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Crystallized intelligence affects hedonic and epistemic values to continue playing a game with saliency-based design



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ABSTRACT

The purpose of most educational games is to generate students' interest to learn or apply their knowledge. This study designed a new type of human-computer interaction for players to "blow away" the sand shown on the smartphone screen by physically blowing into the smartphone's sound channel. A saliency model was used to examine whether crystallized intelligence (Gc) is correlated to players' experiential value and willingness to play. Data from 200 university students were collected for confirmatory factor analysis with structural equation modeling. The results revealed that Gc was an antecedent of hedonic and epistemic values, and these two types of experiential values could predict an individual's continuance intention to play. The implication of this study suggests that Gc is an essential factor in playing an App game involving object feature identification, as it encourages students to learn and to gain a variety of knowledge.

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1. Introduction

In some studies, researchers claim that their video games can improve an individual's cognitive ability. However, it is difficult to find empirical evidence supporting these sorts of statements (e.g., Green & Bavelier, 2003; Núñez Castellar, All, de Marez, & Van Looy, 2015; Smith, McEvoy, & Gevins, 1999; Smith, Stibric, & Smithson, 2013). Research has found that cognitive ability affects video game playing (Quiroga et al., 2009) and in line with this argument, the present study examined how intelligence is correlated to affective factors in game playing. Cattell (1943), who initially distinguished between two broad factors of intelligence, said that fluid intelligence (Gf) "shows itself in successfully educing complex relations among simple fundaments whose properties are known to everyone", whereas crystallized intelligence (Gc) "operates in areas where the judgments have been taught systematically or experienced before" (Cattell, 1971, p. 98). There have been an increasing number of publications on the interrelations between cognitive abilities and so-called investment traits, showing a generally positive relationship between cognitive and affective factors (Ackerman, 1996; Von Stumm & Ackerman, 2012). As an input trait, intelligence affects individual difference in the motivation to engage in and to enjoy thinking and cognitively challenging tasks (Petty, Brinol, Loersch, & McCaslin, 2009). Thus, this study explored how one's Gc in playing a challenging App game correlates to continuous intention to play.

Ackerman (1996) hypothesized that skill performance depends on personal characteristics (general intelligence, perceptual speed, and psychomotor ability) and tasks demands (consistency, complexity, and transfer). In a task, contextual

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information may provide insufficient information to immediately execute goal-relevant actions; it may increase attention to predict the occurrence of events or the feature of articles (Geng & Mangun, 2011). However, stimulus-driven attention captured by perceptually salient stimuli that are completely goal-oriented activate mental processes (e.g., Corbetta, Patel, & Shulman, 2008; Indovina & Macaluso, 2007). Based on a theory of attentional control and decision, we designed a salient stimuli game by manipulating the object feature for players to define and reason from a perceptually salient contextual cue to identify the appearance of a target stimulus. In line with this idea, the App game (called “Mastering Taiwan”) essentially requires players to use learned knowledge to predict the target stimulus.

According to gratifications theory, individuals are active and goal-oriented, which leads to their affective, cognitive, and behavioral outcomes in media learning (McQuail, 1994). Thus, the present research was designed to focus specifically on the role of Gc in the game goal pursuit to pave the way to understand how goals might differentially lead to affective, cognitive and behavioral outcomes when playing a saliency-based App game. This game utilized a patent, which involves the player physically blowing into the smartphone’s sound channel to “blow away” the sand shown on the device’s screen to reveal the image of the target stimulus. As the player starts to blow air into the sound channel, some of the sand is removed on the screen, and small parts of the embedded image are revealed. From this, the player can reason to predict what the whole image represents and name the article. Through playing Mastering Taiwan, experiential values (i.e. hedonic and epistemic value) may be aroused within the player. That is, in the way of playing, players’ feelings of fun, enjoyment and pleasure can be generated as hedonic value (Alba & Williams, 2013); and desire to be knowledgeable and answer more questions correctly can be formed as epistemic value (Pihlström & Brush, 2008). Currently, there is limited research in relation to how Gc might exert an effect on the perception of experiential value to continued game playing. As such, this study focused on exploring the correlates among individual’s Gc, experiential value perceptions, and continuance intention to play.

1.1. Crystallized intelligence

Gf reflects the capability to solve problems for which previous experience, learned knowledge and skills are of little use. It is considered to be best measured by tests that have limited scholastic or cultural content, for example, perceptual and figural tasks or verbal tasks that rely on relationships among common and familiar words (Johnson & Bouchard Jr., 2005). Gc reflects consolidated knowledge gained by education, access to cultural information, and experience. Cognitive ability comprises intelligence (the ability to think), knowledge (the store and retrieval of true and relevant knowledge), and the intelligent use of this knowledge. A broader concept of intelligence also includes knowledge aspects (“crystallized intelligence”) (Rindermann, Falkenhayn, & Baumeister, 2014). Consequently, in completing a task, if information-processing speed is basic to cognitive ability, then working speed should correlate with intelligence, particularly with subsidiary facets of Gc (Bates & Shieles, 2003).

Mental speed has been applied to an extremely diverse range of tasks (Deary, 2000). In this research, we restricted ourselves to information-processing speed in a saliency-based App game designed to assess the speed with which basic recognition tasks are accomplished (i.e., identify the article embedded). Processing speed reflects the rapidity with answer input to processing game modules. Defined this way, processing speed may be objectively related to explicit cognition in which game behavior is affected. This is the theoretical basis for arguing that Gc, as a self-concept in knowledge to play a saliency-based game (hereafter “SBG”), may affect one’s information-processing speed in a game.

1.2. Experiential values

Experiential value can be defined as a perceived, relativistic preference for system attributes or system performances resulting from system usage to achieve users’ goals or purposes (Holbrook, 1999). Smith and Colgate (2007) indicated that experiential value is derived from how a product creates appropriate experiences, feelings, and emotions in a customer. However, perceived value is subjective and experiential in nature (Holbrook, 2005), and consumers may use products to seek various types of value. Mathwick, Malhotra, and Rigdon (2002) proposed experiential characteristics according to (1) the degree of involvement of consumers and (2) the correlation between experience and the environment, majorly divided into two types: hedonic and epistemic. Hedonic value is defined as the level of pleasure and joy users experience, and it has a positive impact on new technology device adoption intention (Hong, Tam, & Kim, 2006). On the other hand, Huang (2012) argued that for informants, epistemic value initiated by an experience can satisfy curiosity and desire for understanding.

However, there has been recognition of a preferred level of individual choice in relation to experiential values with game playing (Pallud & Straub, 2014). Falloon (2013) stated that adoption decisions prioritized hedonic and epistemic values as key drivers. Satisfied customers may switch to alternative games to try something else that provides fun (Steenkamp & Baumgartner, 1992) based on a desire for novelty, or out of curiosity, and such factors can lead to the switching phenomenon (Bhattacharjee, Limayem, & Cheung, 2012). As Li, Liu, Xu, and Heikkilä (2013) stated, the Internet makes it possible for online game players to easily switch between games and they frequently do so without hesitation. Thus, it is important for game developers to investigate the post perception of App game players (Li, Liu, Xu, Heikkilä, & van der Heijden, 2015). The present study seeks to examine whether the player’s hedonic and epistemic values would affect playing a SBG.

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