Critical Review: Improving the Efficacy of Games for Change Using Personalization Models

Persuasion is the act of influencing or reinforcing certain attitudes and behaviours [Khaled et al., 2008]. The use of technology for encouraging behavioural change to benefit its users or the wider community is a long-term area of research [Fogg, 2002]. This review will present a summary and critical analysis of Orji et al. [2017] whose paper explores the use of personalisation models as a persuasive device for improving the efficacy of games which are designed to change user behaviour, as well as putting forward a set of suggestions for future work in this domain of Persuasive Technology.

Summary of Contributions

Orji et al. [2017] highlight the rising prominence of *games for change* that are designed for purposes other than entertainment, to effectively educate players about certain topics in a way that influences their behaviour [Busch et al., 2015]. The authors raise the issue that many such games are designed with a "*one size fits all*" philosophy whereby the design of the game itself (and its adopted persuasive *strategies*) are not tailored to the *type* of the player. Orji et al. [2017] therefore seek to answer two main research questions to understand the observed efficacy of certain strategies in existing games [Peng, 2009, Kaipainen et al., 2012]. Firstly, whether tailoring games for change to a specific player type increases their persuasiveness. Secondly, if beneficial effects of tailoring are observed, whether these effects are mediated by an improved play experience. If these could be answered, results could inform the future decisions of games designers in which persuasive strategies they adopt to maximise efficacy in certain player types.

Initial work by the authors indicated that a strategy shown as effective for one type of user could indeed be detrimental to another [Orji et al., 2013] (Table 1). This table sets out a well-founded taxonomy which maps gamer types defined by the BrainHex model of Nacke et al. [2014] (*Achiever, Conqueror, Daredevil, Mastermind, Seeker, Socializer and Survivor*) against commonly adopted persuasive strategies selected by Gerling et al. [2014] based on a large-scale online survey of gamers.

Table 1: β values confusion matrix: Strength of motivation of different players that result from different strategies. Positive β values indicate that gamers of this type are motivated by the corresponding given strategy. Negative β values indicate demotivation, whilst an empty value indicates neither motivation demotivation.

Strategies / Gamer type	CMPT/ CMPR	COOP	CUST	PERS	PRAS	SEMT/ SUGG	SIML	REWD
Achiever	-	.15	-	-	-	.10	-	.10
Conqueror	.25	-	-	.12	-	.12	.14	-
Daredevil	-.10	-	-	-	-	-.14	.11	-
Mastermind	.12	-	.10	.12	-	.14	.12	-
Seeker	.10	-	.19	.11	.10	-	-	-
Socializer	.11	.17	-.12	-	-.12	-.13	-	-
Survivor	.17	-.20	-.13	-	-	.27	-	-.14
CMPT/CMPR = competition and comparison, COOP = cooperation, CUST = customization, PERS = personalization, PRAS = praise, SEMT/SUGG = self-monitoring and suggestion, SIML = simulation, REWD = reward.								

Whilst ..., the data collected from authors' earlier experiments is corroborated by other existing work - treating user groups in a monolithic way is generally considered dangerous, especially in the domain of games for health [Berkovsky et al., 2010].

To evaluate their research questions, Orji et al. implemented two versions of a custom a game called *Junk Food Aliens* (Figure 1). The reward-based version (JFA-R) adopted persuasive strategies such as achievement badges (Figure 3) whereas the competition-based version (JFA-C) adopted comparative strategies such as leaderboards (Figure 2).

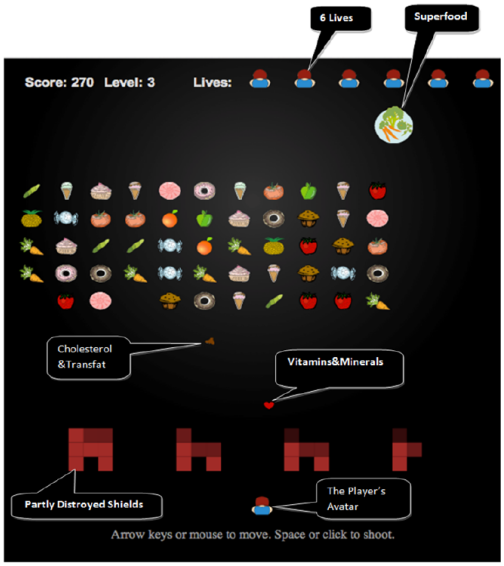

Figure 1: "Junk Food Aliens" (JFA): A persuasive game designed to change gamer behaviour towards healthy eating.

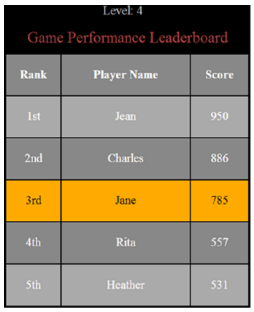

Figure 2: JFA-C: Competition-based version of JFA.

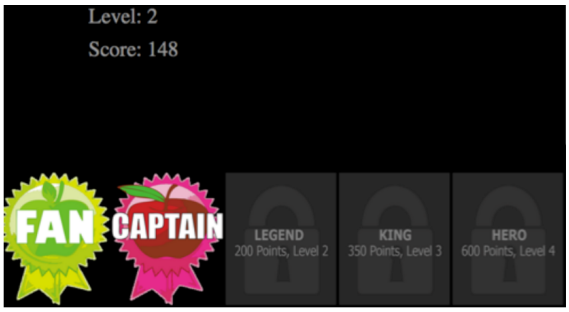

Figure 3: JFA-R: Reward-based version of JFA.

Justifications for Conclusions

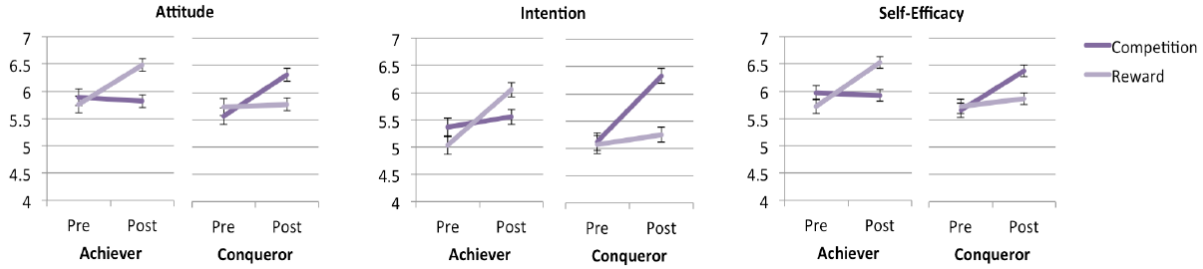

Figure 4: Mean values ± SE for Attitude, Intention, and Self-Efficacy by Gamer type (Achiever, Conqueror) and Game version (Competition, Reward).

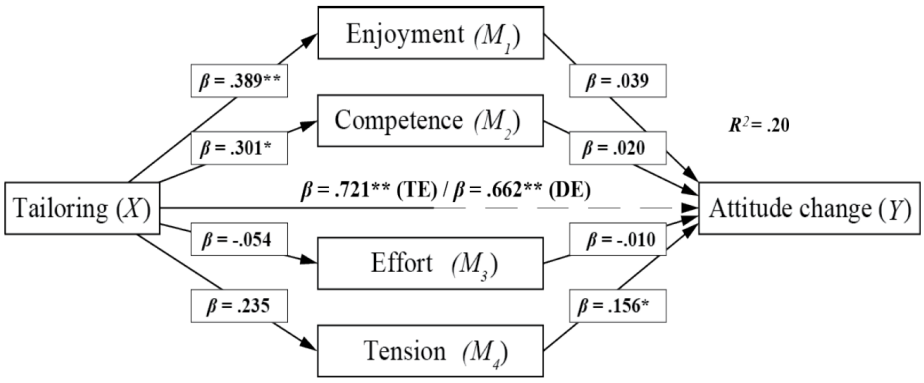

Figure 5: Parallel mediation model of tailoring on attitude change with play experience as mediator.

Limitations and Suggested Further Work

Conclusion

Word count: 0 words

References

Shlomo Berkovsky, Mac Coombe, Jill Freyne, Dipak Bhandari, and Nilufar Baghaei. Physical activity motivating games: Virtual rewards for real activity. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '10, pages 243–252, New York, NY, USA, 2010. ACM. ISBN 978-1-60558-929-9. doi: 10.1145/1753326.1753362. URL http://doi.acm.org/10.1145/1753326.1753362.

Marc Busch, Elke Mattheiss, Rita Orji, Andrzej Marczewski, Wolfgang Hochleitner, Michael Lankes, Lennart E. Nacke, and Manfred Tscheligi. Personalization in serious and persuasive games and gamified interactions. In *Proceedings of the 2015 Annual Symposium on Computer-Human Interaction in Play*, CHI PLAY '15, pages 811–816, New York, NY, USA, 2015. ACM. ISBN 978-1-4503-3466-2. doi: 10.1145/2793107.2810260. URL http://doi.acm.org/10.1145/2793107.2810260.

B. J. Fogg. Persuasive technology: Using computers to change what we think and do. *Ubiquity*, 2002 (December), December 2002. ISSN 1530-2180. doi: 10.1145/764008.763957. URL http://doi.acm.org/10.1145/764008.763957.

Kathrin Maria Gerling, Regan L. Mandryk, Max Valentin Birk, Matthew Miller, and Rita Orji. The effects of embodied persuasive games on player attitudes toward people using wheelchairs. In *Proceedings of the 32Nd Annual ACM Conference on Human Factors in Computing Systems*, CHI '14, pages 3413–3422, New York, NY, USA, 2014. ACM. ISBN 978-1-4503-2473-1. doi: 10.1145/2556288.2556962. URL http://doi.acm.org/10.1145/2556288.2556962.

Kirsikka Kaipainen, Collin R Payne, and Brian Wansink. Mindless eating challenge: Retention, weight outcomes, and barriers for changes in a public web-based healthy eating and weight loss program. *Journal of medical Internet research*, 14:e168, 11 2012. doi: 10.2196/jmir.2218.

Rilla Khaled, Ronald Fischer, James Noble, and Robert Biddle. A qualitative study of culture and persuasion in a smoking cessation game. In Harri Oinas-Kukkonen, Per Hasle, Marja Harjumaa, Katarina Segerståhl, and Peter Øhrstrøm, editors, *Persuasive Technology*, pages 224–236, Berlin, Heidelberg, 2008. Springer Berlin Heidelberg. ISBN 978-3-540-68504-3.

Lennart E. Nacke, Chris Bateman, and Regan L. Mandryk. Brainhex: A neurobiological gamer typology survey. *Entertainment Computing*, 5(1):55 – 62, 01 2014. ISSN 1875-9521. doi: https://doi.org/10.1016/j.entcom.2013.06.002. URL http://www.sciencedirect.com/science/article/pii/S1875952113000086.

Rita Orji, Regan L. Mandryk, Julita Vassileva, and Kathrin M. Gerling. Tailoring persuasive health games to gamer type. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, CHI '13, pages 2467–2476, New York, NY, USA, 2013. ACM. ISBN 978-1-4503-1899-0. doi: 10.1145/2470654.2481341. URL http://doi.acm.org/10.1145/2470654.2481341.

Rita Orji, Regan L. Mandryk, and Julita Vassileva. Improving the efficacy of games for change using personalization models. *ACM Trans. Comput.-Hum. Interact.*, 24(5):32:1–32:22, October 2017. ISSN 1073-0516. doi: 10.1145/3119929. URL http://doi.acm.org/10.1145/3119929.

Wei Peng. Design and evaluation of a computer game to promote a healthy diet for young adults. *Health Communication*, 24(2):115–127, 2009. doi: 10.1080/10410230802676490. URL `https://doi.org/10.1080/10410230802676490`. PMID: 19280455.