes, as shown in figure 1, while trying to regulate his or her emotional state in order to receive certain in-game advantages.

The game is part of an intervention package aiming at increasing performance in investment decision-making settings in the xDELIA project (Excellence in Decision-making through Enhanced Learning in Immersive Applications, Contract No. 231830). This paper will elaborate on the development process, design and evaluation of the game prototype. It describes the process of the first development iteration cycle as well as the initiation of the second iteration based on the results from the first. It will not, however, provide solid evidence that *transferable* skill training is taking place since this study has yet to be performed by project partners.

Figure 1. The Aiming Game.

Purpose

The main concern of the xDELIA project and thus the Aiming Game is to develop learning interventions for financial investors, particularly those using the Saxo Bank trading platform. We focus mainly on investors who meet the following criteria:

1. They trade their portfolio sufficiently often that systemic patterns and biases in their trading are detectable.
2. They trade on a regular basis through a trading platform.

There is evidence to suggest that effective regulation of emotions can have positive effects on performance in investment and trading settings (Fenton-O'Creevy et al., 2010). The Aiming Game is specifically aimed at assisting investors in becoming aware of their own arousal state as well as training them in regulating their arousal. Successfully training investors in arousal regulation in a game environment is hypothesized to have a positive effect on their behavior, in a real trading environment.

Cognitive Bias

When making decisions people use statistic, logics and heuristic simplifications (Gigerenzer & Gaissmaier, 2011). When using heuristic simplification, tasks usually require less cognitive resources and/or time, but this also gives rise to various cognitive biases (Baker & Nofsinger, 2002). Cognitive biases were first introduced as a concept by Tversky & Kahneman (1972) and are ways in which humans make systematic errors when trying to complete certain tasks. Baker & Nofsinger (2002) discuss two very broad categories of origins of investor biases: the structure of investors thinking and the emotions the investors are having. The Aiming Game focuses on emotions and emotion regulation in order to change the underlying information so investors who master this will not be as prone to show the biases that have a basis in feelings. Since these biases can be found in almost all subjects, investor or not, it is first tested on students to ensure that there is an effect on performance.

Emotions and Emotion Regulation

Emotions can be interpreted as manifestations of the independent components of arousal and valence (Russell, 1980), where arousal represents excitement level and valence refers to pleasurable or unpleasurable feelings. It is hypothesized that these independent dimensions represent different underlying neurophysiological systems. The subjective experiences of specific emotions, such as fear or happiness, may be understood as consequences of cognitive interpretations of these patterns of physiological activity that occur in the context of eliciting stimuli (Posner, Russell, and Peterson, 2005). Hence, by this interpretation, emotions can be visualized in a diagram where arousal and valence defines each axis, as seen in figure 2.

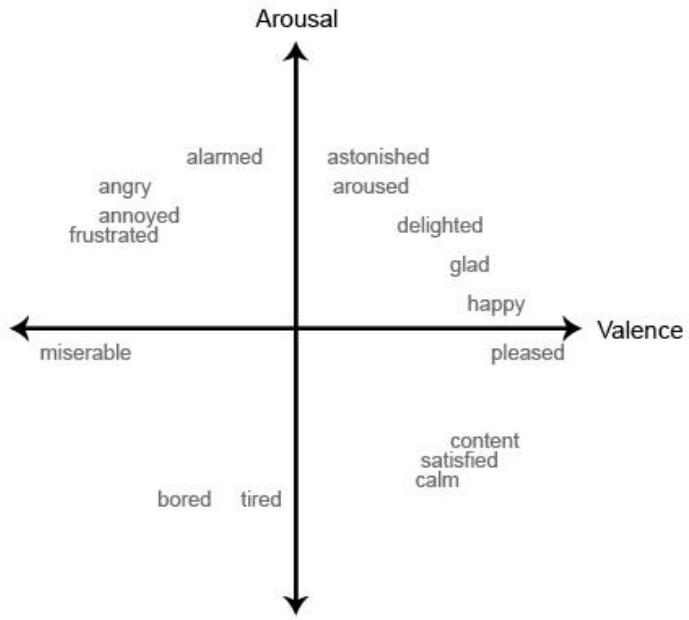

Figure 2. Emotions in the valence-arousal space.

By this interpretation, emotions can be measured by measuring a combination of valence and arousal. Valence has been inferred by facial electromyography (EMG) (Fridlund & Cacioppo, 1986), but since there are several technical difficulties such as accessibility and extensive setup procedures, the version of the Aiming Game described in this paper is not

concerned with valence. Instead, the focus here is on arousal as the primary attribute of interest, with the game being developed as a tool for training in deliberate regulation of state of arousal.

When facing difficult and stressful tasks, people tend to use one of two main broad categories of strategies to deal with corresponding negative emotions (Wallace et al., 2009). These strategies are:

- Suppression
- Reappraisal

Suppressers generally tend to push down emotions, but are continuously affected by them to a large extent. Reappraisers however tend to positively reevaluate situations, making the emotional response of the new perceived situation more bearable. Both emotion regulation strategies exhaust cognitive resources for the person affected by the emotion (Wallace et al., 2009). Wallace et al. point out that suppressing emotions generally takes up more cognitive resources than reappraisal. Generally it is therefore preferable to apply reappraisal strategies to deal with unwanted emotions.

In order to identify emotion regulation strategies used by individuals, Gross et al. (2003) developed the Emotion Regulation Questionnaire (ERQ). The ERQ makes specific statements in regards to the emotion regulatory process intended to be measured such as "I control my emotions by changing the way I think about the situation I'm in". Results of the ERQ can be cross-correlated with results from a demanding task, such as the Aiming Game.

DESIGN

The Aiming Game is one piece in a learning intervention meant to facilitate people's, particularly investors who trade on a regular basis, learning to become aware of their emotional state. It is also meant to provide effective training in how to more efficiently regulate and control their emotions. While this training occurs in a game related setting, we hypothesize that the resulting skills that are learned can be transferred to the different settings, such as financial investment activities.

Gameplay

The Aiming Game is a two dimensional, first person shooter game, developed in Unity 3D™, where the main objective is to score as many points as possible by shooting down targets in the form of black airplanes. This is done by using a regular computer mouse as input device to aim at and shoot targets. The core game consists of three levels or phases, each lasting 180 seconds. The phases and their respective additional core game mechanics are explained in the table below.

Table 1 The three phases with objectives and features.

Phase	Objectives	Features
Phase 1	Shoot down targets	Targets (Black airplanes)
Phase 2	Shoot down targets/ Avoid distractors	Targets (Black airplanes)

		Visual distractions (Red airplanes)
Phase 3	Shoot down targets/ Avoid distractors	Targets (Black airplanes)
		Visual distractions (Red airplanes)
		Auditory distractions

The first phase is basically an introduction to the core game mechanics and a chance for players to learn how to play. The player attempts to shoot down airplanes as they appear from outside the screen and rapidly move across it. These targets are spawned once every 0.8 seconds.

In the second and third phases of play, visual distractions are added in the form of red airplanes. The goal is still to hit the black planes, but also to avoid shooting down the distractions. The purpose of the distractors is solely to disturb the player and pressure him or her into making errors, and thus becoming stressed. Distractors are spawned once every 0.4 seconds.

In the first version of the Aiming Game prototype the velocity and spawn frequency were exactly the same. According to an early heuristic evaluation of the prototype, related to game challenge as described in Isbister & Schaffer (2008), it was found that the element of distraction had too small an impact and was not challenging the players in a stimulating way (e.g. see Gee, 2005). Adjustments to the visual distractor were made accordingly which resulted in the red airplanes moving 30% faster than the black ones and also spawning 100% more often.

The third phase involves auditory distraction by adding stressful music. North & Hargreaves (2008) argue that music plays a role in task performance and showed that music and concurrent tasks competed for the same cognitive resources. In the Aiming Game the song Surfin' Bird by the Thrashmen is used because of its stressful nature.

There is no limit to how many shots one can fire in a certain amount of time during the game. To ensure balance regardless of play styles when it comes to fire mechanics, a shot cost was implemented. This means that for every shot fired a score of two points are reduced from the players total score pool (compared to a ten point gain when hitting targets and a ten point loss when hitting distractors). Without this feature, it would become beneficial to shoot frantically without hesitation, consideration or strategy.

Bio-Feedback and Game Play

Biofeedback concerns the process of making users, or in this case players, aware of some physiological state in their own body. Today, biofeedback is widely used in, for instance, medical studies (Babu et. al., 2007) to treat various kinds of pain and disorder. To provide biofeedback in the Aiming Game, the Emotiv EPOC™ (Figure 3) is used (http://www.emotiv.com). The EPOC provides Electroencephalography (EEG) and Electromyography (EMG) sensors that can detect electrical signals produced by the brain

and facial muscles, respectively, that can be interpreted as measurements of the instantaneous excitement, or arousal, of a player.

Figure 3. The Emotiv EPOC.

This information is used as bio-feedback, meaning that it is fed back into the game and displayed in a bar on the screen, allowing the player to become aware of his or her current state of arousal. Arousal is divided into five segments, from *one* representing very low arousal (completely calm) to *five* representing very high arousal (highly excited/stressed).

Besides presenting the player with psychophysiological information, the data is also used to create distractions in the game depending on the player's current arousal level, in two different ways:

- Distorted aiming
- Blurring of targets and distractors

Aiming is distorted by receiving an offset to the original aim position. This offset is constantly moving within the bounds of a predefined square (Figure 4) and the distance between the original position and the offset position is directly related to the amount of arousal one is experiencing at the time.

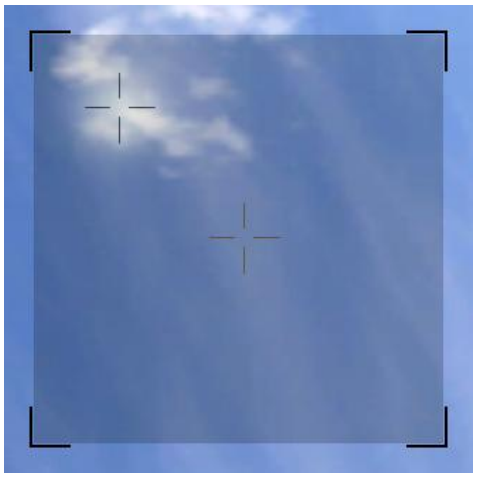

Figure 4. Illustration of the arousal-dependent aiming offset.

Also, when the player becomes aroused, the targets start to become blurred. The amount of blur affecting the airplanes is balanced so that, at minimum arousal, there no blur at all, while at maximum arousal it is hard to see the airplanes' exact position.

While constantly providing the player with real time bio-feedback and affecting game content depending on arousal, all game data is also logged to file to allow retrospective analysis of both in-game actions and arousal. This allows the Aiming Game to be used as a tool for studies in addition to being a training environment for emotion regulation.

Motivation

An issue to consider when developing serious games is that there may not always exist intrinsic motivation for the player playing a game or to invest much time in it, since the motivation behind developing the game is not primarily entertainment. In the case of the Aiming Game, with the investor target group, it may be that the desire of players for learning and skill training will be motivation enough to get them to frequently use the platform or game.

Even though the Aiming Game is a relatively simple game with regard to game mechanics and features, it is vital that the elements that do exist both help and support the motivation to play the game. The main design goal of the game is for it to be challenging and thus also to allow players to practice mastery (Schell, 2008). Furthermore, Karat et al. (2000) claim that there can be great satisfaction in the ability to master one's tools and produce a desired result, so users are willing to invest a great deal of time in doing so. Offering challenge and the opportunity to master a skill therefore seems to provide great, and perhaps even sufficient, motivation for people to engage in games.

Game Logic and Elements

The Aiming Game mainly consists of the software elements described in Figure 5.

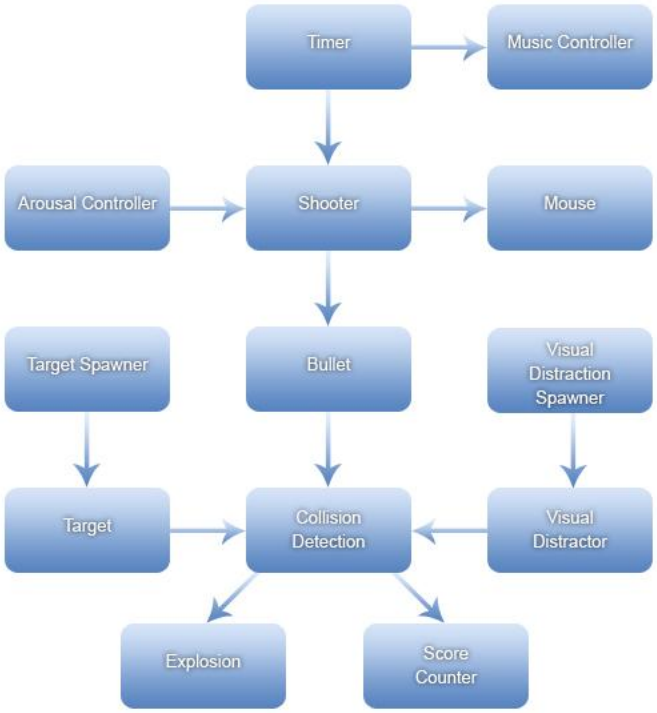

Figure 5. The Aiming Game system design.

The game elements mostly revolve around the Shooter object, where most actions and calculations are performed. This is where bullets are generated when the player shoots by clicking the mouse and also where the mouse object is updated.

With each frame of the simulation, the Shooter object calls the Arousal Controller to request updates of the psychophysiological data collected from the EPOC-wearing player. The response is a value between one and five which is then translated and sent to the mouse object where the aiming offset is applied accordingly. At maximum arousal level, the crosshair will receive an offset of approximately 15% of the screen width.

There are two object-generating entities called Target Spawner and Visual Distractor Spawner. These entities run on predefined timers and spawn (generate) their respective child objects (Targets and Distractors) according to their timer intervals. Targets are generated with a frequency of 1.25 (i.e. every 0.8 seconds), and Distractors with a frequency of 2.5 (i.e. every 0.4 seconds).

For each frame, the Collision detection object compares Bullet objects to both the Distractor objects and the Target objects in order to identify collisions, where a collision means that a bullet actually hit an airplane. The Collision detection object then calls the appropriate actions such as explosion animations, sounds and score adjustments.

Regardless of the rest of the scene, there is a timer object counting down from a predefined time, thus keeping track of when to change levels, as well as a Score Counter

which, during all phases, collects all score data. Scores are calculated by the following criteria:

- Shot -2 points
- Target hit +10 points
- Distractor hit -10 points

Connected to the Timer is also an Audio Player. This is a simple entity which becomes active in the third phase and controls the background music that is meant to distract the player.

Data gathering and analysis

The incentive for data collection in the Aiming Game prototype is twofold. The first and most important reason is to present relevant data to the player in real time. Malone (1982) stresses the importance of players always being able to identify their score or progress in the game. At the same time, the game interface should be as non-intrusive as possible so not to interfere with the player's attention. Logged components that are also necessary to represent visually to the player during gameplay are:

- Real time arousal value
- Score

The second incentive to gather data is to be able to perform analysis of the participant performance regarding both score and success rate in emotion regulation. Data is therefore stored in two separate files, namely arousal statistics and shot statistics, for each phase and each participant. The data that needs to be collected for each phase is:

- Participant ID
- Phase
- Play time this phase (in seconds)
- Number of samples
- Sampling frequency
- Arousal value at incremental time points
- Shots and consequences and when they occur
- Total shots fired
- Total hits

The two data files are uniquely identified by Participant ID to ensure complete anonymity. The samples related to time are collected at each game frame to ensure that there is not a lack of data. Each sample contains a time stamp and an arousal value. The arousal value is stored in the text file with values that range from one to five, one being very low arousal and five being the maximum arousal that the EPOC device is able to register. In order to analyze changes in arousal over time with regard to in-game actions, we also store shot statistics for each action, including the time and outcome of that specific action. This can be used to investigate how temporary failures (misses and distractor hits) may be related to changes in arousal, by correlating information from arousal statistics and shot statistics.

Evaluation

In order to assess the potential of the Aiming Game, several evaluation methods were applied. The evaluation of the Aiming Game consists of studies related to game mechanics and usability testing using Heuristic evaluation as well as play testing by students, all parts of a generic Evaluation Toolkit developed in the xDELIA project. Usability refers to user interfaces and how helpful the game or system is in providing the player with necessary information and guidance, while gameplay heuristics analyze the actual gameplay and how well it is designed in terms of game content.

Heuristic Evaluation

The game development iteration was followed by a heuristic evaluation which aimed to qualitatively identify design errors and suggest improvements to correct them (Desurvire, 2004). The Heuristics are divided into a set of categories inspecting different aspects of the game prototype. The heuristic evaluation requires three evaluators and it is desirable that all three evaluators have both game design and usability competence. The evaluators evaluate the game separately and are not supposed to collaborate with each other. The list of the heuristics is distributed to the evaluators after which the evaluators describe issues violating each heuristic in the list. When the first step is completed, the evaluators meet and put together their lists of issues. If two evaluators have the same issue on their lists the problem stays on the final list. All the issues are discussed and if only one has a particular issue and the others can agree that the issue is legitimate then that problem stays on the list as well. A report is then prepared which describes the issues in more detail than in the previous list. This report should contain screenshots to clarify the issues more effectively. The evaluators together with the developer discuss possible solutions and the suggestions are compiled into recommendations and added to the documentation. After the heuristic evaluation is conducted and documented, the result is presented to the product owner and in collaboration decisions regarding what to do with the recommendations are made, including whether a new iteration should start or whether play testing should be conducted.

Play Testing

Play Testing is a valuable asset in the evaluation of games since it allows different players to analyze the game from different subjective perspectives. This may reveal novel aspects of experience which have not previously been discussed or evaluated by the development team. Different components of game experience can be measured using the Game Experience Questionnaire (GEQ) (IJsselsteijn et al., 2008).

Additionally, while participants play the game, psycho-physiological data is collected along with performance data. This data is retroactively compared with the participants' subjective statements.

Procedure

For the Play Testing Evaluation, six arbitrarily chosen people played the game (following the recommendation of Pernice & Nielsen, 2009) for approximately 10 minutes each. Before playing the game, demographic data considering gender, age and experience with similar digital games was collected. In order to objectively determine which game elements the players are paying most attention to, the gameplay can be studied using an eye tracker device (as exemplified by Sennersten 2008, 2010). Eye Trackers measure the saccades (fast movements) and fixations (dwell times) of human gaze (Duchowski, 2003) and have been used for several decades for different assessments, e.g. Graf and Krueger (1989) and Lankford et al (1997). Graf and Krueger (1989) applied Eye Tracker

technology to both measure usability and analyse Eye Tracking as an interaction device, while Lankford used the Eye Tracker to identify important graphical features in software design. Due to the relationship between eye fixations and attention focus, we are able to infer aspects of cognitive processes underlying virtual environment exploration (Sennersten, 2008). The purpose is to be able to tell how important different objects are, and in interviews afterwards, receive indications of how to improve the visual representations of the game.

Participants were seated in front of the Eye Tracker and were connected to the computer via the Emotiv EPOC. They were also briefed on the equipment and the purpose of the study. Instructions were given to the player from a static screen on the computer and were not communicated through the experimenter in order to provide each participant with the same preconditions. The participants were then asked to play the game and follow the instructions on the screen which led them seamlessly through the play testing session. After playing the game, participants were asked to complete the Game Experience Questionnaire (GEQ) (IJsselsteijn et al., 2008) as well as a modified version of the System Usability Scale (Brooke, 1996).

According to IJsselsteijn (2008) the GEQ measures experiential components of immersion, tension, competence, flow, negative and positive affect, and challenge. Each of these seven components is assessed by 5–6 question items (e.g., "I was deeply concentrated in the game" is a flow component item). Each question item consists of a statement on a five-point scale ranging from 0 (not agreeing with the statement) to 4 (completely agreeing with the statement).

Game Usability can be measured with a modified System Usability Scale (SUS) (Brooke, 1996). Brooke states that the SUS has proven to be a valuable evaluation tool, being robust and reliable. To evaluate results, Tullis & Albert (2008) argue that an average SUS score under 60% is relatively poor and one over 80% can be considered good.

In addition to the play testing questionnaires, semi-structured interviews were conducted in order to catch additional information about gameplay and the players' experience. The players were questioned about specific game elements that caught their attention, if anything was lacking, motivational factors that were present (or missing), and game strategy. These were conducted after the questionnaires, and after the player had enough time to reflect upon their gaming experience.

The interview questions usually became open discussions regarding the specific planned topics, which in turn generated additional useful data. The topics discusses with participants were:

- Arousal bar and Bio-feedback
- Aiming Mechanics
- Flow and Progression
- Difficulty
- Music
- Other (open discussion to let participant speak freely regarding the game)

Elements that the players were uncomfortable with and suggestions for gameplay improvements gathered in the play testing session were fed back into the design process as work items for the next development iteration.

Play Testing Results and Discussion

The Play Testing evaluation generated much valuable data, which was used in order to improve the Aiming Game both as an entertainment platform and as a learning tool.

When the results from the GEQ, SUS and interviews were collected and summarized, experimenters attempted to put the new-found information in the context of what it means in terms of game design.

An observation regarding the Arousal Bar was that five out of six participants claimed to have had awareness of their own arousal with the help of the arousal bar. Eye Tracking results however indicate that none of the participants paid any (or very little) direct attention at all to the arousal bar during gameplay. This finding might indicate that players are able to perceive the arousal bar in their peripheral vision while playing the game and having the centre of vision focused on the bar is not necessary for awareness of its value. Another possible explanation for the participants claiming that at most times they had full awareness of the level of the arousal bar might be that they received this information in other forms. This hypothesis is based on the fact that players receive several indications of their arousal in the form of airplane blurring and crosshair offsets as well their own gut feeling. This phenomenon will have to be investigated further.

In general participants answered uniformly with respect to the Aiming Mechanics. All participants experienced aiming as being somewhat rough and several participants drew the analogy to an old mouse with wheel-based mechanics.

Most participants (five out of six) also had a problem with the delay between when a shot is fired and when it actually hits the targets. Players had to learn how this worked before being able to hit targets correctly. Since the game does not explicitly explain the phenomenon, this caused confusion among participants.

Several participants described the development of tactics throughout the game and how these changed in accordance with the changes between game phases. The most common tactic seemed to be to focus attention towards the middle of the screen where evidently the most planes eventually appeared. This tactic was shattered however when the second phase was initiated and red distraction airplanes appeared. Since these come in greater number with the same generation procedure as the targets, the red airplanes swarm in the middle of the screen making it very hard for the player to separate the targets from the distractors in this region. This led to players completely switching tactics and focusing their attention to the borders of the screen instead, something that can be seen in the Eye Tracker data of some participants during the last phases.

When asked what their suggestion to make the game more interesting to play would be, all participants talked about the repetitiveness which eventually leads to boredom in the game and suggested different ways to vary the game content. Suggestions to decrease repetitiveness were:

- Additional types of airplanes with different features such as blue planes which are rewarded with more points.
- Reaching new levels by performance instead of time, to increase the incentive to achieve better.
- Several graphically different levels
- A variation of many games with the same mechanics but different game manifestations, e.g. click-and-drag items to different places.

From the Game Experience Questionnaire answers, it was possible to extract uniform trends regarding several components. In order to gain statistical significance from the GEQ one would preferably need approximately 20-30 participants. In the case of the Play Testing of the Aiming Game, which only used six participants, this is not possible. In this section several components will be discussed which were nevertheless apparent and should be taken into consideration in further design iterations.

Participants generally answered that they felt tense during the game (M = 4, SD = 0.89) as well as having to constantly focus on the game (M = 4.17, SD = 0.41). They also congruently reported low scores on the questions of whether or not they were allowed to explore things (M = 1.5, SD = 0.84) and if they felt imaginative (M = 2, SD = 1.09).

Participants also reported low scores on whether they felt happy during the game (M = 2, SD = 0.63) at the same time as stating that they were not particularly bored (M = 1.83, SD = 1.17).

Design Process

The Aiming Game is one game in a series of prototypes created in order to assess, elicit or train emotion regulation. Prototyping is a commonly used design method in game development (Fullerton et al., 2004). When a prototype does not look like a finished product, it is easier not to comment on its looks but to concentrate on the design of the core gameplay instead (Snyder, 2003). The Aiming Game was developed using a mixture of methods, depending on which phase the development currently was in. The concept of the Aiming Game was developed in a collaborative manner similar to Participatory Design (http://cpsr.org/issues/pd/introInfo/) where partners met and sat down to discuss ways to induce player arousal in a relatively simple game. When the game product had been roughly defined, the development shifted into a SCRUM process (http://www.scrum.org/) where a product owner was appointed and developers began to specify their interpretation of the agreement on paper which was then reviewed by other project partners to find out if everyone's interpretations of the concept were congruent. When partners had agreed on the documented concept, the specification was broken down using a traditional Breakdown Structure (WBS) which resulted in a SCRUM backlog (requirement list). Since the backlog had to be approved as well, this was sent to the product owner as well as involved partners/stakeholders. Once approved, the development of the first iteration could begin. The development process proceeded for two weeks, just as a normal SCRUM iteration, before developers and the product owner met again for a check-up meeting to make sure development of the game prototype was on track. Once confirmed, another two weeks of development followed.

Ollila et al (2008) report finding agile methods useful for game prototyping because they make it possible to change the functionality of the prototype quickly when needed. This is especially true when using participatory design, when all of the product development team members are brainstorming and developing. Moreover, for development projects including non-game designer partners who are contributing to design specifications, these methods are even more useful, since the more inexperienced the game designers are, the more difficult is for them to imagine what kind of gameplay will eventually emerge (Ollilla et al, 2008). When the "final version" of the first prototype iteration was completed, a Heuristic evaluation was applied followed by a Play Testing session. Heuristic evaluation can be very beneficial in such an early stage of development since it usually is able to detect design errors that developers might have missed and development is able to get on the right track without much additional effort. Play Testing, however, is usually more concerned with Game Experience which might be harder to assess so early in the iterative development process.

DISCUSSION

The Aiming Game was developed to assist investors in learning to identify and regulate their emotional state, more specifically their arousal level. In a first iteration of the development of such a learning platform, the game had to support designs which can be applied to a general audience, before specifically targeting the investor group. The blind implementation of the initial requirements was sure to lead to design faults. Being aware of this fact and having specific methods to tackle it was therefore crucial. Heuristic Evaluation, executed by colleagues, followed by a Play Testing session were applied in order to identify these design flaws and systematically structure and prioritize them. These methods generated a large quantity of faults, opinions and suggestions on how to improve the prototype. When using Heuristic Evaluation, we recommend analyzing the heuristics and eliminate irrelevant items. In the same way, one might realize that "standardized" heuristics do not cover all aspects of a game. In our case there were no heuristics for evaluating novel interaction devices, so we had to develop our own heuristics for these.

Interestingly there was not always a congruent philosophy between evaluators and play testers. Certain topics split the groups into two camps expressing completely different opinions and also suggesting very different solutions, while in other cases, issues expressed by one group was rejected as issues at all by the other. Both the Heuristic evaluation as well as Play Testing have been quite successful in their purpose of identifying design flaws and will therefore be applied in future to similar development scenarios.

During the Play Testing, and also during interviews with test participants, it became clear that it is important to bear in mind the potential difference between Play Testing subjects and the ultimate target group. In the case of the Aiming Game this difference was quite large since our Play Testers mostly consisted of students and colleagues while the target group is financial investors having very different backgrounds and experience. However, this difference does not exclude the possibility of receiving much helpful data from such a study. Regardless of gaming experience, all players should immediately understand the purpose, goal and mechanics of the Aiming Game. When game rules or other elements were unclear to subjects, this was immediately registered as a fault in the game design. In this way, the Aiming Game strives to become an intuitive tool suitable for anyone, regardless of experience.

One of the greater challenges with developing games that should suit players with very different levels of experience is the balance of difficulty. The Aiming Game should be tuned in such a way that it can be stimulating and meaningful to experienced players as well as people with limited knowledge and experience with computer games. The current design, having elapsed time as the only criterion for switching between phases, does not fully support this requirement. Instead, in ongoing development, the game should progress by other criteria, such as player performance.

From the Play Testing and interviews, it was obvious that for the Aiming Game to work as a long-term learning platform, it has to become more interesting for players. According to the results of Play Testing, players found the game to become quite boring even before having played an entire session (4x 3min). Since the idea is that the game should, at least to some extent, entertain players while they are also learning/training, the complexity of the game and the variety of game elements must be increased in order to keep players motivated.

In the Aiming Game the song Surfin' Bird by the Thrashmen is used because of its stressful nature. The subjectively chosen music will be compared in a future study with music generally accepted to induce stress, first listed by (Mayer et al., 1995), to analyze if there is a difference in average stress levels between groups. Hints at trends in this experiment may spark new studies in the future.

CONCLUSION

The focus of the first iteration of the Aiming Game was to test the effectiveness of the different features which an emotion regulation training tool requires. In this respect, the iteration has been a success and has generated much data, feedback and comments that have been organized into a backlog on which the second development iteration is based. Play Testing with students and colleagues, Heuristic Evaluation and pilot studies carried out with the help of the Aiming Game, testing its potential as a learning- and training tool, have all led to a deeper understanding of how the development should proceed.

When working with design and collaborating on an international level, it is important to have a clear structure which allows all partners to have frequent access to the development process and state of progress. In the case of the development of this game prototype, this issue was solved by setting check-up meetings with the product owner, where initial requirements were matched against design choices and implementations. Having frequent check-up meetings has proven to be very beneficial for this type of development process.

When developing in a similar manner to that described in this paper, we recommend splitting large game development cycles into tangible, manageable iterations where each iteration is Heuristically evaluated by a few experts. This will, as shown in this paper, allow developers to spot design flaws early on before much time, effort and money has been spent. Play Testing is also strongly recommended but requires a product that is somewhat closer to completion since it involves game experience that can be hard to induce in early stages.

The Aiming Game will be used in several xDELIA studies regarding Emotion Regulation, in the summer of 2011. It will also be featured in a study and a paper regarding the training of emotion regulation in relation to performance in games.

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