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BRIEF REPORT

THE EFFECT OF TYPE A PERSONALITY ON PHYSIOLOGICAL AROUSAL WHILE PLAYING COMPUTER GAMES

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Abstract — Despite the widespread use of computer games, there is a lack of systematic research in the area — particularly on their "addictiveness" potential. Anecdotal evidence suggests that computer game addiction may be due to arousal properties of computer games, although other factors may be important. This study examined the relationship between Type A personality and arousal in computer-game play. It was hypothesised that, during computer-game play, Type A and Type B subjects would have significantly higher heart rates as compared with baseline levels and that Type A subjects would experience a significantly greater increase in arousal when playing a computer game than Type B subjects. These hypotheses were both supported and the results are discussed in relation to arousal, personality, and addiction.

Computer games are now a predominant part of the leisure culture. Despite the widespread use of these games, there is a distinct lack of systematic research in the area, although there is growing evidence that they are potentially addictive (e.g., Griffiths, 1991; Griffiths & Hunt, 1993). If computer games are addictive, the logical question to ask is "What is the addictive process?" Griffiths (1993a) proposed four theoretical accounts adapted from McIlwraith's (1990) work on television addiction in an attempt to answer such a question. These were:

1. that computer game addiction is a function of the computer game's effects on imagination and fantasy life, i.e., people who play computer games to excess have poor imaginations;
2. that computer game addiction is a function of the computer game's effects on arousal level, i.e., people who play computer games to excess do so for either its arousing or its tranquilizing effects;
3. that computer game addiction is a manifestation of oral, dependent, or addictive personality, i.e., people who play computer games to excess do so due to their inner personality as opposed to the external source of the addiction;
4. that computer game addiction is a distinct pattern of uses and gratifications associated with the computer game medium, i.e., people who play computer games to excess enjoy the physical act of playing or play only when they are bored, etc.

None of these explanations for computer games has been empirically studied, although anecdotal evidence from arcade video addiction appears to support the second theoretical orientation (Griffiths, 1993a). Research into similar behavioural addictions (e.g., fruit-machine addiction and other gambling addictions) have suggested that arousal may have a major reinforcing role in the "addictiveness" of the

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behaviour (e.g., Anderson & Brown, 1984; Brown, 1988; Leary & Dickerson, 1985). In the case of computer games, the "high" of winning the game or beating one's personal high score is probably equivalent to winning money in gambling. However, recent research on the psychophysiology of fruit machine players by Griffiths (1993b) indicated that there was no difference in arousal levels (as measured by heart rate) between regular and nonregular gamblers, although both groups' arousal levels increased significantly during the playing period. If both regular and nonregular players are equally likely to get aroused during play, then arousal as the sole explanation for "addictive" play cannot be substantiated. It could, therefore, be the case that some other variable (e.g., a dimension of the player's personality) may be exerting an influence on arousal and/or addictiveness.

One little-studied personality dimension in the field of addiction research is the Type A behaviour pattern (TABP). Various facets of the TABP have been noticed in the studies of amusement-machine playing and gambling. For example, Griffiths (1991) has shown that one of the major motivations for fruit-machine players to gamble regularly is competition — a major component of the TABP. Type A individuals have been shown to experience greater physiological reactivity in response to a psychologically challenging situations than to physical tasks (Krantz & Manuck, 1984). It is therefore expected that Type A individuals would experience greater arousal when playing a computer game in an attempt to win a prize or to beat a personal high score than Type B individuals, and that the arousal would be predominantly as a result of the psychological rather than the physical component of the game.

The study to be reported involved the systematic measurement of heart rate in both Type A and Type B individuals while playing a computer game. The study aimed to explore the differences in heart rate between the two groups playing a computer game (between-subjects measure) and heart-rate differences in the individuals themselves by comparing heart rates when playing with baseline measures (within-subjects measure). It was hypothesised that (a) during the playing period both Type A and Type B subjects would have significantly higher heart rates as compared with their own baseline levels and that (b) Type A subjects would experience a significantly greater increase in arousal when playing a computer game then Type B subjects.

METHOD

Subjects

To distinguish between Type A and Type B behaviour patterns, 79 copies of the Jenkins Activity Survey (Jenkins, Zyzanski, & Rosenman, 1979) were distributed at a first year psychology lecture at the University of Plymouth. Subjects were asked to take and complete the forms if they were interested in participating in a computer game experiment at a later date (for which course credits would be available). Of the 79 copies distributed, 60 were returned. From the returned questionnaires, subjects were selected on the basis of their percentile scores. Those with a percentile score of above 55 (indicative of a Type A individual) or below 20 (indicative of a Type B individual) were given an opportunity to participate in the experiment. This left a possible 30 people available to take part in the experiment. The final subject sample consisted of 12 Type A individuals (5 males, 7 females; mean age = 24.3 years) and 12 Type B individuals (5 males, 7 females; mean age = 24.1 years).

Design

A two-way, partial within-subjects design was utilized. The within-subjects measure was the difference in physiological arousal (heart rate) between the three experimental conditions (before playing, during playing, and after playing), whereas the between-subjects measure was the difference between Type A and Type B individuals' physiological arousal.

Procedure

Subjects were tested individually in a quiet laboratory-based environment for an experimental session that lasted approximately 30 min. During this time they were acquainted with a computer game and told that if they got the highest score of all the participating subjects they would win a £10 prize. The aim of the game was to rotate their spaceship and obliterate as many asteroids and alien spaceships as possible. The smaller the target they managed to destroy, the more points they scored. To measure physiological responses, a heart speedometer to measure their heart rate via a simple clip device was attached to one of the subject's ear lobes. This provided a fairly unobtrusive way of measuring the subjects' heart rates. Heart rate measures were recorded every 15 s during three separate phases. These were (a) a 3-min baseline period before play had commenced, (b) a 15-min period while subjects were playing the computer game, and (c) and a further 3-min baseline period after they had stopped playing. Mean heart rates were then computed for each of the subjects' three phases.

After the experiment was over, all subjects were given a small postexperiment questionnaire, which asked them to provide a few demographic details and some information about their own computer-game playing. This included a "computer-game-addiction checklist" adapted from the DSM-III-R for pathological gambling (American Psychiatric Association, 1987). The checklist examined a number of addiction components including *salience* ("Do you frequently play most days?"), *tolerance* ("Do you frequently play over longer periods of time?"), *euphoria* ("Do you play for excitement or a 'buzz'?"), and *withdrawal* ("Do you become restless if you cannot play?"). A cut-off point of four (out of eight) indicated the participant was operationally defined as playing at "addictive" levels at the time of the study.

RESULTS

Analysis of the heart rate data

In examining the difference between the mean heart rates of Type A and Type B and the differences in means for each subject between the three experimental periods, an ANOVA revealed that within subjects there was a significant main effect of playing the computer game ($F(2, 44) = 26.42$; $p < .001$). This therefore supported the hypothesis that both Type A and Type B subjects would experience significantly higher heart rates in comparison with their own baseline measures during the playing period and is shown graphically in Fig. 1. Further analysis revealed there were no differences found between subjects with respect to personality type ($F(1, 22) = 1.79$; $p = .187$) or the interaction between personality type and heart rate while playing ($F(2, 44) = .98$; $p = .382$). Therefore the hypothesis that Type A subjects would experience greater increase in arousal while playing the computer game than Type B subjects was not supported.

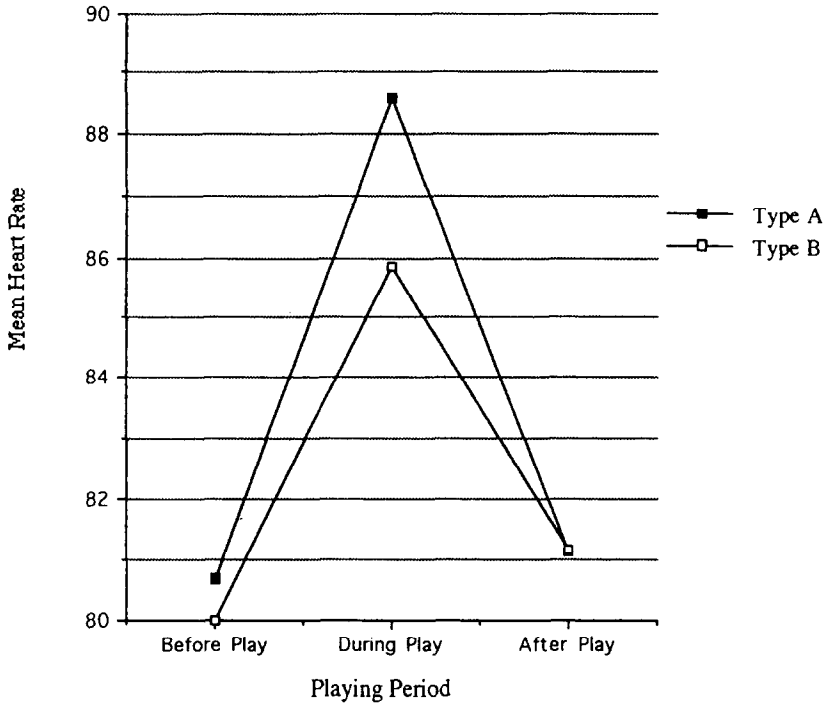

Fig. 1. Showing the means of the heart rates for Type A and Type B subjects for the three periods of the experiment.

However, it was considered that individual subject variation may be disguising a personality effect in between-subjects comparisons, so a further ANOVA was undertaken using the differences between the mean heart rate scores in each individual subject, i.e., the mean for each of the two heart-rate baselines (before and after play) was subtracted from the mean playing period heart rate to produce a figure for the difference between phase 1 (before play) and phase 2 (during play), and for the difference between phase 2 (during play) and phase 3 (after play). The analysis revealed a significant main effect for personality ($F(1, 22) = 4.63$; $p = .043$) thus supporting the hypothesis that type A subjects would experience a significantly greater increase in arousal than Type B subjects. This is shown graphically in Fig. 2.

Analysis of the post-experiment questionnaire

Only 6 of the subjects had never played a computer game before (25%), and these were spread evenly across the two groups. There were no significant differences between the two groups on age, regularity of playing, and average session playing length. Scores from the computer game addiction checklist revealed that 6 out of 12 Type A subjects who were operationally defined as "addicted" to computer games in the past but were not "addicted" currently and that two Type B subjects were currently operationally defined as "addicted" and that a further subject used to be but was not at present. This means that twice as many Type A subjects as Type B subjects reported being "addicted" to computer games at some point in their lives, although this was not significant using Fisher's Exact ($p = 0.2$).

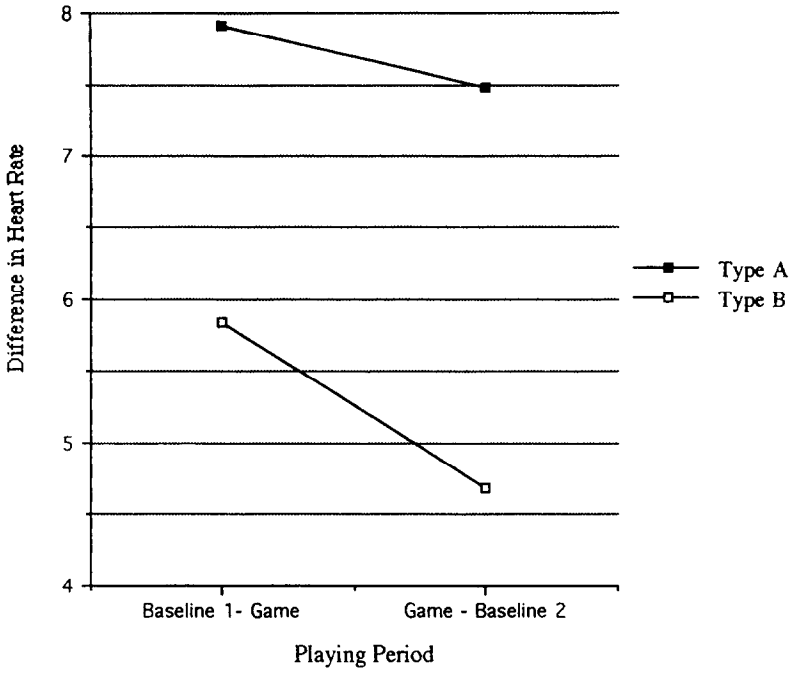

Fig. 2. Showing the effect of personality type on the magnitude of difference in heart rate when resting and when playing a computer game.

With respect to the game they played in the experiment, a majority of subjects (15 out of 24) rated the game as exciting, whereas the remaining subjects (9 out of 24) rated it as neither exciting nor boring. Three-quarters of the subjects (18 out of 24) reported that *playing* the game made them feel excited. The exciting component in playing the game reported by subjects was trying to beat the overall high score (10 out of 24) and/or the game itself (9 out of 24).

DISCUSSION

The hypotheses that (a) within subjects both Type A and Type B subjects' heart rates would increase significantly while playing a computer game and that (b) Type A subject's heart rates would be significantly higher than Type B subjects' while playing a computer game, were both supported. The results of the study support and extend the research on the role of arousal in gambling (e.g., Anderson & Brown, 1984; Griffiths, 1993b; Leary & Dickerson, 1985) to computer-game playing. The findings suggest that computer-game players become aroused while playing, that through this arousal they may be more likely to play again, and that Type A individuals might be more susceptible to addiction because they experience greater arousal. However, further empirical work would be needed to confirm such an assertion.

Although computer-game playing does not involve winning money as gambling does, there are without doubt some "win-like" experiences such as beating your personal high score or beating the all-time high score set by somebody else. Although the majority of both groups rated the game they played as exciting, none of them

rated it as "very exciting." This may have been for a number of reasons. For instance, the playing period was only 15 min long and may not have given subjects sufficient time to "get into the game," e.g., longer playing times may have allowed the subject to become more engrossed in the game, thus increasing arousal. Second, the game itself was very primitive and was chosen for its easy of learning to play it. It is very unlikely that the experimental game would be as challenging and/or as exciting as the current video console games that have greater speed and improved graphics and manoeuvres. It is therefore unlikely that the level of increased arousal experienced in this experiment would be comparable to that produced when playing the newer games.

The results of this study suggest that personality variables should not be ignored in accounts of the etiology of addictive computer playing. Most research into "addictive personality" has centered around pathological measures (e.g., levels of psychopathology, depression, etc.) whereas the results from this study would seem to suggest the need to widen the search to measures that are not concerned with pathology. It may be the case that the results from this study have implications for the study of Type A behaviour pattern in pathological gamblers. As competiveness and the increase in arousal appears to be greater than Type A individuals, it is likely that Type A gamblers will be more likely to repeat their gambling experiences and that through this reinforcement may be more likely to become pathological gamblers.

The study does have limitations; however, these limitations would serve to *reduce* the degree of enhanced arousal recorded while playing and not overestimate it. It is important for future research to replicate this study in a more naturalistic setting to increase the ecological validity. Research into the psychophysiology of gambling has shown that larger increases in arousal occur outside of the laboratory setting (Anderson & Brown, 1984). The present finding that Type A individuals experience greater increases in arousal when playing computer games and are twice as likely as Type B individuals to fulfil the computer-game addiction criteria, suggests that such a personality factor may play an important predisposing role in the etiology of computer game addiction and that further research in this area needs to be carried out.

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