
Combining Explicit and Implicit Measures to Study the Effects of Persuasive Games

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Abstract

Understanding how games influence players is an integral part of persuasive game design. However, evaluating player attitudes to determine the success of a persuasive game can be difficult, e.g., if games deal with sensitive topics that invite socially desirable answers to explicit measures such as questionnaires. In this paper, we discuss the application of an implicit measure – the Implicit Association Test – to support explicit data, and to help game designers and games user researchers better understand the effects of persuasive games on player attitudes.

Author Keywords

Persuasive Games; Evaluation; Explicit Measures; Implicit Measures; IAT

ACM Classification Keywords

K.8.0 [Personal Computing]: General - *Games*.

Introduction

Understanding how games influence players is an important aspect of designing persuasive games - games that attempt to change player attitudes and behaviours. Designers need to understand how, and to what extent the player's attitudes are affected by the

Disability IAT (DA-IAT)

The DA-IAT [10] is designed to provide insights into attitudes toward people with disabilities.

The terms “disabled” and “nondisabled” are paired up with the words “good” and “bad” (and vice versa); images that are associated with disabilities and able-bodied persons (e.g., crutches, or a skier) are displayed in the centre of the screen along with positive and negative terms (e.g., pleasure, or angry).

Participants are then asked to either press the E or the I key on the keyboard to associate the image or term in the centre with either of the categories. Participants are instructed to associate terms and images as quickly as possible.



games. A major shortcoming of explicit measures such as standardized scales that are commonly applied in Games User Research [7] is that they fall short when topics are sensitive, e.g., when certain attitudes are socially desirable [2]. Previous work has tried to address this issue by including physiological data [8] as a way of including implicit measures, however, this approach is challenging as it requires specialized equipment, cannot be applied in distributed environments, and gives limited insights into player attitudes [7].

Although prior work suggests that implicit measures have a range of limitations in media effects research [6], results regarding their application in the evaluation of persuasive games are promising [1]. In our paper, we discuss the application of the Implicit Association Test (IAT, [4]) as an alternative means of supporting explicit data through the inclusion of implicit measurements. We report on findings from a study with 40 participants investigating the effects of a persuasive game on player attitudes towards persons with mobility disabilities [3] using explicit (ADS, [9]) and implicit (IAT) measures. We discuss opportunities and challenges in the application of the IAT to measure effects of persuasive games, and highlight potential application areas of implicit measures for researchers and practitioners in the GUR community.

The Implicit Association Test (IAT)

Implicit measures are a common way to prevent responses that are skewed by social desirability [6]. One well-evaluated method to assess implicit attitudes is the IAT, a computerized test that can be applied to measure implicit availability of concepts, such as one’s attitudes toward certain minorities. It is available

covering a range of topics; in our research, we apply the disability IAT (DA-IAT) [10]. For a detailed description of the DA-IAT, please refer to the side column. In a multimodal context, the IAT offers access to associations, which are not accessible using standard methods, and allows researchers to evaluate attitudes and behaviour from an additional perspective [4]. The IAT makes use of time pressure with the purpose to exploit automatic reactions and spontaneous behavior to eliminate higher cognitive processes such as motivated biases [6].

Many persuasive games aim to change player attitudes, concepts that are difficult to assess because of the human tendency to provide socially desirable answers to sensitive topics [6]. In this context, the IAT offers an opportunity for researchers and game designers to gain insights into the effects of persuasive games on player attitudes beyond explicit measures.

Case Study: Persuasive Games to Change Attitudes Toward People Using Wheelchairs

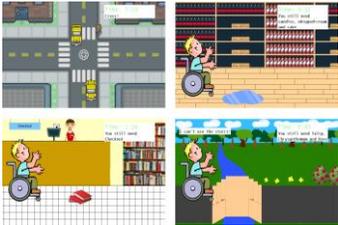
In our evaluation of the persuasive game Birthday Party (see side column, page 3), we combine explicit and implicit measures by applying the Attitudes Toward Disability Scale (ADS, [9]) in combination with the DA-IAT (see side column, page 2) to investigate the effects of the game on player attitudes toward persons with disabilities.

Evaluation Overview

Forty persons participated in the evaluation of Birthday Party (21 female, average age 28.5), which was carried out in two sessions. (1) Online: After providing informed consent, participants were invited to fill in demographic information, answer the ADS, and

Design: Birthday Party

Birthday Party is a persuasive game designed to change player attitudes toward people using wheelchairs [3].



In the game, players are challenged to attend a friend's birthday party, but first have to make their way to different stores to pick up presents (see screenshot above). It integrates accessibility challenges that persons using wheelchairs encounter in their daily lives, e.g., not being able to use stairs.



The game can be controlled using a manual wheelchair (see image above) or with a regular gamepad.

complete an online version of the DA-IAT. (2) Lab study, one week later: Participants played Birthday Party either using a wheelchair as input device or with a regular gamepad, and were asked to answer the ADS and participate in another IAT.

Evaluation Results

In our study, we were interested in the effects of embodied interaction – input using a manual wheelchair – on player attitudes. Explicit measures show that regardless of the type of input device, playing the game raised awareness to everyday issues of people with a disability, and decreased negative judgment of the prospects a person living with a disability has (Figure 1). However, these results do not necessarily reflect actual changes of beliefs among players; they might be caused by the mere exposure to the game and the experimental situation that stimulates cogitation about challenges people with disabilities have to face. In our study, results of the DA-IAT show an effect of input device, suggesting that only wheelchair-based input led to a change in implicit associations (Figure 2, see [5] for a complete description of the scoring algorithm).

Challenges When Applying the IAT

Our study shows that the IAT can be a valuable tool in persuasive game evaluations as it can back up explicit results, but also allows for interpretation where explicit differences are occluded. The results highlight how explicit and implicit measures can lead to different results, with implicit measures being less sensitive to environmental factors and social desirability.

Regarding the practical application of the IAT, our study revealed certain challenges: when engaging participants in a time-based reaction task, performing

parts of the study online is difficult because there is no control over the environment. However, the scoring algorithm [5] allows correcting for high error rates, but can't identify slower reaction times caused by distraction. Furthermore, a version of the IAT that allows for high-precision data collection on multiple platforms is not available for free, and the interpretation of its data requires expert knowledge, which limits its feasibility for small development teams.

Additionally, there are limitations to the application of the IAT as a means of obtaining insights into implicit player attitudes. On a basic level, the IAT can only be applied in subject domains where it has previously been made available, e.g., attitudes toward minorities. It only gives insights into general attitude change provoked by a game; unless games are tested using slight variations in between-subjects designs, the IAT does not provide insights into the contribution of specific game elements to changes of player attitudes. In this context, it is important to understand that the IAT cannot be applied to evaluate in-situ player experience similar to other implicit (e.g., psychophysiology) or explicit measures. Finally, implicit measures such as the IAT only explore attitudes; to fully evaluate the persuasive potential of games, additional behavioural measures should be considered.

Opportunities for Games User Research

When applied appropriately, implicit measures such as the IAT can add to feedback obtained through explicit measures, and can help games user researchers and game designers to develop a better understanding of how video games affect players and their attitudes.

Implicit and Explicit Results

Explicit: Playing the game raises awareness to everyday issues of people with a disability and decreases negative judgment of the prospects a person living with a disability has.

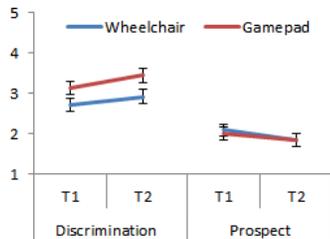


Figure 1: Means (\pm SE) for discrimination and prospects on a scale of 1 (low) to 5 (high).

Implicit: Playing the game changes implicit attitudes towards people with disabilities only, if played with the wheelchair.

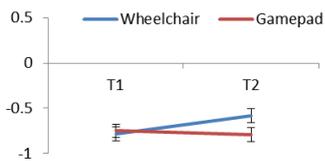


Figure 2: D score (\pm SE) for DA-IAT on a scale of -1 to 0.5.

Validating the effects of persuasive games. Implicit measures that are based on reaction time can reveal whether the stimulation of cognitions is strong enough to be reflected in participants' response times, measuring the strength of the newly formed neuronal pathway within the player's brain: If reaction time is not affected and the formed pathway is not strong enough to sustain, it is unlikely that an actual change of attitude with possible implications for behaviour will happen, thereby providing insights into the effectiveness of a persuasive game.

Applications beyond persuasion. We believe that implicit measures have the potential of supporting games user research beyond persuasive games: Measures such as the IAT cannot only be applied to assess whether games affect internal player attitudes, but can also give insights into player attitudes toward a game, for instance, to provide game designers and marketing teams with insights into how players perceive their game.

It is important for games user research to explore new ways of evaluating video games. This paper highlights opportunities and challenges when combining implicit and explicit measures to study the effects of persuasive games. Our work shows that it is possible to adapt new research methodology from psychology to support game developers and researchers in their understanding of how games can be applied to change player attitudes, potentially fostering the creation of high-quality persuasive content.

References

[1] Alhabash, S. & Wise, K. PeaceMaker: Changing Students' Attitudes Toward Palestinians and Israelis

Through Video Game Play. *International Journal of Communication*, 6 (2012), 356-380.

[2] Fishbein, M., & Ajzen, I. (2005). The influence of attitudes on behavior. *The handbook of attitudes*, 173-222.

[3] Gerling, K.M., Mandryk, R.L., Birk, M., Miller, M., and Orji, R. The Effects of Embodied Persuasive Games on Player Attitudes Toward People Using Wheelchairs. *Proceedings of CHI 2014*, ACM (2014).

[4] Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, 74, 1464-1480.

[5] Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the implicit association test: I. An improved scoring algorithm. *Journal of personality and social psychology*, 85(2), 197.

[6] Hefner, D., Rothmund, T., Klimmt, C., & Gollwitzer, M. Implicit Measures and Media Effects Research: Challenges and Opportunities. *Communication Methods and Measures* 5, 3 (2011), 181-202.

[7] Mandryk, R.L. Physiological Measures for Game Evaluation. Isbister, K. & Schaffer, N. (Eds.): *Game Usability: Advice from the Experts for Advancing the Player Experience*. Morgan Kaufmann (2008).

[8] Nacke, L. E. Wiimote vs. Controller: Electroencephalographic Measurement of Affective Gameplay Interaction. *Proceedings of Future Play 2010*, ACM (2010).

[9] Power, M., & Green, A. The WHOQOL-DIS Group The Attitudes to Disability Scale (ADS): development and psychometric properties. *Journal of Intellectual Disability Research* 54, 9 (2010), 860-874.

[10] Pruet, S.R., & Chan, F. The development and psychometric validation of the Disability Attitude Implicit Association Test. *Rehabilitation Psychology* 51, 3 (2006), 202-213.