Computers in Human Behavior 53 (2015) 396–407

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Full Length Article

Exploring the effects of videogame play on creativity performance and emotional responses

Chloe Shu-Hua Yeh *

Faculty of Education, Liverpool Hope University, UK

ARTICLE INFO

Article history:
Received 30 October 2014
Revised 28 April 2015
Accepted 14 July 2015
Available online 23 July 2015

Keywords:
Attentional breadth
Cognitive flexibility
Creativity
Emotion and videogame play

ABSTRACT

The effects of videogame play is a growing research field in the recent decades, however, little is known about how 'out-of-school' use of videogames influences creativity and emotions. This interdisciplinary study employed a within-participant design to explore the effects of two different types of online videogames (an action videogame and a non-action videogame) on subsequent creativity performance measured using an idea generation task and emotional responses. Results showed that after playing the action game participants performed higher on originality, elaboration and flexibility than after playing the non-action game, but not productivity. Furthermore, playing both types of game elicited positive emotion (i.e., pleasantness) high in approach motivation (i.e., desire). However, action video game play elicited higher arousal and stress than non-action videogame play. The current research suggests that the relationships between the quantity (productivity and flexibility) and the quality (in this paper, originality and elaboration) of creativity performance may be complex and emotional response of arousal might be a significant emotional factor which influences subsequent creativity performance after videogame play. The cognitive and emotional effects of videogames are discussed along with implications for future emotion–creativity–videogame research.

1. Introduction

Via the rapid development of high technology in the 21st century, online videogame play has become one of the popular entertainments across a wide range of students and young adults' lives. However, the climate change of this globalised gameplay culture has outpaced our current understanding of its impacts on students and young adults, causing concerns in both parents and education practitioners (Bennett, Maton, & Kervin, 2008). One of the crucial questions to ask is how the changing culture of "out of school" online videogame play would influence creativity which is an essential ability for young adults to thrive in the rapid changing environment today. Creativity contributes positively to the quality of one's and others' lives as it is often referred to as "the capacity to cope with the advances, opportunities, technologies, and changes that are a part of our current day-to-day lives" (Runco, 2004, p. 685).

However, little research used online videogames to directly investigate their impact on creativity from an interdisciplinary approach which enables a holistic view by bridging creativity, videogame play and emotion literature. In videogame literature, there is a relatively few research on the relationship between videogame play and creativity. Some appear to have contradictory results on whether videogame play has a positive influence on creativity performance (i.e., Hamlen, 2009 and Jackson et al., 2012). Other evidence suggests that some types of videogame programme on practices and training of cognitive thinking processes may enhance creativity related abilities, such as verbalisation and encoding of visual information (Clements, 1986) as well as divergent thinking (Benedek, Fink, & Neubauer, 2006). Findings from the above studies suggest that the use of some types of computer-based programmes or games which require similar cognitive demands of being creative would have an impact on subsequent creativity performances (Oei & Patterson, 2013). In other words, some types of games may not. The problem is that there have been numerous different types of online video games that are popular and freely available to contemporary players nowadays; however, most previous research did not specifically differentiate the types of game which may have either a positive or negative influence on subsequent creativity performance. Besides, unlike the current study, relatively little research provided a direct experimental examination that investigates further the cognitive effect of online videogame play on creativity, or considered simultaneously the emotional experiences elicited by

* Address: Hope Park, Faculty of Education, Liverpool Hope University, Liverpool L16 9JD, UK.
E-mail address: yehc@hope.ac.uk

http://dx.doi.org/10.1016/j.chb.2015.07.024
0747-5632/

videogame play which may have an impact on the subsequent creative cognitive processes as suggested by emotion–creativity research (e.g., Ashby, Isen, & Turken, 1999; Isen, Daubman, & Nowicki, 1987).

To bridge such gaps, the current research aims to explore further the interconnected influences of cognitive mechanisms and emotional experiences of video games on creativity from an emotion–creativity–videogame play interdisciplinary approach. Stemming from the basis of videogame literature (e.g., Dye, Green, & Bavelier, 2009; Green & Bavelier, 2006, 2012), creativity literature (e.g., Friedman, Fishbach, Forster, & Werth, 2003; Guilford, 1967; Hennessey & Amabile, 2010; Kasof, 1997) and emotion–creativity literature (Ashby et al., 1999; Davis, 2009; Isen, Daubman, & Nowicki, 1998; Isen et al., 1987; Martindale, 1995, 1999), the current research specifically chose an popular online action video game, *Light Heroes* (see Fig. 2), in comparison with a non-action video game, *Clusterz* (see Fig. 3), aiming to (1) examine the cognitive effects of action videogame play on subsequent creative thinking processes by applying the overarching understanding of underling cognitive mechanisms involved during an action videogame play and creativity, including defocused attentional breadth and cognitive flexibility; and to (2) explore the emotions elicited during these two types of videogame play which may influence subsequent creativity performances differently. Based on the above attempt, the current research may provide a possible explanation that explores the influences of emotions elicited during videogame play on the subsequent creativity performance for future research.

2. Conceptual development and research hypotheses

2.1. The cognitive processes underlying videogame play and creativity

In creativity literature, creativity is often defined as ideas, products, creative individuals' abilities and thinking processes which contribute to both originality and usefulness (Amabile, 1982; Mayer, 1999). Being creative, individuals must think outside of the box first. Therefore, it has been recognised that defocused (broadened) attention (e.g., Friedman et al., 2003; Kasof, 1997) and cognitive flexibility (e.g., Guilford, 1967; Hennessey & Amabile, 2010) are the core essential cognitive processes of creative thinking.

2.1.1. Defocused attentional breadth, creativity and action videogame play

In creativity literature, a great deal of research has provided evidence that defocused (broadened) attentional breadth facilitates creative generation whereas focused (narrowed) breadth of attention may hinder creative generation (Finke, Ward, & Smith, 1992; Friedman et al., 2003; Kasof, 1997). Attentional breadth (or breadth of attention) was defined as "the number and range of stimuli attended to at any one time" (Kasof, 1997, p. 303). "The greater the attentional capacity, the more likely the combinational leap which is generally described as the hallmark of creativity" (Mendelsohn, 1976, p. 366). Attentional breadth operates the extent of stimuli to be attended to and has an effect on what level of extraneous or irrelevant stimuli or information is to be filtered from awareness (Kasof, 1997). If breadth of attention is chronically broadened (or defocused) on a large range of stimuli or information for a period of time, irrelevant or extraneous stimuli and information tend to gain attention to form new idea associations. In contrast, if breadth of attention is consistently narrowed (or focused) on a relatively small range of stimuli, individuals tend to filter irrelevant or extraneous stimuli and information away from their consciousness. In other words, chronically wide breadth of attention enlarges the possibility for unalike and remotely associated ideas, information or cognitive units to convey into contiguity, resulting in facilitating creative performance (Mendelsohn, 1976; Runco & Sakamoto, 1999). This is evident by the study of Friedman et al. (2003) which found that using situational manipulations (i.e., perceptual attentional priming, visual attention focused on a small or large area of a map, contracting frontalis or corrugators facial muscle) on visual attentional breadth can have significant lingering influences on breadth of perceptual attention and conceptual attention, suggesting that broader breadth of external perceptual attention is positively associated with a broader scope of internal conceptual attention. This suggests that if videogame play may influence creative performance, it might also exert players' attentional breadth in some ways.

Correspondingly, in videogame literature, the link between video games and their cognitive effects has been well-documented (Boot, Kramer, Simons, Fabiani, & Gratton, 2008; Green & Bavelier, 2012; Oei & Patterson, 2013; Spence & Feng, 2010). Particularly, Spence and Feng (2010) explained that the videogame players simultaneously utilise various complex attentional processes[1] associated with cognitive processing (perception, attention, executive functions, etc.). In that, attentional processes such as making predictions of upcoming game events spatially and temporally are likely to enhance attentional breadth which was found to have an impact on subsequent creativity performance (Friedman et al., 2003; Kasof, 1997).

Different types of games would enhance different aspects of cognitive skills, therefore, it is arguable that frequent uses of particular types of game will improve task performances which require similar kinds of underlying cognitive demands (Oei & Patterson, 2013). It is worth clarifying that the type of games used to support the claim that videogame play enhances visual attentional abilities is commonly classified as "action video games" distinguishable from other genres of games (e.g., casual, strategy or role-playing games) (Green & Bavelier, 2012). According to Green and Bavelier (2012, p. R201), action videogames differ from other games in ways that this type of game is often designed with "an emphasis on peripheral visual field processing and divided attention (items of interest often first appear at the edges of the screen at the same time as events that are occurring at the centre of the screen)". Research found that playing action videogames improved visual breadth of attention throughout visual field including both central (i.e., goals and missions) and peripheral visual processing (e.g., distractors or potential benefits or threats of objects) (Green & Bavelier, 2006a; Spence & Feng, 2010). In other words, in action video games, the high speed of moving objects often transiently pop in and out all over the entire visual field. These spatial attentional abilities enhanced during and after action videogame play are seemingly suggesting an enhancement of attentional breadth, a concept used in creativity literature.

However, videogame literature has not provided an explanation of how expanded visual breadth of attention during action videogame play may possibly influence subsequent creative thinking. Therefore, in the light of the above reasoning from both creativity and videogame play literature, the current research proposes the first theoretical assumption to support the methodological design, namely, that playing action video games which require broader and more intensive demands of visual attentional breadth may benefit creative performance than playing non-action (or casual)

[1] These attentional processes include attentional capture, divided attention, switch attention and selective attention simultaneously, to identify, recognise, and keep track of the threats which may appear in various location in a complex visual environment to avoid failures in the game. The current research focuses on attentional breadth which is closely linked to creativity (for more details on other attentional processes, please see Spence and Feng (2010).