

## A validity study of the potential for a specific game environment for training emotion regulation

Olle Hilborn (ohi@bth.se), Craig A. Lindley (cld@bth.se)  
Blekinge Institute of Technology (Karlskrona, Sweden)

The EU project xDELIA (Xcellence in Decision-making through Enhanced Learning in Immersive Applications, [www.xdelia.org](http://www.xdelia.org)) seeks to enhance the quality of investment decisions made by private investors. Investors' financial capabilities are believed to be correlated with their skills in managing their emotions; less skilful investors are more prone to emotional biases in decision-making, such as the disposition effect, i.e. selling stocks that have risen in value fast and holding on to losing stocks yielding a net loss (Shefrin & Statmanand, 1985), and hyperbolic discounting, i.e. valuing present wins over than delayed wins, even if the latter are bigger (Harris & Laibson, 2001).

The work presented here aims to validate a training game prototype that could later be used as a learning platform for training in emotion regulation by the investor group. Emotion regulation can occur in many ways, the two methods addressed in our current work concern emotional suppression (henceforth suppression) and cognitive reappraisal (henceforth reappraisal). Suppression is defined as "inhibiting ongoing emotion-expressive behavior" and reappraisal is "construing a potentially emotion-eliciting situation in nonemotional terms" (Gross, 1998). Reappraisal is commonly thought to be more effective and to have positive effects on wellbeing since it acts before the emotional response is elicited, while suppression acts after the emotional response is elicited and is associated with negative effect on wellbeing, impaired memory and is generally less effective than reappraisal (Gross, 2003). Also, reappraisal appears to put less strain on cognitive resources, making them available for other task, thus improving task performance (Wallace et al., 2009)

Gameplay may be defined as *goal-directed and competitive activity conducted within a framework of agreed rules* (based upon Lindley, 2004). Serious games are games that are created or played for a specific purpose other than mere entertainment. The field of serious games has long sought a way to blend fun and education in order to improve learning. Such approaches have been taken by, e.g., Malone (1980) and Garris et al. (2002). Other approaches, such as simulation training, base the gameplay in a simulation environment. Pierfy (1977) did a meta-analysis of 22 studies where learning was better in three cases with games instead of conventional teaching, worse in three cases, and it did not make any difference in the remaining cases. Biofeedback has been shown to help with learning to influence blood pressure (Glasgow et al., 1982), pain (deCharms, 2008), and self-reported emotional responses (Allen et al., 2001).

Because of these successes with biofeedback, we have created a two-dimensional shooting game, named the Aiming Game (Cederholm et al., 2011), that utilizes biofeedback for training in emotion regulation. The biofeedback device used was the Emotiv EPOC™ ([www.emotiv.com](http://www.emotiv.com)), a commercial EEG headset created for gaming applications. The goal of the Aiming Game is to acquire as many points as possible, which is achieved through shooting down black airplanes. There are also pink airplanes that act as distractors and that will cost the points if they are shot down. Every shot has a cost as well, so it is important for players to not waste shots. During play, the player's instantaneous

excitement is recorded using data from the EPOC™. This data is fed back into the game and used as a measure of player excitement, divided into five intensities. Before each game level the player is informed what intensity of excitement he or she should aim for. The further away from the goal intensity they are, the harder the game gets, by manipulating two factors: the screen becomes increasingly blurry; and an aiming offset occurs, randomly misplacing the aiming crosshair every 0.5 seconds away from the mouse position. The misplacing radius grows bigger the further away from the goal excitement intensity the player is, encouraging the player to handle their emotions well in order to regulate their level of excitement.

We have tested out the game with groups instructed to use methods of suppression, reappraisal and control (i.e. no instructions on how to handle emotions). These results indicated that subjects' tendencies toward emotion regulation strategies are correlated with game performance and will be described in detail later on.

## References

- Allen, J. J., Harmon-Jones, E., Cavender, J.H. 2001. Manipulation of frontal EEG asymmetry through biofeedback alters self-reported emotional responses and facial EMG. *Psychophysiology* 38, 685-93.
- Cederholm, H., Hilborn, O., Lindley, C., Sennersten, C., Eriksson, J. 2011. The Aiming Game: Using a Game with Biofeedback for Training in Emotion Regulation. 5th DiGRA conference: Think, Design, Play.
- deCharms, R.C. 2008. Applications of real-time fMRI. *Nature reviews. Neuroscience* 9, 720-9.
- Glasgow, M.S., Gaarder, K. R., Engel, B.T. 1982. Behavioral treatment of high blood pressure II. Acute and sustained effects of relaxation and systolic blood pressure biofeedback. *Psychosomatic medicine* 44, 155-70.
- Gross, J.J. 1998. Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology* 74, 224-237.
- Gross, J.J., John, O.P. 2003. Individual differences in two emotion regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85, 348-362.
- Harris, C., Laibson, D. 2001. Dynamic Choices of Hyperbolic Consumers. *Econometrica* 69, 935-957.
- Lindley C.A. 2004. The Semiotics of Time Structure in Ludic Space As a Foundation for Analysis and Design, Game Design Research Symposium and Workshop. IT-University: Copenhagen, Denmark.
- Malone, T.W. 1980. What makes things fun to learn? A study of intrinsically motivating computer games, *Cognitive and Instructional Sciences Series, CIS-7, SSL-80-11*, Palo Alto Research Center: Palo Alto.
- Pierfy, D.A. 1977. Comparative simulation game research. *Simulation & Games*, 8, 255-268.
- Shefrin, H., Statman, M. 1985. The Disposition to Sell Winners Too Early and Ride Losers Too Long: Theory and Evidence. *The Journal of Finance* XL, 777-790.
- Wallace, J.C., Edwards, B., Shull, A., Finch, D. 2009. Examining the Consequences in the Tendency to Suppress and Reappraise Emotions on Task-Related Job Performance. *Human Performance* 22, 23-43.