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*[1] 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.

Treating user groups in a monolithic way is generally considered dangerous, especially in the domain of games for health [Berkovsky et al., 2010]. To further justify the need to investigate tailoring, the authors then reviewed the persuasive strategies adopted in a range of existing domains of games for change: healthy eating [Kaipainen et al., 2012, Orji et al., 2013b], physical activity [Fujiki et al., 2008] and disease management [Brownson and Kumanyika, 2007]. The authors, by their own admission, comment that this list is by no means exhaustive which gives plenty of scope for future research in other domains.

Initial work by the authors indicated that a strategy shown as effective for one type of gamer could be detrimental to another [Orji et al., 2013a] (Table 1). This table sets out a well-founded taxonomy which maps 7 gamer types defined by the BrainHex model of Nacke et al. [2014] (Achiever, Conqueror, Daredevil, Mastermind, Seeker, Socializer and Survivor) against 8 commonly adopted persuasive strategies selected by Gerling et al. [2014] based on a large-scale online survey of 1108

[1] An annual festival exists for workshops and design classes on games for change: `www.gamesforchange.org`

gamers. Participants responded to indicate how likely each of 10 selected strategies (explained through storyboards) would influence eating decisions, using a validated scale [Drozd et al., 2012] before completing the BrainHex questionnaire to indicate their gamer type. After careful statistical analysis (Exploratory Factor Analysis and PLS-SEM modelling) 8 strategies were chosen which were pairwise distinct. The data collected from this initial experiment therefore forms as valid justification for the later comparison between Achievers (motivated by Reward) and Conquerors (motivated by Competition).

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 nor demotivation [Orji et al., 2013a].

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.

As a way of empirically evaluating this model, the authors focus on the domain of games for healthy eating for illustrative purposes and restrict their considerations towards the effects of two persuasive strategies (Competition and Reward) on two types of gamers (Achiever and Conqueror). Whilst somewhat limiting, this approach allowed scope for direct pairwise comparison between two types of gamers that have been shown empirically to be significantly-distinct in their response to these strategies [Orji et al., 2013a]. Further, these strategies are also common to existing games [Bell et al., 2006].

To evaluate their research questions, Orji et al. implemented two versions of a custom model-driven online game based on Space Invaders called *Junk Food Aliens* (Figure 1) which targets the domain of healthy eating - players control an avatar and search for fruits and vegetables to save the planet from an invasion of junk foods. 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). A large-scale randomized controlled study of 272 valid participants (50% Achievers and 50% Conquerors) was carried out to investigate the effects of tailoring and contra-tailoring on these two types of gamer.

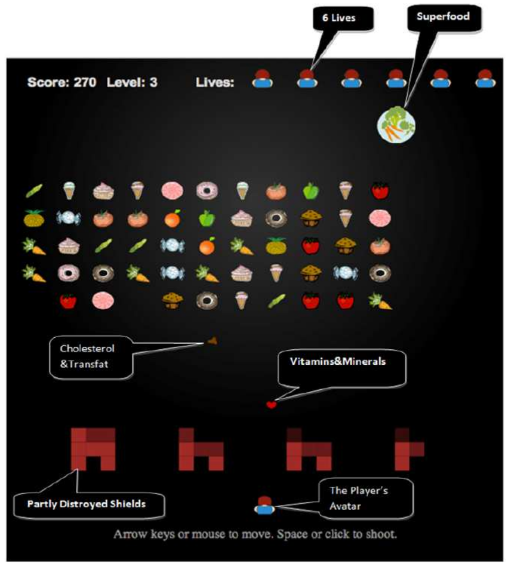

Figure 1: "Junk Food Aliens" (JFA): A persuasive game designed to change gamer behaviour towards healthy eating.

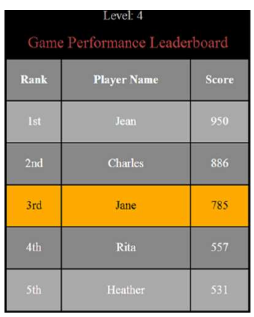

Figure 2: JFA-C: Competition-based version of JFA.

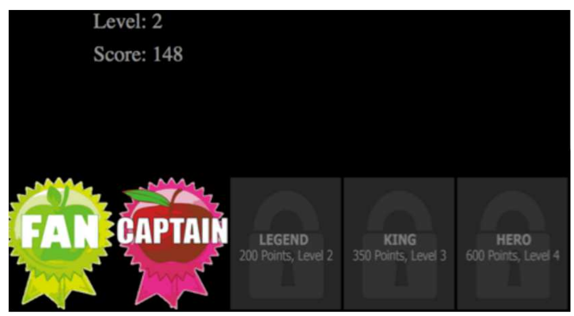

Figure 3: JFA-R: Reward-based version of JFA.

Participants were...

The results showed that tailoring the game to a specific gamer type increased effectiveness (measured by the positive changes in attitudes and intentions towards healthy eating) while contra-tailoring did not.

Main contributions of Orji et al. [2017] are therefore fourfold. First, it is important to tailor games for change in order to observe any efficacy as the main experiment demonstrates by measure of change in attitude, self-efficacy, and intention. Second, tailoring can be achieved by modifying the persuasive strategies adopted, rather than the mechanics of the game which will surely minimise the tailoring costs involved. Thirdly, the resulting positive effect of tailoring was not seen to be mediated purely by an improved player experience which, if it remained untested, would be a very strong potential confounding factor. Finally, the adoption of a single persuasive strategy is sufficient to observe these effects - combining additional strategies is unpredictable and may be somewhat counter-productive.

Justifications for Conclusions

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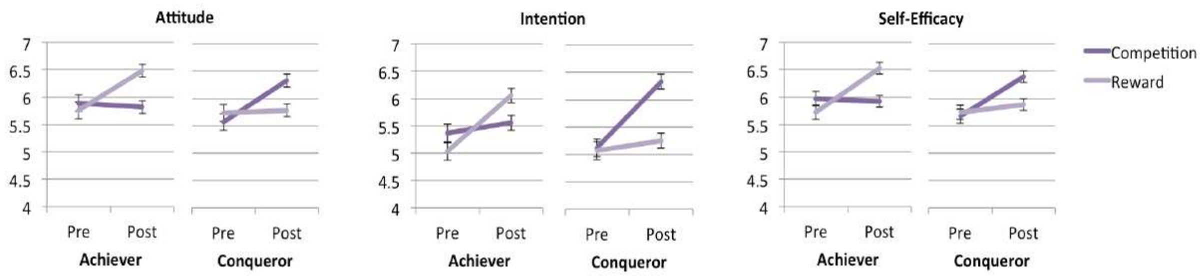

Figure 4: Mean values ± SE for Attitude, Intention, and Self-Efficacy by Gamer type (Achiever, Conqueror) and Game version (Competition, Reward).

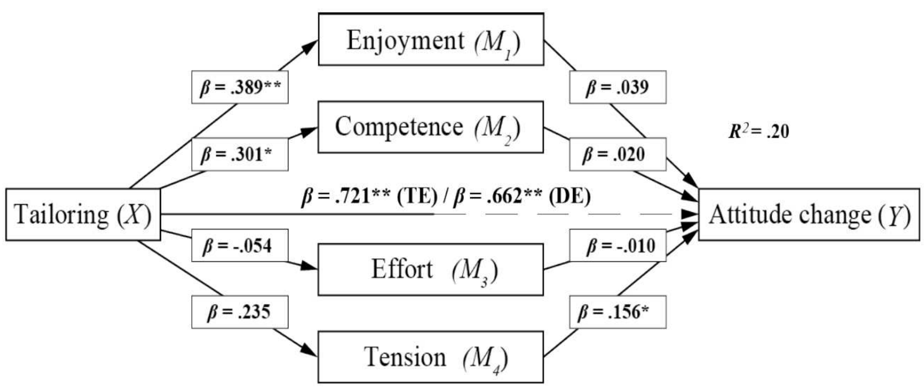

Figure 5: Parallel mediation model of tailoring on attitude change with play experience as mediator.

Limitations and Suggested Further Work

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Conclusion

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Critical Review: Exploring Interactions with Physically Dynamic Bar Charts

Scientific studies investigating how data can be effectively presented to, explored and interpreted by users forms the core part of Information Visualisation ('InfoVis'). This research is under the guise of supporting users in the decision-making process. This review will present a summary and critical analysis of Taher et al. [2015] whose paper explores the use of physically dynamic bar chart as a device for exploring user interactions with visualisations of data, as well as putting forward a set of suggestions for future work in this domain of Information Visualisation.

Summary of Contributions

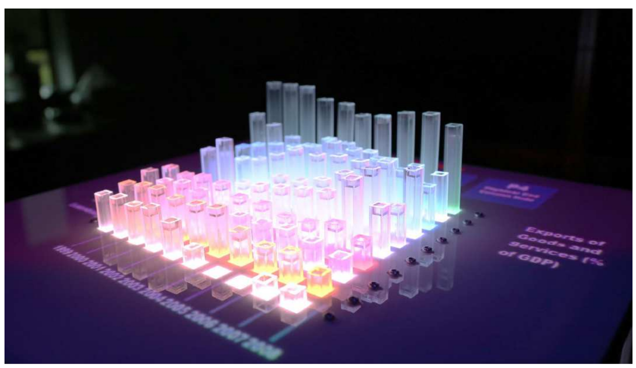

Figure 1: EMERGE: Exploring Interactions with Physically Dynamic Bar Charts using actuating physical rods and RGB LEDs to display international export data.

Table 1: Task-sets and interaction techniques explored during the user study.

Task	**Overview**	**Interaction Techniques**
Annotation ***(Process & provenance)***	Selecting and marking individual data points.	Point, pull, press.
Filtering ***(Data view & specification)***	Hiding and refining data for enhanced perception and comparison.	Swipe away, manual press, assisted press, press shortcut, and press to compare.
Organization ***(View manipulation)***	Data arrangement by moving rows and columns.	Drag and drop with immediate transition and hide-all with transition, press with instant transition and hide-all with transition.
Navigation ***(View manipulation)***	Controlling the view of large data sets.	Scroll, directional arrows, directional press, and paging.

Justifications for Conclusions

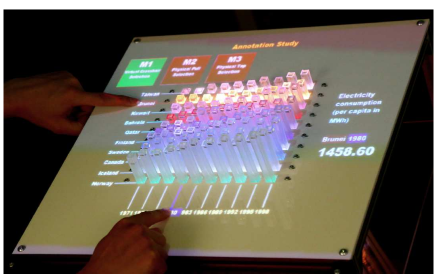

Figure 2: Annotation (Point technique).

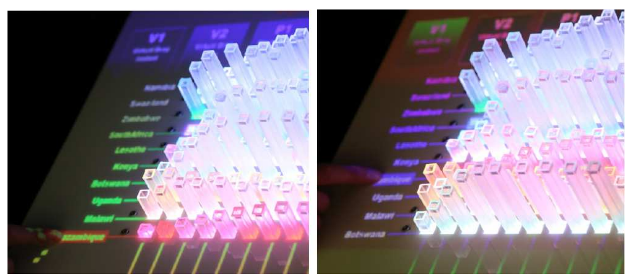

Figure 3: Organisation (Drag and Drop technique).

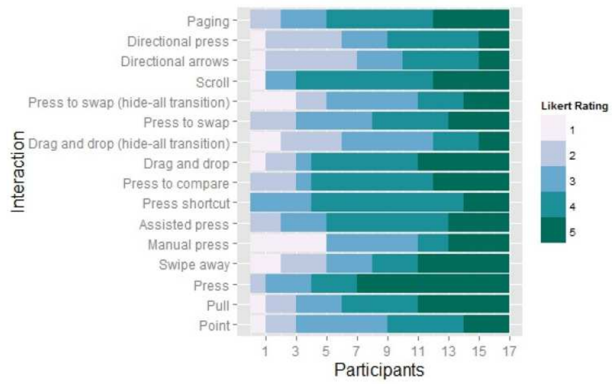

Figure 4: Likert scale ratings for helpfulness of interaction techniques. Range = 1: Strongly Disagree, 5: Strongly Agree.

Limitations and Suggested Further Work

Conclusion

Word count: 0 words

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