

Social attitudes and computer game play: the ability of computer games to influence
implicit attitude

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ABSTRACT:

This study examines the ability of virtual environments (VE's) to shape individuals' attitudes and perceptions related to the environments content. Specifically, we examine the potential of computer-game play to influence and modify individuals' implicit social attitudes, as a result of in-game content. Explicit attitude, amount of presence experienced and affective response to game-play are also measured. Participants' played a first-person war simulation game and were randomly assigned to play the game from the perspective of one of two real-world national groups, either as Americans or Iraqis. The game involved taking part in a war scenario, whereby participants battled against their counter-national group which was computer controlled. Following game play, participants were measured on their relative implicit attitudes towards both American and Iraqi nationalities. Implicit attitude was measured using an implicit association tests (IAT). In addition, explicit attitude towards war and circumstance of social aggression was assessed using the War and Social Aggression Sentiment Questionnaire (WSASQ), the Independent Television Committee's Sense of Presence Inventory (ITC-SOPI) was used to measure presence and affective response to the gaming experience was measured using Izard's Differential Emotional Scale, second edition (DES-II). Results were interpreted using one-way and factorial ANONVA, general linear modeling and correlation matrices. Implicit attitude was found not to be affected by game play, however, effects on explicit attitude were revealed. In particular a strong gender effect was evident in relation to explicit attitude, but game re-enforcement characteristics (i.e. presence and affect) were also found to have influence attitude. These findings and their implications are discussed.

Key words: implicit attitude; virtual environment (VE); explicit attitude; ingroup; affect; presence

Social attitudes, beliefs and interactions are things all humans have in common and cannot avoid. These topics consequently occupy a large area in the study of social psychology and human behaviour. The fact that over the last decade numerous studies have revealed that prejudice can operate without conscious intent or awareness has captured the imagination of those studying social psychology (Devine, 2001). Simultaneously, new tools to help us understand such processes are beginning to be developed and used in research. A particular tool that is becoming used more frequently in research is mediated and virtual environments (VE's). Examples of the application of VE's in recent studies include stereotyping (Yee & Bailenson, 2006), affective response (Riva et al., 2007), violence (Nowak, Krmar, & Farrar 2006) and attitude (Sassenberg & Boos, 2003). The trend evident in the application of VE's in these and similar studies is their common focus on social phenomena. In the current work we explore the potential of socially bias computer-game content to influence players' social attitudes and perceptions. In particular, the impact amount of presence experienced has on players' attitudes and their affective response to the game content is of interest.

Group identification and intergroup bias

Researchers in the field of social psychology have always been interested in the effects of an individual's identification with groups and the cognitive processes involved. Identification with a particular group involves a number of variables (e.g. source, context, individual differences) that act to affirm identification with the particular group (Gilbert, Fiske, & Lindzey, 1998). At a most basic level, the awareness of a common category is a sufficient condition to influence an individual to form an identity with a group (Tajfel, 1982). On consequently having formed this group identity, regardless of the conditions under which the decision was made, individual attitude and behaviour become highly determined by the internalized association. Tajfel's (1989) social identity theory (SIT) describes the effect of assuming an identity, stating that following identification with a group, individuals tend to seek a positive group identity and adopt an attitude of ingroup favouritism.

The need for a positive group identity can consequently lead to the development of intergroup bias when members of an ingroup experience an association with outgroup

members. Intergroup bias, as a consequence of forming a group identity, is defined as the tendency to evaluate one's own group (the ingroup) and its members more favourably than an outgroup and its members (Hewstone, Rubin, & Willis, 2002). Furthermore, according to attribution theory, the construction or manipulation of such attitudes towards outgroups and their members arise from inferences made as a result of the behaviours observed and the context of such behaviour (Gilbert, Fiske, & Lindzey, 1998).

The observation that intergroup bias and inferences about outgroups are “often formed on arbitrary and minimal decisions” (Tajfel, 1982, p. 112) and “go beyond the objective evidence of the situation” (Hewstone, Rubin, & Willis, 2002, p. 347) is of particular relevance to this study. Importantly, this point illustrates that decisions and attitudes are not simply formed on the basis of a particular logical and conscious cognitive process. Rather, these interpretations introduce the role of an unconscious, automatic cognitive processing system as a determinant of intergroup bias and attitude formation- the subject that forms the primary focus of this research.

The theory of intergroup bias and the mental processes that cause individuals to form contrasting attitudes towards the ingroup versus the outgroup(s) is measured on two fronts: explicit measures of attitude and implicit measures of attitude. Explicit attitude is understood as a slow and intentional process of presenting of one's beliefs, which is under conscious control (Akrami & Ekehammar, 2005). Contrastingly, implicit attitude is explained as a fast automatic process, operating without intention and in an unconscious manner.

Explicit attitudes are measured using self-report instruments, such as scaled questionnaires (e.g. the Modern Racial Prejudice Scale) (Akrami & Ekehammar, 2005). When measuring social attitudes and beliefs though, certain factors influence and moderate responses (e.g. motivation to control prejudice beliefs and social desirability effect). As a result and due to the nature of prejudice attitudes, explicit measures of social attitude and group favouritism are inconsistent and often unreliable. For this reason a number of measures have recently been developed to effectively measure implicit prejudice attitudes (e.g. IAT and adjective evaluation task).

The implicit association test (IAT) is one of the most widely recognized measures of implicit attitude and the measurement used in this study. Due to the evident lack of reliability in measuring attitudes of prejudice explicitly, we have focused on measuring attitudes of social prejudice implicitly. At the same time explicit attitudes are also measured, but in terms of personal social beliefs unrelated to prejudice (e.g. beliefs about war and social aggression). Unlike implicit attitudes, these types of attitudes are more readily expressed and less inhibited, making them easier to accurately assess using explicit measures.

Implicit social attitudes

Numerous studies have been conducted into both explicit and implicit attitudes; however, recent research has shown a trend toward a focus the latter. In particular, Devine (2001) has noted that there has been an explosion of work into the measurement of implicit components of prejudice, many of which question the factors influencing implicit attitudes. The expanse of recent literature into implicit measures of attitude (e.g. Devine, 2001; Gawronski, Geschke, & Banse, 2003) and fresh interest in the topic illustrates the study of implicit processes to be a potentially fruitful area in terms of uncovering new psychological knowledge.

However, theoretical (as oppose to research) literature still forms the foundations of understanding the automatic cognitive processes involved in development of social attitudes and ingroup bias. Robinson (1996) describes the establishment of prejudicial implicit attitudes as the mind's way of dealing with too little information about the outgroup. Additionally, Gilbert, Fiske and Lindzey (1998) draw on Fazio's (1990) MODE model of attitudes, describing implicit representations of group bias as the activation of evaluative or stereotypic attitudes associated with the category of the outgroup without a conscious reasoning process. Thus, despite minimal interaction, ingroup members are able to implicitly categorize and form negative attitudes about outgroups and their members. This phenomenon is explained as the result of an innate need to defend the ingroup ego and to avoid recognizing the arbitrariness of ones own group's status (Gilbert, Fiske, & Lindzey, 1998).

Recent research into implicit impression formation and attitudes of prejudice towards outgroups has investigated several particular questions within this field of enquiry. Most prominent are questions of the relation between implicit and explicit attitudes (Akrami & Ekehammar, 2005), the automaticity of prejudice attitudes (Devine, 2001) and the persuasion of attitudes (Zuwerink & Devine, 1996). The general findings of implicit-based intergroup bias research however, are almost unanimous on two similar aspects: (1) that ingroup identification has a primary impact on implicit measures of intergroup bias (Sassenberg & Wieber, 2005), and (2) the process of social categorization clearly contributes to even the most extreme forms of intergroup bias (Hewstone, Rubin, & Willis, 2002).

Attitude change and context

Continuously we are exposed to material which attempts to modify or change our perceptions and attitudes. It is not surprising then that social psychologists have also focused on factors and processes that contributed to effective persuasion of established attitudes (Zuwerink & Devine, 1996). Having understood the formation of attitudes and the factors acting to create them, another question is added to the table—how readily do people's attitudes change and what factors contribute towards this shift? With regard to this study, we were interested in the influence of contextual factors and their ability to change social attitudes.

How easily attitudes are able to be influenced is dependent on the importance and strength of the attitude (Krosnick, 1988, as cited in Zuwerink & Devine, 1996). If we consider social attitudes as important and strongly embedded, then change to these should be relatively difficult to produce. However, although certain attitudes may be fairly stable (usually important attitudes), contextual factors have been found to play a role in the malleability of attitudes despite their relative importance (Mitchell, Banaji, & Nosek, 2003). Contextual factors can be described as certain variables that may influence one's mental representation of the object or stimuli they are exposed to. Thus, attitude is seen to be a function of the characteristics of the environment in which it is placed (Mitchell, Banaji, & Nosek, 2003)

Current research examining the effect that context has on persuading social attitudes and prejudices has been able to add to previous knowledge which describes social attitudes and biases as a result of categorization (Tajfel, 1989). A study by Mitchell, Banaji and Nosek (2003) on the contextual variations in implicit social attitudes strongly suggested that previously formed attitudes may be shaped by recent orienting experiences (e.g. recent associations with a person of a particular race or gender). Zuwerink and Devine (1996) hold a similar view and concluded that while the process of attitude change is both cognitive and affective, it is often also defined within the context established by the situation. Illustrated in these and similar studies (e.g. Bertram, Geschke, & Banse, 2003) is the notion that despite previously held social beliefs, the context in which an attitude object is presented to a person has an additional degree of influence on their attitude.

The idea that context plays a role in influencing attitude is of particular relevance to this study which concerns itself with factors that may contribute towards the formation or influence of social attitudes and intergroup bias. The context of the attitude influence in this study is considered to be the computer game. Having understood the influence that context plays in shaping attitude, we are interested in seeing if interaction with social attitude objects (i.e. race and war) in the context of a computer game is able to influence attitude.

Based on the current theoretical underpinnings of social attitude and ingroup favouritism reviewed above, we make use of a computer game in this study in an attempt to better understand certain contributing factors influencing attitude. What has already been achieved in this contemporary area of psychology is now worth reviewing in order to gain a firmer grounding of how exactly social psychology and VE's may be combined.

Virtual environments for psychological research

Until recently, social psychological research has generally been performed through the use of manual tests and experimental and field observations. However, the powerful medium of virtual reality (VR) has begun to be used more often and has been described as “potentially paradigm shifting for those who study social

interaction” (Bailenson & Beall, 2006). The reason for this shift towards the use of VR is the various research benefits inherent in the medium. Examples of these benefits include allowing participants to enhance or degrade interpersonal communication (Bailenson & Beall, 2006), and the ability to realistically present stimuli, blurring the distinction between reality and its representation, thus decreasing the trade off between experimental control and validity (Loomis, Blascovich, & Beall, 1999).

The use of VR in recent social psychological research has shown promising results, particularly in terms of expanding current theoretical knowledge concerning implicit attitude formation (e.g. Bailenson & Yee, 2006; Kauppinen, Kivimaki, Era, & Robinson, 1998; Slater, Usoh, & Schroeder, 2000). By bringing the study of social interaction and behaviour into the virtual world, a new angle has been created for researchers to produce both new and confirmatory knowledge in this field.

Assuming an identity within a VE has been shown to hold at least some similar characteristics of real world society and social systems (Kauppinen et al., 1998). This supports our belief that in terms of social psychology research, much can be gained from applying and testing established theories in new and innovative ways. Due to the vast array of knowledge contained within social psychology, as a field of enquiry it is undoubtedly worth exploring with the technology of VE's. The following review of recent research demonstrates that there is certainly much to be gained through the application of this research tool.

Primarily, VE have been applied in social psychological research in two ways, collaborative virtual environments (CVE) and computer-generated stimuli. CVE's are defined as communication systems in which multiple participants share the same three-dimensional digital space (Bailenson & Beall, 2006; Bailenson & Yee, 2006). In this environment individuals interact with others in terms of their assigned digital representations (i.e. avatars). Secondly, interactions with computer-generated stimuli, such as computer-mediated communication (Sassenberg & Boos, 2003) and video game play (Clarke & Duimering, 2006; Sanford & Madill, 2006) have also proved valuable for psychological research.

Interactions within these VE's has shown to result in the development of normative social interventions, such as, greetings, acknowledgements, establishing of groups, and social positioning and expression of privacy (Kauppinen et al., 1998). Such research findings provide evidence that interactions with VE's can to some degree be experienced as a real-world situation. Further support to this claim is illustrated in a study by Garau, Slater, Pertaub and Razzaque (2005), which found that despite acknowledging the interactive experience as computer-mediated, people still respected social norms (e.g. avoiding disturbing others) when confronted by virtual humans.

Persuasive ability of VE's

The above discussion demonstrates the potential persuasive element that exists in a VE encounter. Gee (2003, as cited in Sandford & Madill, 2006, p. 302), states that "our experiences in the world build patterns in our mind, and then our mind shapes our experiences of the world, which in turn, reshapes our mind." Keeping in line with this theory, the notion that VE are often processed as real-world experiences demonstrates the potential of experiences in these environments to 'build patterns in our minds...which in turn reshapes our minds'. Thus, in accordance with our research hypothesis, exposure to a VE containing socially bias content has the potential to reshape ones relevant social attitude and perceptions.

Persuasion resulting from interaction with VE content has been further and more closely examined by Guadagno, Blascovich, Bailenson and McCall (2007). Specifically, the study examined whether people change their attitudes in accord with a position advocated by an apparent ingroup member, even if that individual is known to be a computer-controlled agent. Relevant findings in this research revealed two important factors. Firstly, in absence of explicit information about the virtual human, ingroup favouritism effects were noted. Secondly, social influence effects were seen to be moderated by perceived agency and behavioural realism of the virtual humans. In other words, there are certain factors which can be considered major determinants of attitude persuasion with regard to VE experiences. Such determinants relevant to this study include presence, perspective taking and affect.

Presence

Reasoning as to why people respond to and treat VE experiences as if they were real is a question that has been posed by many researchers since their initial application in psychological research (Clarke & Duimering, 2006). Conclusions made as to exactly what factors contribute to reducing the distinction between the virtual experience and reality have been fairly specific in defining a set of criteria. In particular, one factor is seen as the main attributor. As most research illustrates, the amount of presence experienced is significant in producing a near real interactive experience (e.g. Bailenson & Yee, 2006; Bouchard, St-Jaques, & Renaud 2007).

Although not consensually defined, presence is summarized by Sandowski and Stanney (2002) (as cited in Bouchard, St-Jaques, & Renaud, 2007) along seven dimensions: ease of interaction, user-initiated control, pictorial realism, length of exposure, social factors, internal factors, and systems factors. These factors are seen as attributing to the degree of presence felt by the participant and ultimately “the extent to which people perceive that they are actually present in the artificially created environment” (Nam & Johns, 2006, p.18).

With implicit attitude formation in mind and those factors which are able to shape this attitude, the influence of presence proves to be an important consideration. Examining the relationship between presence and video game content, Nowak, Krcmar and Farrar (2006) found that active participation and increased presence has the ability to persuade people to imitate and repeat the behaviours learned while playing the game. This finding, when considered in terms of cognitive processes, is highly relevant for the purpose of this study. Recent advances in Bandura’s social cognitive theory (SCT) argue that it is the cognitive interpretation and experience of an event (socially relevant computer game content in the case of this study) which leads people to act in ways that create desirable outcomes and utilize information about the consequences of others’ actions in making decisions about how to act (Nowak, Krcmar, & Farrar, 2006). Thus, in terms of computer-games, the greater the sense of presence the more likely the content will influence cognitive perceptions and behaviour. This point demonstrates the importance of taking into account amount of presence experienced when researching the influence computer-games have on players’ social attitudes.

Understanding presence in conjunction with SCT adds to the theoretical underpinnings discussed earlier regarding implicit attitude formation and intergroup bias. When experiencing a social interaction in a VE containing high presence and seemingly realistic content, it can be hypothesised then that the influence the gaming experience has on the participant should have a fair degree of correlation with the influence a similar circumstance would have if the experience was real. Furthermore, according to the above argument, the content of the situation becomes important as it is the influencing variable. In other words, the measured factor (i.e. implicit attitude formation) is hypothesised as a result of one's interpretation and experience of an event, which in turn is dependent of the degree of presence elicited by the VE.

Perspective taking

Past research has shown that the ability or experience of taking the perspective of others has a number of important consequences (Davis, Conklin, Smith, & Luce, 1996). Most relevant is the finding that such an ability or experience is able to elevate- relative to one's own self-interest- the interests of the other person or group. Here perspective taking is said to provide a favoured status to the person whose perspective is being assumed (Davis, et al., 1996).

A theoretical explanation of the observed change in perception describes it as the result of an increased overlap between the self and other (Yee & Bailenson, 2006). This is elaborated upon by Davis et al. (2006), stating that the mental processes associated with perspective taking cause the role-taker's thoughts and feeling about the target to become more 'self-like'. In this sense VE's offer an ideal opportunity for a person to assume the perspective of another individual and the impact of this experience to be assessed. A recent study by Yee & Bailenson (2006) demonstrates this by exploring the impact of perspective-taking on stereotyping using a VE. The findings of this study revealed that taking the perspective of another person lead to a greater sense of identification and empathy towards their disposition. Additionally, both implicit and explicit attitudes were found to be influenced by this perspective-taking.

Affect

Affect has been described by Gilbert, Fiske and Lindzey (1998) as an emotional influence or determinant, whereby attitude is said to be a product of the pairing of an attitude object with a stimulus that elicits an affective (emotional) response. This response is described evaluative, as an attitude is formed based on affective responses, which are considered automatic and unmediated by thinking. With regard to emotional response and mediated stimuli, many studies have been able to confirm the ability of films and TV programs to produce elicited emotional responses (e.g. Horowitz, 2006). On the other hand, the relationship between VE interaction and affective response is less clear (Riva, et al., 2007). Recently however, studies have begun to provide evidence revealing the affective abilities that VE's possess.

In a study examining the relationship between affect and computer-game play, Chumbley and Griffiths (2006) found that in-game reinforcement characteristics were key to influencing a number of affective measurements (e.g. aggression). A similar study by Riva et al. (2007) supports this finding, adding that presence is also strongly correlated with the degree of the emotional response. These findings are of significance to this research, clearly highlighting the possibility that a computer game containing high presence and socially-related reinforcement characteristics may impact the player's relative group perceptions. Additionally, as affective responses are considered automatic, implicit measurements of attitude are of importance and relevant for this study.

Research question

The aim of this research is to gain a further understanding of attitude formation and intergroup bias as a result of interaction within a VE. In attempting to explore the influence that computer-games are able to have on players' attitudes and social perceptions, amount of presence, perspective taking, and affect are all considered significant factors. Specifically, we examine the influence these factors, as components of the computer game, have on shaping the participants' social attitudes and perception. By assigning participants' to one of two social identity groups (Iraqi or American), we were interested to see if a player's implicit attitude becomes more

favorable towards their assigned group identity as a result of presence, affect and perspective taking.

Thus, as our primary hypothesis, we state that following game play, participants' implicit attitudes towards the national group identity they were assigned to will be more favourable in comparison to their attitudes towards the national group that was cited as the enemy. Explicit attitudes are also of interest, but are measured in terms of social and personal beliefs about war and social aggression as mentioned previously. In this way, our overarching hypothesis is that following game play, participants' attitudes will shown to have been influenced by their exposure to the computer game's content. Ultimately, we wish to examine the degree to which computer game play has the ability to influence and change peoples attitudes towards real-world phenomena and what factors are responsible for this influence.

Design

This study uses a two-group experimental design to examine the influence that a socially biased, VE experience has on implicit and explicit attitude. Participants were randomly assigned to play a computer game from the perspective of either an Iraqi or American soldier. After game play participants' responded to the War and Social Aggression Sentiment Questionnaire (WSASQ), the Independent Television Corporation Sense of Presence Inventory (ITC-SOPI), Izard's differential emotional scale (DES-II) and an implicit association test (IAT).

Participants

Participants in this study were 68 undergraduate psychology students (21 males and 47emales) from the University of Cape Town. Mean age of the participants' was 20.4 (range:18-25).

Stimulus Materials

Priming material

Prior to playing the game participants were given both a 'mission briefing' (see appendix A1) and a 'character/event' prime (see appendix A2 & A3). The primes were each printed on a single sheet of paper and contained both images and text. The mission briefing text informed the participant of the objectives of the mission. These were to a) retrieve a laptop hidden in a building somewhere along the designated route and b) kill all enemy soldiers along the way. Included on the mission briefing page was a map of the designated route, way points, terrain and buildings. All participants received the same mission briefing.

Having been randomly assigned to either the Iraqi or American soldier group, participants then received the respective nationality prime. This informed the participants of their identity and motivation for fighting the enemy. In this case the enemy described was the counter-identity (i.e. the American group was told that they would be fighting against Iraqis and vice versa). Both nationality primes gave a narrative of either an Iraqi or American soldier's history, rationale for fighting in the 'war' and primed the participant for aggression against the enemy. Both primes also included images of symbols and soldiers relevant to their assigned identity.

Game

The game used for this study is Delta Force Xtreme. The format is a first-person perspective and requires the player to follow a navigation compass directing them towards the end point. Along the way they were required to defend themselves by shooting at the enemy soldiers. The game contained highly detailed graphics of the surrounding environment, with realistic and relevant representations of weaponry and soldiers (enemy and self) which were identifiable from the priming material. Sounds effects were present and included gun-fire and movement sounds. Speech was also reinforced, whereby American soldiers shouted and commanded in English and Iraqi soldiers in Arabic. These were experienced through the use of headphones. The game carries an age restriction rating of '15'.

Measurement instruments

Explicit attitude

The War and Social Aggression Sentiment Questionnaire (WSASQ) was constructed specifically for this study (see appendix B1). It measures explicit attitude towards war situations and events and circumstances relating to war using 16 items. All items were presented with a seven point Likert response scale, anchored by “Strongly disagree” on the left (scoring 1) and “Strongly agree” on the right (scoring 7).

Affect

Affective response to the game experience was measure using the Izard Differential Emotional Scale, second edition (DES-II) (see appendix B2). This scale contains 30 items, each either a word or phrase describing an emotion; subjects are asked to rate the degree to which they felt that emotion during the experience on a seven point scale (1 = Not at all, 7 = Very much). The Izard DES-II has been recently validated and psychometrically evaluated for research.

Implicit attitude

Implicit attitude was measured using an IAT. The IAT requires the subject to respond to a series of items that are to be classified into four categories – typically, two representing a concept discrimination, i.e. *Iraq* versus *America* and two representing an attribute of discrimination such as *pleasant* versus *unpleasant* valence (Greenwald, Banaji, & Nosek, 2003). Subjects are asked to respond rapidly with a right-hand key press to items representing one concept and one attribute (i.e. *Iraq* and *pleasant*), and with a left-hand key press to items from the remaining two categories (i.e. *America* and *unpleasant*). Subjects then perform a second task in which the key assignments for one of the pairs is switched (such that *America* and *pleasant* share a response, likewise *Iraq* and *unpleasant*).

The IAT produces measures derived from latencies of responses to these two tasks. These measures are interpreted in terms of association strengths by assuming that subjects respond more rapidly when the concept and attribute mapped onto the same response are strongly associated (e.g., *America* and *pleasant*) than when they are

weakly associated (e.g., *Iraq* and *pleasant*). The final IAT score is the difference between these two forms of association.

Presence

Presence, or the extent to which participants felt they were ‘inside’ the game, was measured using the ITC-SOPI (see appendix B3). This included a five point likert scale ranging from ‘strongly disagree - strongly agree’. The ITC-SOPI has four distinct factors, however, for this study only the ‘*engagement*’ factor was used as the score representing amount of presence experienced. The ‘*engagement*’ factor is described as a sense of psychological involvement with and enjoyment of the VE content.

Procedure

Participants were seated in front of a computer screen in a cubical. They then received the mission briefing and the respective nationality prime (American soldier or Iraq soldier). They were given time to read through both scripts.

On completion of reading both primes, participants were verbally instructed on the relevant controls to be used during the game. These included one key on a keyboard used to move forward and a mouse control used to move left or right and to shoot. Following this, participants played a training session which allowed them to practice using the controls. They were required to navigate their way around a small area at their own pace for 1-2 minutes. The training area reinforced the priming through the use of flags, uniforms and weapons associated with the group the participant’s was assigned to.

After learning how to use the controls, participants were given headphones to wear during the game. Before playing the mission they were assured their skill level was not being assessed and told not to worry about their game playing ability. Participants then began playing the game with the researcher seated nearby timing the session. Each participant played the game for 12 minutes.

Immediately after playing the game, participants filled out their demographic details on the computer. They then filled out the WSASQ, IZARD DES-II, ITC-SOPI and IAT in this order on the same computer. Participants were left alone to complete the questionnaire and tests. All demographic details, questionnaires and tests were complete on the computer. On average this took about 25 minutes.

Following completion of the testing, participants were verbally debriefed and thanked for their participation in the research.

Results

IAT analysis

The IAT was the primary measurement in this research. As a test of automatic association and dissociation it was used to test implicit social bias affect based on the participants' assigned condition. Using one-way ANOVA, the effect across conditions was insignificant ($F(1,66) = 2.315$; $p = 0.132$; means: Iraqi condition = 14.546; American condition = -163.841).

Measured against gender it also proved insignificant ($F(1,66) = 0.208$; $p = 0.649$; means: males = -115.283; females = -56.492).

WSASQ analysis

The WSASQ was used to measure explicit attitude. It was found reliable according to Cronbach's alpha ($\alpha = 0.749$) and all questionnaire items were retained. To check for inter-test correlation, the WSASQ was then measured against the IAT. This yielded a low correlation ($r = 0.13$), suggesting one of the measures may have low validity. However, it has been noted that studies using multiple measures of attitude (i.e. explicit and implicit) have tended to show a pattern of inconsistent response across the different measures (Hewstone, Rubin, & Willis, 2002). For this reason and due to the reliability evident in the WSASQ, both measures were retained and considered reliable and valid.

Using factorial ANOVA, no significant difference was found across conditions ($F=0.041$; $p=0.840$) in response to the WSASQ as a main effect. However, a significant difference was found across gender ($F(1,64)=9.984$; $p=0.0024$; means: males= 3.7; females= 3.13) in response to the questionnaire. Although insignificant, the across gender and condition interaction was also worth noting ($F(1,64)=3.27$; $p=0.075$). Additionally, post-hoc testing using Tukey's HSD revealed a significant difference in response across gender and condition to lie in the American condition ($p=0.0051$) only, with the Iraq condition proving insignificant ($p=0.767$). It must be noted though that this is just an indication of where the difference lies and further data needs to be collected.

DES-II analysis

A factor analysis (using varimax raw rotation) of all 30 items in the scale was done in order to extract two factors. Only those with a factor loading higher than 0.68 were retained. Consequently, two factors were produced: (1) 'passive negative affect' and (2) 'active negative affect' (see appendix B1.2). The first factor explained 25% of total variance (eigenvalue: 9.432) and the second explained 21% of total variance (eigenvalue: 4.219). A total of 12 items were extracted, with factor 1 consisting of 8 items and factor 2 consisting of 4 items.

Factorial ANOVA revealed no significant difference in 'passive-negative-affect' across conditions ($F(1,64)=0.9$; $p=0.346$) as a main effect, but again a significant difference across gender was found ($F(1,64)=14.33$; $p=0.00034$; means: males= 2.178; females= 3.63). Tukey's HSD revealed a significant gender effect in both conditions (Iraq: $p=0.0115$; USA: $p=0.006$). No significant interaction effect was found ($F(1,64)=0.447$; $p=0.506$)

The same results were found for 'active-negative-affect', whereby condition was insignificant ($F(1,64)=0.0002$; $p=0.988$) as was the interaction effect ($F(1,64)=0.05$; $p=0.823$). Again, gender effect was significant ($F(1,64)=4.687$; $p=0.034$; means: males= 2.654; females= 3.601).

In terms of the IAT, using a general linear model (GLM), ‘passive-negative-affect’ was insignificant ($F=0.163$; $p= 0.688$), as was ‘active-negative-affect’ ($F= 0.007$; $p= 0.934$) as main effects.

ITC-SOPI analysis

The ITC-SOPI ‘engagement’ factor was compared across conditions and gender using factorial ANOVA. Presence was not a factor across groups ($F(1.64)= 2.275$; $p=0.136$) as a main effect, but despite not being significant, was worth noting when measuring between gender ($F(1.64)= 3.229$; $p= 0.077$) as a main effect. The interaction effect was not significant ($F(1.64)=2.184$; $p= 0.641$)

Using one-way ANOVA, engagement (as presence) and ‘amount of computer game play’ proved to have a significant effect ($F= 3.026$; $p= 0.023$).

Engagement and WSASQ response, using GLM, also proved significant ($F(1.65)= 5.355$; $p= 0.023$), using WSASQ response as a predictor for presence. This result was not dependent on gender ($F(1.65)=0.874$; $p= 0.353$).

The same was also true when comparing engagement and ‘active negative affect’ ($F= 12.45$; $p= 0.0007$) using GLM. Here engagement was used as a predictor for ‘affect’. However, gender was also significant ($F= 9.57$; $p= 0.002$).

Presence did not prove to be significant when correlated with IAT scores ($r= 0.079$; $p= 0.517$).

Negatively related to presence, ‘negative effects’ proved to be significant when measured across gender using a one-way ANOVA ($F(1.66)= 7.627$; $p=0.007$; means: males= 1.658; females= 2.184).

Discussion

The question of whether computer games are able to persuade players’ cognitive perceptions of real-world objects and events formed the core of this study. We

specifically set out to examine the extent to which a computer game, containing real-world social references, could influence a player's attitude to the relevant references suggested to them. This issue has true relevance when considering the high amount of interaction that today's society has with these and other games filled with reality-based social references. As Sanford and Madill (2006, p.302) explain, "if videogames are an area from which knowledge can be generated about a certain type of person, setting or event, then knowledge is heavily influenced by the limitation, biases and values found in the videogame." In this sense we attempted to gain an insight into the kind of social and perceptual influences that computer games are able to produce.

Although the results of this study were somewhat inconsistent across measures and the primary measurement of implicit attitude showed no effect, it was encouraging to notice that all three other measures revealed a certain computer-generated influence. Explicit attitude, presence and affect measurements all demonstrated either their own independent effects, or effects that showed correlations between measures.

The main hypothesis of this research was to examine the effect that assuming a group identity in a VE would have on the participants' implicit attitude. Their implicit attitude towards their group relative to that of the counter-group was assessed. However, the analysis revealed no significant difference in attitude differentiation. Reasons as to why this result proved insignificant can be raised on two fronts, (1) participant demographics and (2) the effectiveness of the IAT as a measurement of implicit attitude. With regard to participant demographics, the sample used for this study had a majority of female participants' (70%). As the results of the other three measures (i.e. explicit attitude, presence and affect) revealed a consistent gender effect was observed. This effect highlighted the fact that females had relatively less computer game experience compared to that of males, acting to reduce the effective transference of the stimulus material.

Secondly, the IAT as a measurement of implicit attitude and prejudice has been subject to scrutiny. As Devine (2001) mentions, although the IAT has reliably produced strong effects and is unquestionably accepted by many, others take a different view. Specifically, the IAT has been questioned in terms of its consistent validity and what it in fact measures. Additionally, the effect of contextual and

situational variables in moderating the magnitude of implicit biases has been shown, which the IAT cannot necessarily take into account. Finally, “despite the high level of activity on the IAT and other implicit bias measures, we currently know very little about these measures and how they will contribute to our understanding of prejudice.” (Devine, 2001, p.758). With this being said, the indication seems to be that more empirical investigations into measures of implicit biases are required. However, in no way should this limit the relevance of this current research as we are able to turn our attention to its additional findings.

The measurement of attitude towards circumstances of war and social aggression was assessed using the WSASQ. Unlike the previous measurement concerning implicit attitudes of prejudice and ingroup favouritism though, this measure was explicit- it did not attempt to conceal what it was measuring. Due to the fact mentioned earlier that some attitudes are more readily and overtly expressed than others, personal beliefs about war and social injustices were assessed in this way rather than prejudice attitudes. Results from this measurement proved to be consistently significant along a number of variables.

The major finding in response patterns to the questionnaire was the significant gender effect referred to earlier. In terms of explicit attitude, it was revealed that females were much more sensitive in terms of advocating the necessity of war or acts of social intimidation in reaction to outside threats following game play. Izards DES-II, which measured affective response to the gaming experience also revealed a gender difference on both its factors. ‘Passive negative affect’ (e.g. feeling of distaste and disgust) and ‘active negative affect’ (e.g. fearful and mad) showed a large gender difference in emotional response to the experience ($p= 0.00034$ & $p= 0.034$ respectively). What these results show is that females proved to be more emotionally influenced by the gaming experience. This response differentiation may not be entirely surprising considering the general contrast between male and female attitudes towards violent and aggressive behaviour and does not really provide any relevant information.

However, explicit attitudes were also found to be significant in terms of amount of presence experienced. This fact is of considerable interest to us as it begins to suggest

that attitudes may have been mediated by the gaming experience itself and not simply by gender. This supposition is in-line with the overarching hypothesis of this study- that consequent measures of attitude would be directly influenced by gaming content and experience within the gaming environment- and begins to provide insight into our research question.

The major contributing factor to explicit attitude response was amount of presence experienced. In fact, explicit attitude was significant against presence ($p= 0.023$) even when gender was factored out. This suggests that the amount of presence experienced is directly related to the ability of computer-game content to inform and influence attitudes and perception, specifically explicit attitude. The major finding here is that a greater sense of presence led the player to be more accepting of war circumstance and hold a relatively more positive view of war and aggression. Our conclusion is thus supportive of research by Nowak et al. (2006), in which they found that increased amount of presence has the ability to persuade people to associate and accept the content behaviours viewed in the game as favourable

Furthermore, that presence was significant in relation to affective response (active-negative-affect, $p= 0.0007$) indicates that interaction with computer games is able to produce cognitive and emotional responses when one experiences a strong sense of presence. This finding is in congruence with that of Riva et al (2007), which confirmed the efficacy of computer generated environments as affective mediums when they were able to realistically present stimuli.

Additionally related to presence, the amount of computer game play and experience the participant had was shown to have an impact on how immersed the participant was in the game. Ultimately, the interlinking point that should be made here is that although gender played a role in terms of attitude influence, greater computer game experience is more important as it allows the player to feel more absorbed by the game. This in turn means that because the environment is perceived to be somewhat representative of the real-world, emotional response is heightened, and so attitude towards the gaming content is becomes more favourable, again referring to Nowak et al's (2006) statement.

Now the major question is what are these interpretations and findings able to really tell us? Unfortunately, the primary hypothesis regarding the ability of computer games to influence implicit attitude remains unanswered, yet there is a bigger picture on which our attention should be focused. That is the extent to which we have begun to understand the relationship between cognitive behaviour and manipulated virtual experiences and their similarity to real-world experiences. Our implicit and explicit attitudes and perceptions are heavily dependent on the environments we are exposed to and the social interactions which take place in these settings. Thus, before concluding, we must ask our selves has the overarching question posed by this research been answered- are VE's a possible medium through which social attitudes may be persuaded?

As noted earlier, the way in which a message is received is thought to be important in influencing ones attitude (Zuwerink & Devine, 1996). Persuasive conveyance of a message or attitude object and the context in which the message is received are considered the main components necessary to produce a change in attitude. The pattern of results in this study revealed that peoples' attitudes and perceptions of social objects may possibly be shifted if certain contextual factors are right in terms of the VE experience.

In this study contextual factors included both the priming material and gaming experience and content. In terms of the priming material, this proved inconclusive as an influential contextual factor as the primes were intended to influence implicit attitudes of group bias in favour of the participant's assigned condition- an effect which was not found. In contrast however, the content of the game (i.e. war and social aggression) proved to be a strong enough contextual factor to influence participants' explicit attitudes of war. The strength of this contextual factor to influence attitude though, was directly related to the amount of presence experienced. This is illustrated in the above discussion which described the strong relationship between presence and affect.

That amount of presence experienced had a strong bearing on explicit attitude (as determined by response to WSASQ) hints at the power that VE's, particularly computer games, as influential means of attitude persuasion. In addition, Riva et al.'s

(2007) finding that presence is strongly correlated with the degree of the emotional or affective response is indicative of the notion that game content is able to shape relative cognitive structures. Specifically, cognitive processes which are emotionally informed may be more impressionable (i.e. attitudes).

In this way our findings are in agreement Nowak, et al.'s (2006), demonstrating that active participation and increased presence has the ability to persuade people's behaviour in relation to that experienced in the gaming environment. Again, although the principle measure of implicit attitude revealed no gaming related influence on attitude, the influence on explicit attitude is what was convincing for us. Ultimately, we have been able demonstrate that game content which is both applicable in a real-world context and reliant on emotional references (i.e. war circumstances) may have some impact on the player's future attitude and perceptions. Furthermore, a player's perception of the amount of presence experienced is considered fundamental in maximizing the transference of affective game content, which in turn, is what influences the strength of consequent cognitive perceptions and attitudes relating to the game content.

Limitations

As mentioned previously the majority female sample would have created a bias in the results, relating to previous gaming experience and skill levels. The sampling bias limited our study in terms of understanding the degree of influence computer game content is able to have on players. The difficulty of measuring implicit attitudes due to contextual factors and the questionable efficacy of the measure used by this study may also be regarded as playing a role in limiting the outcome and findings of this research.

Future directions

In order to further explore concepts of social attitude and the influence computer games are able to exert over players' cognitive processes certain procedures need to be included in future work. Firstly, active participant selection should be the next step in growing this research. This would allow us to ensure a more consistent sample of

participants' in terms of game play ability. We can hypothesize from the results of this study that a sample of participants' with above average game play experience would begin to give our findings even more credibility, due to the relationship noted between presence and amount of computer game play. Secondly, by adding a measure of attitude prior to game play and comparing it with that post-game play, our research will gain a new dimension and become inherently more valid and reliable.

Conclusion

Through this research it has become even more evident that despite the broad expanse of knowledge contained within the field of social psychology, a new window of possibility has opened. One which reveals to us the benefits that beginning to explore non-traditional research methods has for the future of psychological research. The simple understanding of the impact computer game play has on one's explicit cognitive perceptions and attitudes demonstrates the benefits VE's offer to psychological research. Moving forward with this in mind, there is no doubt that research under these guises will help in our attempt to better understand computer games as a medium which has the ability to inform and influence real-world behaviours and perceptions.

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APPENDIX A

Appendix A1

Mission briefing



TOP SECRET

Your mission is to retrieve a laptop that contains the enemy's plans for a new offensive in our area. It is extremely important that you succeed – the enemy's strength in the area is such that we cannot oppose them without these plans.

The laptop is located somewhere inside a small valley where the enemy has set a small camp near to a petroleum refinery. Enemy resistance will be high. Follow the waypoints on your GPS, and search each building for the items.

You will be dropped off in a ruined village at the South end of the valley. At the North end of the valley (past the refinery) a helicopter will be waiting to pick you up once you have completed your mission. Good Luck.

Appendix A2

Iraqi condition character/event prime

Some people were excited when the Americans came to Iraq. They thought we would have a better life without Saddam Hussein. I was not so sure – they had blockaded medicines and turned us from a dignified, cultured people into an undignified charity case by forcing us to sell our oil cheaply. They came telling stories about how they were going to bring freedom, but all they wanted was to run Iraq, take our wealth, and treat us as slaves – as they have done with the rest of the world. I decided I could not sit by, and had to get involved.



A friend of my brother-in-law knew some men who were involved in the resistance – they fought the Americans in '91, and gave us good training. My brother-in-law was then captured by the Americans and we never saw him again – he was probably tortured to death. We got good weapons too – some from Iran and Saudi, others stolen from the Americans. We were ready to fight, and

it was hard in the first months. But as our comrades died, we learnt the painful lessons of war, and now we control the city of Tikrit – the Americans do not dare enter.

I have changed since I started fighting. I am harder, more focused, and more aware that our small group is the only thing that stands between slavery for our people and an Iraq which is cultured, peaceful, free and respected by world once again. Many of us have died, but we will continue to fight. We will send them all home in boxes if we have to.



Appendix A3

American condition character/event prime

I joined the Army just after 9/11. I had heard about terrorism, seen it in the movies, how some dictator in Africa or the middle east somewhere would train fanatics to kill innocent people. I don't really understand why they are doing it – probably because they envy our freedom and our way of life – but I decided that day to stop talking about it and get involved.



Army life was hard. I was good at it, so I was promoted to corporal quickly. As soon



as I could, I volunteered to go to Afghanistan for a year, and I saw combat there. Those poor people, living basically in mud huts, were being oppressed by the Taliban. We sorted them out. Now they have a primitive democracy and some of the freedoms we have. That year made me realize I could help people all

over the world gain their freedom. I volunteered for Iraq.

Iraq is different. Unlike Afghanistan, these people don't know how to appreciate our help. Women and children will hide insurgents and smuggle weapons. It is extremely dangerous to even walk down the street. The Afghans are good people, but the Iraqis don't seem to realize that we are trying to give them a better life. Good thing for them, we know better - we will create a free and democratic Iraq even if we have to stay here 50 years. We will crush the insurgency, one suicide bomber at a time.



APPENDIX B

Appendix B1

War and Social Aggression Sentiment Questionnaire (WSASQ)

This questionnaire is answered using a seven point likert-type scale, with “Strongly disagree” on the left (scoring 1) and “Strongly agree” on the right (scoring 7). It is a measure of explicit attitude, which has been shown to be reliable with Cronbach’s alpha ($\alpha= 0.749$).

1. Countries are justified for going to war for economic reasons?
2. Countries are justified for going to war for religious reasons?
3. Countries should receive approval from the UN before going to war?
4. A country should be allowed to invade another if they think they pose a threat?
5. I approve of the US led war on terror?
6. The resistance in Iraq is justified in killing American soldiers?
7. Killing civilians during war is sometimes justified
8. It is acceptable to invade a country in order to remove a dictator from power?
9. Democracy is worth fighting a war over?
10. Military action is the best way to remove an oppressive government?
11. War is an effective means to fight terrorism?
12. The war in Iraq is making the world safe from terrorism?
13. People who join terrorist groups can bring about nothing good?
14. When a country is attacked it is justifiable for them to attack perpetrators regardless of where they may be?
15. It is not a good strategy to negotiate with terrorists?
16. The people of Iraq should be allowed to remove American influence from their country if they want to?

Appendix B2

The Differential Emotion Scale, Second Edition (DES-II)

Overview

This is the second edition of Izard's differential emotions scale, the DES-II (Izard, 1991). This scale contains 30 items, each either a word or phrase describing an emotion; subjects are asked to rate the degree to which they felt that emotion during the experience on a seven point scale (1 = Not at all, 7 = Very much). The Izard DES-II has been recently validated and psychometrically evaluated for research use (Fuenzalida *et al.*, 2005). The DES-II was used in Study 6 (see chapter 10).

Presentation

The DES-II was presented electronically. Subjects were shown the instruction “*During your experience in the displayed environment, did you feel...*” underneath which appeared the item, and under that seven checkboxes for response. Subjects chose when to see the next item (by clicking a “next” button), but could not go back to previously completed items. The order of item presentation was randomized for each subject.

Items

The following 30 items comprise the DES-II. The thirteen highlighted items represent those used in Study 6, following the factor analysis (those with a factor loading higher than 0.7). Green items formed the positive factor, red items for the negative factor, and blue items formed the attention focus factor.

<i>Alert</i>	Sheepish	Afraid
A feeling of distaste	<i>Joyful</i>	Mad
Blameworthy	Delighted	<i>Attentive</i>
Enraged	<i>Downhearted</i>	Scared
Guilty	<i>Angry</i>	<i>A feeling of revulsion</i>

<i>Disgusted</i>	<i>Surprise</i>	Bashful
<i>Disdainful</i>	Astonished	Contemptuous
<i>Happy</i>	Discouraged	Sad
<i>You were concentrating</i>	Shy	<i>Scornful</i>
Fearful	<i>Amazed</i>	Repentant

Appendix B2.1

Passive negative affect (factor loading)	Active negative affect (factor loading)
A feeling of distaste (0.772)	Afraid (0.777)
Blameworthy (0.713)	Scared (0.801)
Guilty (0.768)	Mad (0.697)
Disgusted (0.824)	Fearful (0.681)
Disdainful (0.749)	
A feeling of revulsion (0.779)	
Sad (0.836)	
Repentant (0.74)	

Appendix B3

The Independent Television Commission's Sense of Presence Inventory (ITC-SOPI)

Overview

This instrument is a cross-media measure which has been thoroughly evaluated in terms of validity and reliability (Lessiter *et al.*, 2001). The scale was developed by factor-analyzing 63 Likert-type items created from a review of the literature, which led to four factors (in decreasing eigenvalue order):

1. *Sense of physical space (spatial presence)*: The degree to which the subject has a sense of being in the space of the VE, and that the objects and characters in the VE occupy the space as the subject.
2. *Engagement*: A sense of psychological involvement with and enjoyment of the VE content.
3. *Naturalness (Ecological validity)*: The sense that the VE and its content are lifelike or realistic.
4. *Negative effects*: Measures negative physiological effects (such as dizziness and eyestrain) – this factor is negatively correlated with the other three factors.

The final form of the scale retained only 44 of the original 63 items over the four factors (physical space: 19 items; engagement: 13 items; naturalness: 5 items; negative effects: 6 items). The four factors are conceptually independent, so that a single presence value cannot be produced by the scale – rather, each measure produces four independent values which are supposed to measure separate aspects of the experience (although in practice the first three factors often correlate significantly with each other (Lessiter *et al.*, 2001; Nunez & Blake, 2006). Further details of this scale can be found in section 2.4.1.4 in Chapter 2.

Presentation of items

In all studies reported, the items were presented in the order given by Lessiter *et al.* (2001), namely: a1, a2, a3, a4, a5, a6, b1, b2, b3, b4, b5, b7, b8, b9, b10, b11, b12, b13, b14, b15, b16, b17, b18, b19, b20, b21, b22, b24, b25, b26, b27, b28, b29, b30, b31, b32, b33, b34, b35, b36, b37, b38.

All items were presented with a seven point Likert response scale, anchored by “Strongly disagree” on the left (scoring 1) and “Strongly agree” on the right (scoring 7), as suggested by Lessiter *et al.* (2001).

Items in each factor

Sense of physical space (spatial presence)

<i>Item number</i>	<i>Item stem</i>
b12	I felt I wasn't <i>just</i> watching something.
b13	I had the sensation that I moved in response to parts of the displayed environment
b18	I had a sense of being in the scenes displayed.
b19	I felt that I could move objects (in the displayed environment).
b22	I could almost smell different features of the displayed environment.
b24	I had a strong sense of sounds coming from different directions within the displayed environment.
b25	I felt surrounded by the displayed environment
b28	I felt I could have reached out and touched things (in the displayed environment)
b29	I sensed that the temperature changed to match the scenes in the displayed environment.
b31	I felt that <i>all</i> my senses were stimulated at the same time.
b33	I felt able to change the course of events in the displayed environment.

b34	I felt as though I was in the same space as the characters and/or objects.
b35	I had the sensation that parts of the displayed environment (e.g. characters or objects) were responding to me.
b36	It felt realistic to move things in the displayed environment.
b38	I felt as though I was participating in the displayed environment.
b4	I felt I could interact with the displayed environment.
b7	I felt that the characters and/or objects could almost touch me.

Engagement

<i>Item number</i>	<i>Item stem</i>
a1	I felt sad that my experience was over
a3	I had a sense that I had returned from a journey
a4	I would have liked the experience to continue
a5	I vividly remember some parts of the experience
a6	I'd recommend the experience to my friends.
b1	I felt myself being 'drawn in'.
b16	My experience was intense.
b17	I paid more attention to the displayed environment than I did to my own thoughts (e.g., personal preoccupations, daydreams etc.).
b2	I felt involved (in the displayed environment).
b3	I lost track of time.
b30	I responded emotionally
b32	The content appealed to me.
b8	I enjoyed myself.

Naturalness (Ecological Validity)

<i>Item number</i>	<i>Item stem</i>
b11	The content seemed believable to me.
b15	I felt that the displayed environment was part of the real world.
b20	The scenes depicted could really occur in the real world
b27	I had a strong sense that the characters and objects were solid.
b5	The displayed environment seemed natural.

Negative effects

<i>Item number</i>	<i>Item stem</i>
a2	I felt disorientated
b10	I felt tired.
b14	I felt dizzy.
b21	I felt I had eyestrain.
b26	I felt nauseous.
b37	I felt I had a headache.

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