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How hand gestures influence the enjoyment in gamified mobile marketing

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ABSTRACT

With the rapid development of mobile technologies, gamification has been deployed pervasively on mobile platforms as an effective marketing tool. In this study, we focus on how mobile gesture technology influences consumer enjoyment of mobile marketing games by examining two types of hand gestures: surface and motion gestures. Considering the characteristics of hand gestures and embodied cognition theories, we propose that hand gestures influence the enjoyment of mobile marketing games with two other game elements: object visual presentation and reward setting. Specifically, the interaction between surface gesture (vs. motion gesture) and the object visual presentation of a real product picture (vs. symbolic brand logo image) leads to greater enjoyment of marketing games through mental simulation. Similarly, the interaction between motion gesture (vs. surface gesture) and reward setting of uncertainty (vs. certainty) leads to greater enjoyment of marketing games through perceived control. Three online experiments are conducted to support the proposed hypotheses. Results provide implications for marketing practitioners that hand gesture design should be aligned with congruent object visual presentation and reward setting in order to enhance consumer enjoyment of mobile marketing games. This study contributes to the extant literature of gamification, as well as human-computer interaction.

1. Introduction

Gamification, which is defined as a process of enhancing a service with affordances for gameful experiences to support users' overall value creation, has recently become an effective tool in supporting marketing activities (Deterding et al., 2011; Huotari and Hamari, 2017). Especially with the rapid development of mobile technology, gamification is deployed pervasively on the mobile platform to facilitate mobile marketing (Hofacker et al., 2015). Many brands, such as Starbucks and Nike +, have applied gamification elements in their mobile applications and managed to enhance customer engagement. In addition, some mobile applications, Foursquare for instance, specially provide gamification service for brands' mobile marketing (Business Insider, 2013). An increasing body of research has found that gamification implemented on the mobile platform is effective in helping firms increase customer brand loyalty, customer–brand connection, etc. (e.g. Berger et al., 2017; Kim and Ahn, 2017). An effective gamification design should be focused on creating gameful and enjoyable experiences rather than solely changing certain behaviours. Consequently, to achieve mobile marketing goals, it is important for firms to invest effort in enhancing consumer enjoyment of mobile marketing games through better gamification design (Hofacker et al., 2015; Huotari and Hamari, 2017; Liu et al., 2017).

Many research has explored various gamification design elements (e.g. points, badge, leaderboard) and their influences on users' psychological experience and behavioural outcome in marketing context (Hamari et al., 2014; Seaborn and Fels, 2015). However, minimal attention has been directed towards examining design elements that are unique to mobile technology. Mobile gesture technology, is a newly emergent gamification design element on the mobile platform. Rarely used in traditional marketing channels (e.g. TV, desktop, digital signage), mobile gesture technology provides gamified mobile marketing with more interaction through various modalities of hand gesture (e.g. Daiber et al., 2012; Hinckley et al., 2016). Some hand gestures require physical contact devices (Karam and Schraefel, 2005), such as surface gestures based on touch-sensor technology (e.g. touching, scrolling, and swiping), as well as motion gestures based on motion-sensor technology (e.g. shaking, tilting, and rotating) (Ruiz et al., 2011; Wobbrock et al., 2009). By contrast, others can be realized without physical contact, such as gaze gesture, body movements and facial expressions (Kratz et al., 2011; Zhao et al., 2012). Besides, in-air gestures involve physical and nonphysical contact (e.g. pre touch above the self-capacitative touch screen) (Hinckley et al., 2016; Lee et al., 2011). Nevertheless, the most widely adopted gesture input in mobile marketing games is

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physical contact-based input, mainly surface gesture and motion gesture (Liu et al., 2017). Illustrations of these two types of gestures are pervasive in mobile marketing practices. For example, McDonald's has implemented many interactive mobile games in China (McDonald China, 2016). A game designed for the promotion of a sesame-flavoured cone requires consumers to shake their mobile phones continuously to sprinkle the sesame presented on top of the screen down to the cone positioned at the bottom of the screen. Another game asks consumers to pile up different snacks by manipulating the snack pictures with finger touch. Consumers acquire a coupon when they win the games. Domino's Pizza also adopts gamification in its marketing promotions, whereby consumers who are uncertain about what to order may use a pizza slot machine by shaking the phone, and the game will randomly select one topping for them (Forbes, 2012).

One question follows up: Serving as one component of gamification design, whether and how mobile gesture technology influence consumer enjoyment of mobile marketing games jointly with other gamification design elements? Specifically, we focus on two major modalities of mobile gesture technology in mobile marketing games: surface and motion gestures. Existing research on mobile hand gestures has focused mainly on specific gesture designs by exploring the performance of various gestures (e.g. Daiber et al., 2012; Rempel et al., 2014; Scheible et al., 2008; Vatavu et al., 2012; Williamson et al., 2013; Wobbrock et al., 2008; Yoo et al., 2010). However, little is known of the psychological nature of different hand gestures, and it is unable to provide direct answer to the question. Therefore, the present study aims to provide initial insights to facilitate better understanding of the role of surface and motion gestures and their interaction with other gamification design elements in the context of gamified mobile marketing.

Considering the characteristics of each gesture and embodied cognition theories (Barsalou, 2008; Ruiz et al., 2011; Wobbrock et al., 2009), we propose that hand gestures, as a kind of bodily action, may interact with other game elements in gamified mobile marketing, hence jointly influencing consumer enjoyment. Two game design elements, visual presentation and reward setting, which determine the basic environment for game experience, are considered (Robson et al., 2015). Specifically, we predict the interaction between surface gesture (vs. motion gesture) and visual presentation of a real product picture (vs. symbolic brand logo image) will lead to greater enjoyment of mobile marketing games, which is mediated by mental simulation. Similarly, the interaction between motion gesture (vs. surface gesture) and reward setting of uncertainty (vs. certainty) leads to greater enjoyment of mobile marketing games through the mediation of perceived control.

The present study contributes to the extant literature in three important ways. First, our project extends the gamification research by investigating the technology component, which serves as an important aspect of gamification design. Second, the present study contributes to the literature of human-computer interaction and deepens our understanding of the nature of surface and motion gestures from the perspective of consumer psychology. Furthermore, our research contributes to the embodied cognition literature by expanding the embodied cognition theory from the traditional physical environment to a mobile virtual environment. The findings of our research also shed light on how to integrate hand gestures into gamified marketing design for mobile gamification designers and marketing practitioners.

The remainder of this paper is organized as follows. We begin by reviewing literature pertinent to our research and then propose our hypothesized effects. Then, we describe three studies that provide supporting evidence to bolster the predictions and illustrate the psychological mechanism underlying the effects. Finally, our paper is concluded with a discussion of the implications of our results and potential future research directions.

2. Literature review and conceptual framework

2.1. Taxonomy and characteristics of mobile hand gestures

Different from traditional inputs involving computer keyboards or mouse, mobile platforms enable various input modalities via sophisticated technologies. In general, two major types of physical contact-based mobile gestures exist, as categorized by the enabling technology (Karam and Schraefel, 2005; Ruiz et al., 2011). One input modality involves surface gestures, such as clicking, dragging and moving objects on the screen of a mobile device, which allows the user to interact directly with the object on a touch-sensing screen in a 2D space (Wobbrock et al., 2009). The other input modality involves motion gestures based on a set of motion sensors (e.g. accelerometers, gyroscopes, orientation sensors) that engage users in a 3D environment via shaking, tilting or rotating a mobile phone (Daiber et al., 2012; Ruiz et al., 2011).

In addition to the enabling technology, surface and motion gestures also differ from one another in terms of manipulating style and bodily involvement, which gives us a deeper understanding of the characteristics of these gestures.

Manipulating Style. Manipulating style refers to how gestures control a virtual object by applying a tight relationship between the actual movements of the gesturing hand with the object being manipulated (Quek et al., 2002). Surface gestures are commonly used in 2D interactions, which involve controlling the virtual object displayed on the screen, whereas motion gestures often involve manipulation of the physical mobile devices (Karam and Schraefel, 2005). Put differently, surface gestures enable users to act directly on the virtual object without any intermediate devices, such as a mouse or keyboard (Gutwin and Penner, 2002; Long et al., 1999); whereas with motion gestures, users operate on the virtual object by manipulating the mobile device (Karam and Schraefel, 2005; Ruiz et al., 2011). For instance, in the Temple Run game, users need to tilt the phone to control the avatar's running direction. In this sense, motion gestures inherently involve indirect manipulation of the virtual object via the intermediation of a mobile device. By contrast, surface gestures involve direct manipulation with the fingers touching the virtual object presented on the screen (Cockburn et al., 2012; Ruiz et al., 2011; Shen et al., 2016; Wobbrock et al., 2009).

Body Involvement. Another factor to understand different gestures is body involvement, which refers to the body parts used to make gestures (e.g. hand, fingers, head) (Karam and Schraefel, 2005). Rempel et al. (2014) distinguish different gestures based on hand posture features and body parts involved. On the touch-sensing interface, surface gestures (e.g. pinching, flicking and swiping) require moving the fingertips, mainly the thumb, index and sometimes middle fingers (Tucker and Ellis, 1998). Motion gestures (e.g., shaking, tilting and rotating mobile devices) are performed with minimal finger movement and more palm-based contact and body involvement, including fingers, hands, wrist and arms, whereas gestures in a 3D space decouple the hand from a touch-sensing interface. Motion gestures usually require more body involvement than surface gestures. Table 1 summarizes the characteristics of each gesture from the two perspectives.

Table 1
Characteristics of surface gestures and motion gestures.

	Manipulating style	Body involvement
Surface gestures (e.g. touching, tapping, dragging)	Direct manipulation of the virtual object presented on the screen	Low involve mainly fingers
Motion gestures (e.g. shaking, tilting, rotating)	Indirect manipulation of the virtual object presented on the screen	High involve fingers, hands, wrist and arms

2.2. How mobile hand gestures influence enjoyment of mobile marketing games

When we integrate mobile gesture technology into a gamification design, an important question emerges: whether hand gestures will influence consumer's enjoyment in mobile marketing games. The general viewpoint of embodied cognition posits that our cognitive process does not only depend on our mentality but is also rooted deeply in the body's interactions with the external environment (Barsalou, 2008; Wilson, 2002). Distinct from classic theories and models of cognitive science, which assumes the motor and perceptual system as peripheral input, embodied cognition posits that our body serves the mind in cognitive processes, even under situations decoupled from the real-world environment, e.g. a mental task whose referents are distant in time and space or imaginary (Wilson, 2002). Therefore, we contend that in the virtual context of mobile marketing games, hand gestures as a way of body interaction can influence consumer enjoyment.

A further question is how different hand gestures influence consumer enjoyment of mobile marketing games. From the perspective of gamification design, hand gestures may not influence game enjoyment alone, but rather with other game elements that constitute the basic game environment, such as aesthetic and mechanic elements (Daiber et al., 2012; Liu et al., 2017; Schell, 2015). According to the literature on embodied cognition, perceiving a concrete object (e.g. a banana) will automatically activate a mental simulation of how to interact with the object even when no actual bodily interaction occurs (Thelen and Smith, 1995; van Gelder and Clark, 1998; Zwaan and Taylor, 2006). In reverse, the bodily state will also affect the perception of the concrete object (Barsalou, 2008; Prinz, 2010; Wilson, 2002). Given the characteristics of manipulating style, how hand gestures manipulate the object presented on the screen is greatly based on visual perception because vision input can activate compatible motor activity (Jeannerod, 2001). Therefore, we propose that hand gestures may interact with object visual presentation, a basic element in the game aesthetic design, to influence consumers' game enjoyment jointly.

In contrast, the influence of bodily state may not only occur for concrete objects that can be physically interacted with but also for abstract concepts, considering that abstract concepts are also grounded metaphorically in the sensory motor system (Barsalou, 2008; Lakoff and Johnson, 1980; Pecher et al., 2011). Given the characteristics of body involvement, we propose that hand gestures as a bodily state may also shape how consumers perceive abstract mechanical elements and further influence game enjoyment. In this research, we focus on the mechanics of reward setting, a core design element in marketing games.

We elaborate on these interaction effects and their underlying mechanisms below. The conceptual model of this research is shown in Fig. 1.

2.2.1. Interaction effect between mobile hand gestures and visual presentation

Visual perception—Action coordination and mental simulation. Embodied cognition theories highlight the close relationship between the visual system and the motor system. Accordingly, the core function of vision is to provide information for action possibilities, also known as affordance (Gibson, 1979; Jeannerod, 2001). For example, Tucker and Ellis (2001) have shown that object size influences motor response. When people see small-sized objects, it is more likely to perform a precision grasp, mainly with finger movement. By contrast, when large objects are present, power grasp, involving hand palms, becomes more relevant. Rooted in this viewpoint, embodied cognition also contends that seeing an object that one may potentially interact with primes actions and induces mental simulation before the acting on the object, even if there is no intention to perform an action (Barsalou, 1999; Gerlach et al., 2002; Ping et al., 2009). Mental simulation acts as a re-enactment of perception and is an automatic form of mental imagery activated by the representation of objects (Barsalou, 2008). Several neuroimaging studies have provided evidence to support the role of mental simulation (Simmons et al., 2005; Zatorre and Halpern, 2005).

Prior research has also shown that mental simulation plays an important role in shaping evaluation and preference. For example, when the mental simulation is impeded by having the dominant hand occupied with irrelevant objects, the evaluation of the target objects will be affected negatively (Ping et al., 2009). For example, people prefer visually presented objects with the orientation of the handles matching handedness, such as a fork placed at the left or right side of a cake, and this preference is driven by the ease of mental simulation. However, if the dominant hand is occupied, the fluency of mental simulation is reduced, thereby decreasing the liking of the target object (Elder and Krishna, 2012; Shen and Sengupta, 2012). Substantial work has demonstrated that mental simulation serves as the underlying mechanism of the relationship between visual stimuli and the liking of the target objects (Elder and Krishna, 2012; Ping et al., 2009; Tucker and Ellis, 1998).

Congruency between surface gesture and real product presentation. Given the characteristics of manipulating style endorsed by the two different hand gestures, we propose that hand gestures will interact with the visual presentation in the games to influence consumer experience jointly. In this research, we focus on two commonly used visual presentation formats in mobile marketing games: real picture of a specific product and symbolic brand logo. Product presentation refers to using the picture of a real product, such as a can of soda, which is often highly vivid and appears widely as the interaction object in marketing games. For example, the McDonald's cone game presents a picture of a real cone on the display (McDonald China, 2016). By contrast, the brand logo is an image consisting of colourful shapes and verbal brand name in various typefaces (Jiang et al., 2016). The placement of brand logos in digital games are common in online social games nowadays (e.g. Cañete et al., 2014; Jeong et al., 2011; Nuijten et al., 2013; Walsh et al., 2013). Viewing a product picture and a symbolic brand logo can induce mental imagery, which involves mental representations through which sensory experiences are reassembled in working memory (MacInnis and Price, 1987). The mental imagery of a product picture tends to contain information involving multiple sensory organs, especially haptic imagery, which is generated from the past experience of interacting with the object. By contrast, the imagery of a symbolic brand logo may not include such information, considering that a brand logo is often an intangible and abstract stimulus (Jiang et al., 2016). For example, Shen and Sengupta (2012) find that seeing the picture of a 7-Up soda leads people to simulate mentally how to act on the soda can, whereas the image of the 7-Up brand logo fails to induce mental simulation.

Synthesizing these lines of research, we propose that a congruency between surface gestures (i.e., direct touching) and visual presentation of a real product picture exists, given that surface gestures involve direct manipulating style without any intermediate devices, thus encouraging greater mental simulation than motion gestures (i.e. shaking) that always require a mobile device. By contrast, when the target object is presented in the form of symbolic brand logos, generating mental simulation is difficult regardless of which type of interactive gestures are used.

Moreover, as embodied cognition posits, the congruency between surface gesture and visual presentation of a real product picture will increase the preference for the target object. Hence, we propose that such preference can further be extended to an enhanced interactive game process. Supporting evidence can be found in research on a video game. When game controllers are high in natural mapping, it allows players to feel "in" the game effortlessly and engage in better mental simulation, hence generating greater game enjoyment (Hou et al., 2012; Skalski et al., 2011; Tamborini and Skalski, 2006). Additionally, other research shows that vivid mental imagery is a critical part of immersion in the virtual world (Green et al., 2004; Tamborini and Bowman, 2010),

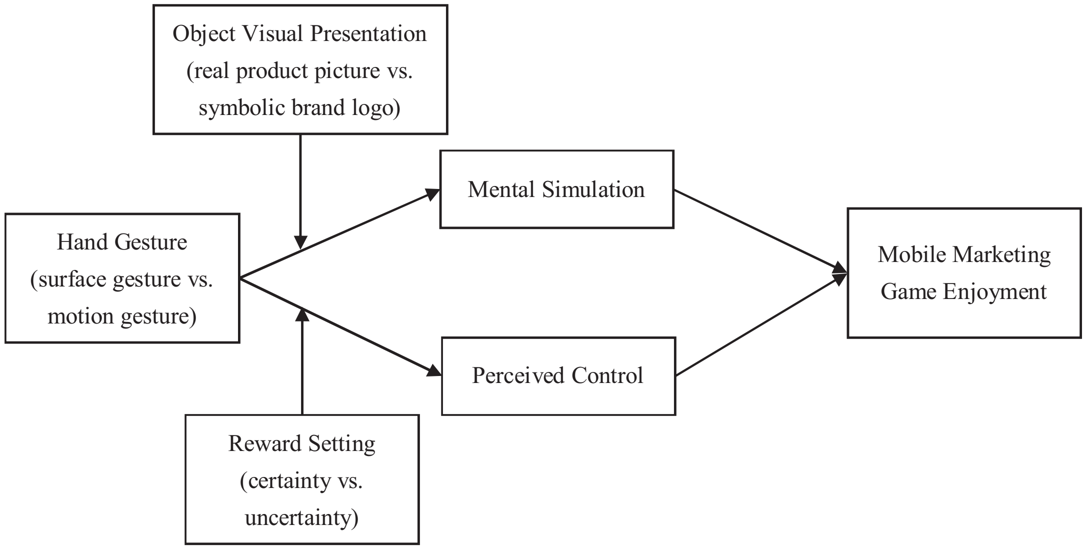

Fig. 1. Conceptual model.

which serves as an essential factor that determines game enjoyment, according to the flow theory (Csikszentmihalyi, 1990).

Hence, we hypothesize that

H1. The interaction between hand gesture and visual presentation influences the enjoyment of mobile marketing games. Specifically, when the object is presented visually as a real product picture (vs. symbolic brand logo), greater enjoyment will be induced by using a surface gesture (vs. motion gesture).

H2. The interaction effect between hand gesture and visual presentation on mobile marketing game enjoyment is mediated by mental simulation.

2.2.2. Interaction effect between motion gesture and reward setting

Abstract concept—Action coordination. As discussed earlier, the motor system not only influences the perception of concrete concepts but is also fundamental to the perception of abstract concepts (Pecher et al., 2011). For example, the approach/avoidance effect occurs for concrete objects that people try to physically avoid (e.g. a dangerous animal) and abstract entities, such as a verbal description (e.g. the word 'hostility') (Pecher et al., 2009). Lakoff and Johnson (1980) posit that abstract concepts may be grounded in sensory motor processing through conceptual metaphor, meaning that people understand abstract concepts via analogy to representations of concrete and embodied experiences. For example, people understand life by analogizing it with a journal (Lakoff, 1987). Conceptual metaphors are present in many linguistic expressions, and people use concrete metaphors when talking ubiquitously about abstract concepts. For example, people express the positive affective experience 'happy' by using 'up' and the negative affective experience 'sad' by using 'down' and understand a problem-solving process as a 'path' with a 'starting point' and a 'destination' (Lakoff and Johnson, 1980).

Other research finds that the manipulation of an individual's body movement or body states will influence the judgement of abstract concepts. Jostmann et al. (2009) have demonstrated that people tend to overestimate the importance of an event while holding a relatively heavier tablet, suggesting that physical weight impacts the perception of the abstract concept of value, as weight is a metaphor for importance in many languages. Some evidence also suggests that irrelevant information can sometimes affect responses in situations with high uncertainty. For instance, in one study conducted by Giessner and Schubert (2007), participants were asked to select the most powerful leader based on a chart. When participants were uncertain on the actual situation, the position of names in the chart influenced their choices, as they tend to believe metaphorically that the embodied experience of 'top' means 'more powerful'.

Reward setting (certainty vs. uncertainty) and perceived control. In many marketing promotion games, the target product or service is set as a final reward to attract consumers. As part of the basic game design, reward setting plays a vital role in influencing consumer's motivation and valuation of the marketing games (Kalra and Shi, 2010; Richter et al., 2015; Skinner, 1996). One typical manipulation is to set the reward as certain or uncertain before consumers start the game. For example, 'complete the task and you will win X' or 'complete the task and you will win one of the gifts' (e.g. Ailawadi et al., 2014; Alavi et al., 2015; Goldsmith and Amir, 2010; Shen et al., 2015; Yoo et al., 2010). Different from visual presentation, which is concrete and sensory to the player, reward setting needs to be understood through abstract concepts (Hamari, 2011; Robson et al., 2015).

According to Shen et al. (2015), reward certainty denotes rewards with a fixed and known magnitude, (e.g. a 100% chance of getting X), whereas reward uncertainty includes situations in which at least two potential reward magnitudes are available regardless if the winning probability is known (i.e. a 50% chance of getting X and a 50% chance of getting Y, X and Y are positive gains). Similarly, Lee and Qiu (2009) have differentiated two reward settings based on whether the game participants have been notified clearly of the prizes. In the certain reward setting, only one certain reward is present, whereas the uncertain reward setting provides several potential rewards and participants are unclear about what they are going to acquire. In this study, reward certainty is defined as 100% chance of getting one certain reward after finishing the task, and reward uncertainty is defined as situations in which more than one potential reward is available regardless of the probability of winning the reward is known or not; game participants are uncertain about which reward they would acquire before they finish the task.

Earlier research suggests that when facing uncertainty, people tend to feel deprived of personal control (Bandura, 1977; Dweck and Reppucci, 1973; Glass et al., 1969). More recent work has pointed out that people have a natural tendency to restore perceived control (Cutright and Samper, 2014; Fiske et al., 1996), that is, feelings of control deprivation will lead people to strive for control restoration. The desire to regain control is analogous to motivation, which is to reduce the discrepancy between the current and expected state when one feels a lack of control in the process of goal pursuit (Carver and

Scheier, 2001). Similar work on the relationship between uncertainty and motivation also suggests that when people pursue a reward with uncertain magnitude, an increase in motivation will result in illusions of control, leading to a belief that good results are for hardworking people (Langer, 1975; Skinner, 1996).

One way to solve the discrepancy and to restore feelings of control is to exert effort (Cutright and Samper, 2014). The effort is regarded as the primary means to obtain a sense of control. Prior research has shown that the more effort people devote, the more they suggestively believe they can control the outcomes with the help of the effort, and the greater sense of efficacy people experience (Carver and Scheier, 2001; Higgins, 2012; Lee and Qiu, 2009; Scheible et al., 2008; Schunk, 1983). In marketing literature, evidence has indicated that when people feel low in personal control, they tend to prefer high-effort products to gain self-empowerment and re-establish their senses of control (Cutright and Samper, 2014).

To sum up, acquiring a sense of control when facing the uncertain reward setting is a psychological need, and exerting more effort is one way to satisfy such need. Is there a way that consumers can gain a sense of control by exerting effort on hand gestures under the uncertain game context?

Congruency between reward uncertainty and motion gestures. According to the conceptual metaphor view of embodied cognition, the word 'hold' is a metaphor for control in the English and Chinese language. For instance, when faced with complex and uncertain problems, people may try to 'keep a hold on' the situation. Having an object held in one's hand creates similar feelings of possession and the capability of obtaining desired outcomes when one is uncertain. Therefore, a link between hand gestures and perceived control might exist not only on a linguistic level but also on a conceptual level, and the conceptualization of perceived control is grounded in bodily experiences of 'handholding'. Another metaphor that involves the body is used to describe one's effort level. In English and Chinese, people say 'with body and soul' or 'throw whole oneself' to demonstrate how much effort one devotes when pursuing a goal. Prior research has examined ways of effort that may influence perceived control, such as devoting time, money or other resources during goal pursuit (Reczek et al., 2014). However, limited studies have explored bodily state as a way of effort. In the present study, we propose that motion gestures, with the characteristics of higher physical involvement (e.g. elicited movement of hand, wrist and arm) as compared to surface gestures, will exert greater influence on the perceived control when the reward setting is uncertain.

Substantial work in the gaming literature concerns the players' sense of control, which is one of the key factors that influence gaming experience (Komulainen et al., 2008; Korhonen et al., 2009; Sánchez et al., 2012). One widely recognized model of flow proposes that perceived control will influence enjoyment, especially in the context of games, in which player control originates from the game interface and input devices (Sweetser and Wyeth, 2005). The ability to exercise a certain sense of control over actions during the game will further induce feelings of enjoyment.

One might argue that the sense of control during games should be related meaningfully to the outcome feedback (Csikszentmihalyi, 1990). However, we contend that this argument only concerns games that involve outcomes obtained through practice and personal skills but not games whose outcomes are determined randomly and are out of personal control. In the latter case, no causal relationship exists between control and personal behaviour. Nevertheless, an individual's involvement in such uncertain situations may still induce a sense of control, particularly an illusory sense of control (Ladouceur and Mayrand, 1984; Langer, 1975). For example, gamblers who roll the dice themselves often make a larger bet than those who have an agent to roll the dice, even though the effort of rolling has nothing to do with the outcome (Darke and Freedman, 1997; Langer, 1975). Similarly, consumers who have invested more effort in previous purchases are more likely to believe they will have a greater likelihood of winning a reward in the lucky loyalty game, even though the outcome is random and unrelated to the previous effort (Reczek et al., 2014). Therefore, we believe that even though hand gestures do not affect the outcome in games with uncertain rewards, people may still form an illusory sense of control via different hand gestures.

Hence, the high bodily involved nature of motion gestures renders congruency between reward uncertainty and motion gesture. We hypothesize the following:

H3. The interaction between hand gestures and reward uncertainty influences the enjoyment of mobile marketing game. Specifically, using motion gestures like shaking (vs. surface gestures) will increase game enjoyment when the reward is set as uncertain (vs. certain).

H4. The interaction effect between hand gesture and reward setting on the enjoyment of mobile marketing games is mediated by perceived personal control.

3. Overview of experiments

We conducted three experiments to investigate how hand gestures, together with object presentation and reward setting, influences consumer enjoyment. All the games used in our experiments were developed based on HTML5 technology. Ten participants were recruited from a university in China for the pre-test of the games. Participants for the formal studies were recruited online and they completed the studies on their personal mobile phones. In Experiments 1a and 1b, we designed a simple mobile marketing promotion game (Kalra and Shi, 2010), where reward presentation was manipulated by using product pictures or brand logos. In Experiment 2, a simplified lucky wheel game was used to examine the relationship between hand gestures and reward uncertainty, as well as their interactive effect on consumer enjoyment. Participants in all three experiments were smart phone users with online shopping experiences for more than two years.

3.1. Experiment 1a

Experiment 1a was designed to test the interactive effect of hand gestures and visual presentation on the enjoyment of the mobile marketing game (H_1) as well as the mediating role of mental simulation in shaping the relationship (H_2).

3.1.1. Method

One hundred twenty-eight students located in a Chinese university were recruited online. All participants were told that the goal of this study was to understand mobile marketing promotions. The experiment used a two (object visual presentation: real product vs. brand logo) × two (hand gesture: surface vs. motion) between-subjects design. Participants were assigned randomly to one of the four conditions. Upon getting into the game, participants were told they might have a chance to win a free Sprite. As a manipulation of object presentation, half of the participants were presented with a picture of a can of Sprite, while the other half were presented with the brand logo of Sprite (see Fig. 2). Subsequently, the participants were asked to touch the virtual object or shake the phone to win a free Sprite as a promotion gift, which served as the hand gesture manipulation. A screenshot of the game interfaces is shown in Fig. 3 with the product presentation. Unbeknownst to the participants, everyone won the reward. Finally, participants answered a set of questions to measure mental simulation and game enjoyment. Specifically, to measure mental simulation, participants indicated the extent to which they agreed or disagreed with the two statements ("I imagined that I am holding this can of Sprite in my hand" and "I enjoyed imagining holding the can of Sprite") on a nine-point scale (1 = totally disagree, 9 = totally agree; $\alpha = 0.64$) (Shen & Sengupta, 2012; Shen et al., 2016). For the enjoyment of the mobile marketing game, we asked participants to rate the level of pleasure,

Fig. 2. Visual presentation manipulation in Experiment 1a.

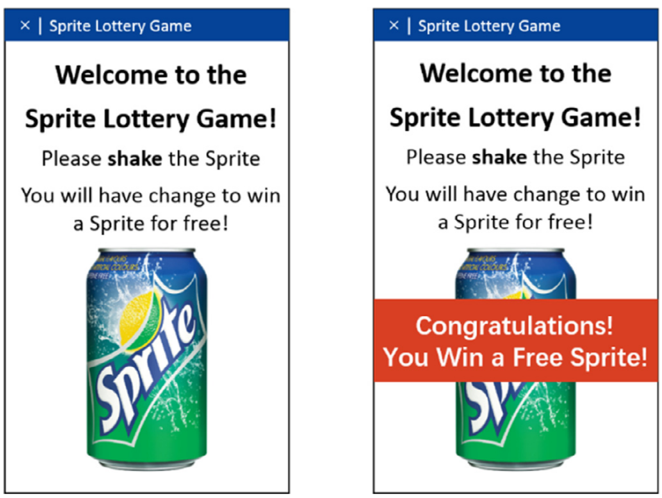

Fig. 3. Screenshot of game interface in Experiment 1a. *Note: The original game introduction was in Chinese.*

excitement, and playfulness they experienced while playing the marketing game on a nine-point scale (1 = very unpleasant/very unexciting/very boring, 9 = very pleasant/very exciting/very enjoyable; $\alpha = 0.82$) (Kim, Chen, & Zhang, 2016; Wu and Liu, 2007).

3.1.2. Results

Enjoyment. A two × two between-subjects ANOVA on the enjoyment of the mobile marketing game revealed a non-significant main effect of hand gesture ($F(1,124) = 1.24$, $p = 0.27$) and a marginally significant main effect of visual presentation ($F(1,124) = 2.96$, $p = 0.09$). More importantly, as predicted, the interaction between visual presentation and hand gesture was significant, $F(1,124) = 5.65$, $p = 0.02$, partial $\eta^2 = 0.04$. Specifically, when participants touched the screen to get the reward, mobile marketing game enjoyment was significantly more positive compared to when the real product picture was presented than when the symbolic brand logo was presented ($M_{picture} = 6.63$, $SD = 0.35$ vs. $M_{logo} = 5.13$, $SD = 0.38$; $F(1,124) = 6.28$, $p = 0.004$, partial $\eta^2 = -0.06$). By contrast, when the shaking gesture was used to get the reward, no significant differences were observed between the two visual presentation formats ($M_{picture} = 5.35$, $SD = 0.37$ vs. $M_{logo} = 5.59$, $SD = 0.36$; $F < 1$). These results provide support for H_1.

Mental simulation. Another two × two between-subjects ANOVA was performed on mental simulation. The main effect of gesture was significant, $F(1,124) = 5.01$, $p = 0.03$, partial $\eta^2 = 0.04$. Participants reported greater mental simulation when using surface gesture ($M_{surface} = 6.48$, $SD = 2.17$) than motion gesture ($M_{motion} = 5.52$, $SD = 2.47$). More importantly, the interaction between hand gesture and reward presentation on mental simulation reached significance level, $F(1,124) = 5.98$, $p = 0.02$. Simple effect analyses revealed participants who touched the real object picture generated greater mental simulation ($M_{picture} = 7.17$, $SD = 0.38$), but the level of mental simulation was lower when touching the symbolic brand logo ($M_{logo} = 5.67$, $SD = 0.41$; $F(1,124) = 7.11$, $p = 0.01$, partial $\eta^2 = 0.05$). However, motion gesture did not lead to reliable differences in mental simulation between the two visual presentation conditions ($M_{picture} = 5.29$, $SD = 0.41$, $M_{logo} = 5.75$, $SD = 0.40$; $F < 1$).

Moderated mediation analysis. We further tested H_2, the proposed mechanism regarding mental simulation as a mediator in the relationship among hand gesture, visual presentation and enjoyment, by examining the moderated mediation effect. We followed the procedure proposed by Preacher et al. (2007). In addition to the interactive effect of visual representation and gestures on the enjoyment of the mobile marketing game, mental simulation has a significant effect on perceived enjoyment ($\beta = 0.25$, $t = 3.15$, $p = 0.002$). Next, we conducted a 95% bias-corrected bootstrap with 5000 samples. The indirect effect of interaction between gestures and reward presentation on mobile marketing game enjoyment through mental simulation was significant, 95% CI = [0.09, 1.19]. Such indirect effect is conditional, which is significant only when product picture was presented (95% CI = [−0.85, −0.10]) rather than brand logo (95% CI = [−0.16, 0.53]). Moreover, the direct effect of gestures on mobile marketing game enjoyment was not reliable in the two presentation conditions. This result suggested that mental simulation fully mediates the interaction between hand gesture and presentation format. Thus, H_2 is supported.

3.1.3. Discussion

Study 1a provides initial support for our prediction that when a product picture is presented, greater enjoyment of the mobile marketing game will be derived from using direct-touch rather than shaking gesture. Enhanced mental simulation induced by the congruency between visual presentation and hand gesture also mediates the proposed effect. However, Shen et al. (2016) demonstrate that hedonic products, such as Sprite, are often affect-laden, which lead people to more likely act on the simulation physically, such as grabbing the product. Therefore, the observed effect that touching is a better match with a can of Sprite might have resulted from the natural tendency to manipulate directly the hedonic product. To rule out this alternative account, we conducted Experiment 1b, where a less hedonic product, mineral water, was used as the target product.

3.2. Experiment 1b

3.2.1. Method

One hundred four students from the same population of Experiment 1a were recruited online. Identical to Experiment 1a, Experiment 1b involved a two (reward presentation: real product vs. brand logo) × two (hand gesture: surface vs. motion) between-subjects design. The same procedure was followed as well as the measurements of mental simulation ($\alpha = 0.70$) and mobile marketing game enjoyment ($\alpha = 0.88$), with one exception that the target product was mineral water (see Fig. 4 for details).

3.2.2. Results

Enjoyment. A two × two between-subjects ANOVA revealed a non-significant main effect of hand gesture ($F < 1$) and a marginally significant main effect of visual presentation ($F(1,00) = 3.61$, $p = 0.06$). More importantly, the interaction effect of gesture and presentation format on the enjoyment of the mobile marketing game was significant, $F(1,100) = 4.04$, $p = 0.05$, partial $\eta^2 = 0.04$. Similar to the results of Experiment 1a, touching a real product picture on the screen led to greater mobile marketing game enjoyment than touching the brand logo ($M_{picture} = 5.58$, $SD = 1.98$, $M_{logo} = 3.84$, $SD = 2.15$; $F(1,104) = 7.50$, $p = 0.01$, partial $\eta^2 = 0.07$). However, when motion gesture was used, no significant difference was observed between the two presentation formats ($M_{picture} = 4.69$, $SD = 2.24$ vs. $M_{logo} = 4.74$, $SD = 2.61$; $F < 1$). Similar to the result of Experiment 1a, H_1 is partly supported.

Fig. 4. Visual presentation manipulation in Experiment 1b.

Mental simulation. Another 2 × 2 between-subjects ANOVA on mental simulation showed a significant interaction between hand gesture and visual presentation, $F(1,100) = 4.85$, $p = 0.03$, partial $\eta^2 = 0.05$. Specifically, touching facilitated greater mental simulation in the viewing of a real object picture rather than symbolic brand logo ($M_{picture} = 4.35$, $SD = 2.40$ vs. $M_{logo} = 2.88$, $SD = 1.83$; $F(1,104) = 5.67$, $p = 0.02$, partial $\eta^2 = 0.05$). No reliable difference between two visual presentations was also observed when shaking gesture was used ($M_{picture} = 3.30$, $SD = 2.26$ vs. $M_{logo} = 3.74$, $SD = 2.25$; $F < 1$). Neither the main effect of hand gesture nor the main effect of reward presentation reached significance level ($p > 0.2$).

Moderated Mediation Effect. Hand gesture and visual presentation had significant interaction with mental simulation ($\beta = 1.90$, $t = 2.2$, $p = 0.03$), suggesting that visual presentation moderated the first stage of the mediation model. When the interaction between gesture and visual presentation was controlled, mental simulation had a significant effect on the enjoyment of the mobile marketing game ($\beta = 0.64$, $t = 7.88$, $p < 0.001$). Lastly, when controlling for mental simulation, the direct effect of the interaction was no longer significant for both gesture conditions. The 95% bias-corrected bootstrapping analyses with 5000 samples revealed the conditional indirect effect of visual presentation on mobile marketing game enjoyment through mental simulation was significant in surface gesture condition (95% CI = [−1.79, −0.19]), but not in motion gesture condition (95% CI = [−0.52, 1.05]). H_2 is supported by the results of Experiment 1b.

3.2.3. Discussion

The results of Experiment 1b supported our proposed model, such that when the object is presented as a real product picture, surface gesture (vs. motion gesture) tended to facilitate mental simulation, further leading to greater enjoyment of the mobile marketing game. By using mineral water as the focal product, we managed to rule out the alternative account of the product type. Our findings of Experiment 1b generalized the observed interactive effect of hand gesture and visual presentation from hedonic products to utilitarian products.

3.3. Experiment 2

The purpose of Experiment 2 was to examine how hand gestures interacted with reward uncertainty to influence jointly the enjoyment of mobile marketing games (H_3). We also tested the mediating role of perceived control in shaping the proposed relationship (H_4). We designed a lucky wheel game, in which participants were instructed to click a button on the wheel or shake the smart phone to reveal the final reward. We manipulated the reward setting of uncertainty by varying the number of potential rewards. Specifically, one fixed reward was offered in the reward certainty condition and the reward uncertainty condition involved two potential rewards. In this experiment, we recorded the duration of gesture interaction as an index of effort to provide more direct evidence for the proposed mechanism regarding perceived control.

Fig. 5. Game interface screenshot of reward certainty condition in Experiment 2.

3.3.1. Method

One hundred thirteen participants from the same population as the previous experiments were recruited online. They completed the experiment on their personal mobile phones. We used a two (reward setting: certain vs. uncertain) × two (hand gesture: surface vs. motion) between-subjects design. Participants were told they were going to play a lucky wheel game to win a reward, which was revealed only after they finish the game. Depending on gesture condition, participants were instructed to click a button on the screen or shake the smart phone to activate the arrow on the wheel. Participants could keep clicking the button or shaking the phone for as much time as they want. We recorded the total time they spent interacting with the game as a behavioural measure of effort. The interaction time was measured from the start of the first gesture input to the last gesture (i.e., when no more input was recorded within 3s). Half of the participants were assigned to the certain reward condition, where they were told they would have a 100% chance of receiving a reward (Fig. 5). The remaining half of participants was assigned to the uncertain reward condition, where they were told they would have a 100% chance of obtaining a reward from a set of two potential rewards (Fig. 6). The two rewards are of equal value. In the two conditions, participants could click-touch or shake for as much time as they wanted, and the final reward would pop out on the wheel panel once the gesture stopped. To control for pre-existing preference for Sprite or Coke, we had all participants win the Coke. Finally, participants filled a questionnaire assessing perceived control and mobile marketing game enjoyment. As a measure of

Fig. 6. Game interface screenshot of reward uncertainty condition in Experiment 2. *Note: The original game introduction in Figs.5 and 6 was in Chinese.*

perceived personal control, we asked the participants to indicate the extent to which they agreed or disagreed with the statements, (1) “I feel I am in full control during the game,” (2) “I feel I can control the result of the game,” and (3) “I feel the more I click touch / shake the more likely I will get better results ” on nine-point scale (1 = totally disagree, 9 = totally agree; $\alpha = 0.90$) (Ejova et al., 2010; King et al., 2012). As for the enjoyment of mobile marketing game, identical to previous experiments, we asked participants to evaluate pleasure, excitement and playfulness of the game on nine-point scale ($\alpha = 0.84$) (Davis et al., 1992; Yi and Hwang, 2003).

3.3.2. Results

Enjoyment. A two × two between-subjects ANOVA on the enjoyment of the mobile marketing game. No significant main effects of either hand gesture or reward setting ($Fs < 1$) were observed. However, as predicted, the interaction between gesture and reward setting was significant ($F(1,109) = 5.35$, $p = 0.02$, partial $\eta^2 = 0.05$). Specifically, when the final reward was uncertain, participants who used motion gesture evaluated the mobile marketing game as more enjoyable than those who used surface gesture ($M_{motion} = 4.33$, $M_{surface} = 3.01$; $F(1, 113) = 5.22$, $p = 0.02$, partial $\eta^2 = 0.05$). However, no significant difference was observed between the two gestures when the reward was certain ($F(1,113) = 1.00$, $p = 0.32$).

Perceived control. Another two × two between-subjects ANOVA was conducted on perceived control. Neither the main effect of reward setting ($F < 1$) nor the main effect of gesture was significant ($F(1,109) = 2.65$, $p = 0.11$). However, consistent with our prediction, a significant interaction was observed between the two variables on perceived personal control ($F(1,109) = 7.11$, $p = 0.01$, partial $\eta^2 = 0.06$). Specifically, when the reward was uncertain, motion gesture led to higher levels of perceived control as compared with surface gesture ($M_{motion} = 5.03$, $M_{surface} = 3.23$; $F(1,109) = 9.46$, $p = 0.003$, partial $\eta^2 = 0.08$). Such difference between two gestures was attenuated when the reward was certain ($F < 1$).

Effort investment. We recorded interaction time as an indicator of the participants’ effort investment in the mobile marketing game. A two × two between-subjects ANOVA on interaction time showed a significant interaction between hand gesture and reward setting, $F(1,109) = 4.93$, $p = 0.03$. Specifically, in the uncertain reward condition, participants invested more effort on the motion gesture than surface gesture ($M_{motion} = 1384$ ms, $M_{surface} = 413$ ms; $F(1,113) = 5.65$, $p = 0.02$, partial $\eta^2 = 0.05$). However, no difference was observed between two gestures in the certain reward condition. These results resonated with the perceived control measures.

Moderated mediation analysis. Based on the above results, we further conducted a moderated mediation analysis through bootstrapping with 5000 samples. A significant indirect effect of the interaction was observed between gesture and on mobile marketing game enjoyment (95% CI = [0.52, 3.38]). In addition, the mediating effect of perceived control was reliable only when the final reward was uncertain (95% CI = [0.54, 2.61]). In summary, H_4 was supported.

3.3.3. Discussion

Experiment 2 provided further evidence to bolster the interactive effect between hand gestures and reward setting on the enjoyment of the mobile marketing game. Perceived personal control was shown to mediate the proposed relationship. As a behavioural measure, interaction time demonstrated more directly the influence of gesture and reward setting on effort investment, which serves as an effective way to retain personal control. Consistent with prior work, the more effort participants spent, the more control they seem to have. Moreover, the current study extended existing literature to the mobile game context and offered an initial explanation for the relationship between reward setting and perceived personal control.

4. General discussion

As a relatively new technology, interactive gestures have become an indispensable element in gamified mobile marketing. In the current paper, we examine how mobile hand gestures interact with visual presentation and reward setting to enhance consumer enjoyment of mobile marketing games.

Two types of gestures are compared based on the different sensor technologies. Surface gestures, based on touching-sensor technology, are more direct and sensory-related (Karam and Schraefel, 2005; Shen et al., 2016), while motion gestures based on motion-sensor technology are more bodily involved (Rempel et al., 2014). With different characteristics, the influence of two gestures on mobile marketing game enjoyment is contingent on visual presentation and reward setting through distinct psychological mechanisms. Using two HTML5-based mobile marketing games, we conducted three experiments to provide evidence for our proposed model. The first two experiments show that when a real product picture (vs. symbolic brand logo) is presented, surface gestures (vs. motion gestures) facilitate the formation of mental simulation. Thus, the participants have greater enjoyment of mobile marketing games. In Experiment 2, we used the lucky wheel game to demonstrate that motion gestures (vs. surface gestures) enhance perception of personal control when the reward is uncertain (vs. certain), which in turn resulted in better evaluations of mobile marketing game enjoyment. Moreover, the interactive effect between visual presentation and hand gesture could be extended from hedonic to utilitarian products. Table 2 summarizes the findings of the experiments.

One major counter-argument of this research is that instead of the congruency effect between surface gesture and visual presentation of product picture on mental simulation, people might consider it more natural shake a real product presented on screen because people might be map-holding the physical phone to grasp the object in reality. One can view the gesture in a metaphoric or in a direct way in which the gesture is simply a manipulation of the phone or the virtual content itself, according to Ruiz et al. (2011). However, our results show that motion gestures fail to induce greater mental simulation when facing real product presentation as compared to surface gestures. To examine further the potential alternative, we conducted a posttest. We randomly assigned participants ($N = 40$) to one of the two gesture conditions and showed them the two game interfaces of Experiments 1a and 1b. Then, we asked whether they view the phone as a soda can or a mineral water while they were shaking or touching the phone, depending on the condition. For soda and mineral water, no reliable evidence was found that people would be more likely to view the phone in a metaphorical way when shaking (15%) versus touching (10%, $\chi^2 < 1$).

Indeed, how gestures are mapped metaphorically relies on many factors (Ruiz et al., 2011). For instance, the iBeer application vividly presents virtual beer as occupying the screen, which may lead consumers to view their phone as a container to hold the beer. However, the object presentation used in our experiment only takes up very limited space on the screen, making imagining the phone as a soda can or a bottle for mineral water difficult.

4.1. Contributions and implications

First, our results extend the research stream of gamification by exploring the role of mobile gesture technology and illustrating how the mobile hand gestures influence enjoyment in gamified mobile marketing together with two other game design elements, namely, visual presentation and reward setting. Current gamification research focuses limited attention to technology elements in gamification design, and explores gamification design elements in isolation (Hofacker et al., 2015). Our research explores mobile hand gestures as one technology element embedded in the gamification design, and also shows that hand gestures do not influence consumer enjoyment alone in the gamified mobile marketing but are aligned with other game design elements.

Table 2
Summary of Experiments.

	Experiment 1a	Experiment 1b	Experiment 2
Objective	Testing H1 and H2	- Testing H1 and H2 with different product types to rule out the alternative account of product type - Generalizing the findings	Testing H3 and H4
Experimental Design Manipulation	Coupon lottery game of Sprite soda - Visual presentation of Sprite soda: Real picture vs. Sprite logo - Interaction gesture: Touch the virtual object vs. shake the mobile	Coupon lottery game of mineral water - Visual presentation of mineral water: Real picture vs. Nestle logo - Interaction gesture: Touch the virtual object vs. shake the mobile	Lucky wheel game - Reward setting: Win one certain reward vs. win one of two rewards - Interaction gesture: Touch the arrow vs. shake the mobile
Measurement	- Mobile marketing game enjoyment - Mental simulation	- Mobile marketing game enjoyment - Mental simulation	- Interaction time - Mobile marketing game enjoyment - Perceived control
Results	Support H1 and H2 - Interaction between surface gesture and real picture induces greater mobile marketing game enjoyment. - Such interaction effect is mediated by mental simulation.	Support H1 and H2. - Product type does not influence the interaction effect between hand gesture and reward presentation on mobile marketing game enjoyment.	Support H3 and H4. - Interaction between motion gesture and reward setting of uncertainty induces greater mobile marketing game enjoyment. - Such interaction effect is mediated by perceived control.

Judging whether one gesture is better or worse than the other is arbitrary. Rather, the functionality of hand gestures should be evaluated under specific game scenarios. Second, the present work contributes to the literature on human-computer interaction as well as deepens understanding of the nature of surface and motion gestures in mobile marketing games. By exploring the psychological mechanisms of mental simulation and perceived control, we acquire more knowledge on the nature of hand gestures in the game context. Further, by exploring the two psychological mechanisms, our research adds a small part to the literature of embodied cognition.

The findings of this research provide implications for marketing practitioners and mobile game designers. The results highlight that to enhance the enjoyment in gamified mobile marketing, hand gestures should be aligned with visual presentation and reward setting. The psychological nature that each gesture possesses should be considered. Moreover, prior research indicates that gamified information presentation of new products is more vivid given that consumers can interact with the presentation (Müller-Stewens et al., 2017). Our research provides firms and game designers with more detailed design guidance. Specifically, when firms place a real picture of their products in the game, surface gestures may work better because the greater mental simulation is induced by touching the new product. However, when brand logos are involved in games, no preference is indicated for which kind of gesture should be used. In another case, if firms plan to launch promotions, the combination of uncertain reward setting and motion gestures will enhance consumers' perceived control. Thus, they will have an enjoyable experience. Put differently, firms and designers may follow the psychological nature of gestures. Gestures designed to be more involved bodily may increase perceived control when consumers are presented with uncertainty.

4.2. Limitation and future research

Our research has several limitations. First, our mobile marketing game was designed in a very simple form. We designed the games in a simplified manner with only a limited number of elements to reduce the potential interferences introduced by other irrelevant game elements. For example, in the first two games of Sprite and mineral water, the only colourful image presented on the screen was the focal object. This design may have reduced the overall aesthetics level and somewhat influenced the enjoyment of the mobile marketing games. However, except for lacking a colourful design, our game design contained basic game elements and was adapted from real online shopping applications. We agree that gamification may not be a full-fledged game, given that the design was embedded with a few game elements. More importantly, gamification should be understood more broadly from the perspective of consumer experiential value, but not limited to the question on game elements per se (Deterding et al., 2011; Huotari and Hamari, 2012). Therefore, we believe our games, though simple, are good examples of gamification in mobile marketing contexts. Second, we conducted our experiment in a less controlled environment. Participants received our experimental games via a URL and completed the experiment on their devices. Thus, each participant might be in very different environments. Mobile usage behaviour can be influenced by social surroundings (Williamson et al., 2013). For example, people might avoid engaging in unusual gestures in public. An individual's cultural background and previous user experience may also influence their perceptions of different gestures (Skalski et al., 2011).

The hand gesture is not a new topic in Psychology or in human-computer interaction (HCI). However, a limited number of psychological studies of hand gesture can be found in HCI context. First, our present research focuses on the positive aspect of integrating hand gestures in mobile marketing games. Others may argue that hand gestures may lead to perceptions of effort, which may negatively affect enjoyment. We believe future research could investigate if hand gestures could exert negative influences in gamification, which will allow a more comprehensive understanding of hand gestures. Additionally, more gestures need to be explored. Theories of embodied cognition provide a basic assumption that different gestures with different characteristics may elicit varied psychological processes. For example, arm extension and flexion influence the judgement of unfamiliar objects (Cacioppo et al., 1993; Centerbar and Clore, 2006). We may infer that different ways of shaking a mobile phone might induce different consumer perceptions. Moreover, with the fast development of VR technology, exploring whether and how these newly invented gestures will affect mobile marketing gamification effectiveness is worthwhile.

Third, as mentioned before, natural mapping, which denotes mapping gestures in a natural and predictable manner when interacting with a virtual environment (Skalski et al., 2011), is emphasized in the context of video games to provide players with more natural means of interaction through design game controllers (McGloin et al., 2011). Therefore, how to design the gesture to map a given task or certain usage scenario will benefit mobile marketing game designers and HCI developers in their creation of a better fit between gesture and task.

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References

Ailawadi, K.L., Gedenk, K., Langer, T., Ma, Y., Neslin, S.A., 2014. Consumer response to uncertain promotions: an empirical analysis of conditional rebates. Int. J. Res. Mark. 31, 94–106. https://doi.org/10.1016/j.ijresmar.2013.08.002.

Alavi, S., Bornemann, T., Wieseke, J., 2015. Gambled price discounts: a remedy to the negative side effects of regular price discounts. J. Mark. 79, 62–78. https://doi.org/10.1509/jm.12.0408.

Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. Psychol. Rev. 1, 139–161. https://doi.org/10.1037/0033-295x.84.2.191.

Barsalou, L.W., 2008. Grounded cognition. Annu. Rev. Psychol. 59, 617–645. https://doi.org/10.1146/annurev.psych.59.103006.093639.

Barsalou, L.W., 1999. Perceptions of perceptual symbols. Behav. Brain Sci. 22, 637–660. https://doi.org/10.1017/S0140525X99532147.

Berger, A., Schlager, T., Sprott, D.E., Herrmann, A., 2017. Gamified interactions: whether, when, and how games facilitate self–brand connections. J. Acad. Mark. Sci. 3, 1–22. https://doi.org/10.1007/s11747-017-0530-0.

Business Insider, 2013. Playing to win: mobile gamification done right. [WWW document]. URL. https://www.businessinsider.com/gamification-in-the-mobile-landscape-2013-7.

Cacioppo, J.T., Priester, J.R., Berntson, G.G., 1993. Rudimentary determinants of attitudes II: arm flexion and extension have differential effects on attitudes. J. Pers. Soc. Psychol. 65, 5–17. https://doi.org/10.1037/0022-3514.65.1.5.

Cañete, A.M.C., Hsu, M.C., Chen, C.P., 2014. Prominence of brand-related visual graphic contents in advergames. Int. J. Vis. Des. 7, 25–36. https://doi.org/10.18848/2325-1581/CGP/v07i02/38736.

Carver, C.S., Scheier, M.F., 2001. Optimism, pessimism, and self-regulation. Optimism & Pessimism: Implications for Theory, Research, and Practice. pp. 31–51. https://doi.org/10.1037/10385-002.

Centerbar, D.B., Clore, G.L., 2006. Do approach-avoidance actions create attitudes? Psychol. Sci. 17, 22–29. https://doi.org/10.1111/j.1467-9280.2005.01660.x.

Cockburn, A., Ahlström, D., Gutwin, C., 2012. Understanding performance in touch selections: tap, drag and radial pointing drag with finger, stylus and mouse. Int. J. Hum. Comput. Stud. 70, 218–233. https://doi.org/10.1016/j.ijhcs.2011.11.002.

Csikszentmihalyi, M., 1990. Flow: The Psychology of Optimal Experience. https://doi.org/10.5465/AMR.1991.4279513.

Cutright, K.M., Samper, A., 2014. Doing it the hard way: How low control drives preferences for high-Effort products and services. J. Consum. Res. 41, 730–745. https://doi.org/10.1086/677314.

Daiber, F., Li, L., Krüger, A., 2012. Designing gestures for mobile 3D gaming. In: Proceedings of the 11th International Conference on Mobile and Ubiquitous Multimedia - MUM '12, pp. 1. https://doi.org/10.1145/2406367.2406371.

Darke, P.R., Freedman, J.L., 1997. Lucky events and beliefs in luck: paradoxical effects on confidence and risk-taking. Personal. Soc. Psychol. Bull. 23, 378–388. https://doi.org/10.1177/0146167297234004.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1992. Extrinsic and intrinsic motivation to use computers in the workplace. J. Appl. Soc. Psychol. 22, 1111–1132. https://doi.org/10.1111/j.1559-1816.1992.tb00945.x.

Deterding, S., Dixon, D., Khaled, R., Nacke, L., 2011. From game design elements to gamefulness. In: Proceedings of the 15th International Academic MindTrek Conference on Envisioning Future Media Environments - MindTrek '11, pp. 9. https://doi.org/10.1145/2181037.2181040.

Dweck, C., Reppucci, N.D., 1973. Learned helplessness and reinforcement responsibility in children. J. Pers. Soc. Psychol. 25, 109–116. https://doi.org/10.1037/h0034248.

Ejova, A., Delfabbro, P., Navarro, D., 2010. The illusion of control: structure, measurement and dependence on reinforcement frequency in the context of a laboratory gambling task. In: Proceedings of the 9th Conference of the Australasian Society for Cognitive Science, https://doi.org/10.5096/ASCS200914.

Elder, R.S., Krishna, A., 2012. The "visual depiction effect" in advertising: facilitating embodied mental simulation through product orientation. J. Consum. Res. 38, 988–1003. https://doi.org/10.1086/661531.

Fiske, S.T., Morling, B., Stevens, L.E., 1996. Controlling self and others: a theory of anxiety, mental control, and social control. Personal. Soc. Psychol. Bull. 22, 115–123. https://doi.org/10.1177/0146167296222001.

Forbes, 2012. Getting apps right: how Domino's is beating the odds. [WWW Document]. URL. https://www.forbes.com/sites/scottdavis/2012/06/21/getting-apps-right-how-dominos-is-beating-the-odds/#7ea411dd78a5.

Gerlach, C., Law, I., Paulson, O.B., 2002. When action turns into words. Activation of motor-based knowledge during categorization of manipulable objects. J. Cogn. Neurosci 14, 1230–1239. https://doi.org/10.1162/089892902760807221.

Gibson, J.J.J., 1979. The Ecological Approach to Visual Perception. Houghton Mifflin, Boston.

Giessner, S.R., Schubert, T.W., 2007. High in the hierarchy: how vertical location and judgments of leaders' power are interrelated. Organ. Behav. Hum. Decis. Process. 104, 30–44. https://doi.org/10.1016/j.obhdp.2006.10.001.

Glass, D.C., Singer, J.E., Friedman, L.N., 1969. Psychic cost of adaptation to an environmental stressor. J. Pers. Soc. Psychol. 12, 200. https://doi.org/10.1037/h0027629.

Goldsmith, K., Amir, O., 2010. Can uncertainty improve promotions? J. Mark. Res. 47, 1070–1077. https://doi.org/10.1509/jmkr.47.6.1070.

Green, M.C., Brock, T.C., Kaufman, G.F., 2004. Understanding media enjoyment: the role of transportation into narrative worlds. Commun. Theory. https://doi.org/10.1111/j.1468-2885.2004.tb00317.x.

Gutwin, C., Penner, R., 2002. Improving interpretation of remote gestures with telepointer traces. In: Proceedings of the 2002 ACM Conference on Computer Supported Cooperative Work - CSCW '02, https://doi.org/10.1145/587078.587086.

Hamari, J., 2011. Perspectives from behavioral economics to analyzing game design patterns: loss aversion in social games. In: Proceedings of the CHI 2011 Social Games Workshop.

Hamari, J., Koivisto, J., Sarsa, H., 2014. Does gamification work? - A literature review of empirical studies on gamification. In: Proceedings of the Annual Hawaii International Conference on System Sciences, https://doi.org/10.1109/HICSS.2014.377.

Higgins, E.T., 2012. Beyond pleasure and pain: how motivation works. Beyond Pleasure and Pain: How Motivation Works. Oxford University Presshttps://doi.org/10.1093/acprof:oSo/9780199765829.001.0001.

Hinckley, K., Buxton, W., Heo, S., Pahud, M., Holz, C., Benko, H., Sellen, A., Banks, R., O'Hara, K., Smyth, G., 2016. Pre-touch sensing for mobile interaction. In: Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems - CHI '16, pp. 2869–2881. https://doi.org/10.1145/2858036.2858095.

Hofacker, C.F., De Ruyter, K., Lurie, N.H., Manchanda, P., Donaldson, J., 2015. Gamification and mobile marketing effectiveness. J. Interact. Mark. 34, 25–36. https://doi.org/10.1016/j.intmar.2016.03.001.

Hou, J., Nam, Y., Peng, W., Lee, K.M., 2012. Effects of screen size, viewing angle, and players' immersion tendencies on game experience. Comput. Human Behav. 28, 617–623. https://doi.org/10.1016/j.chb.2011.11.007.

Huotari, K., Hamari, J., 2017. A definition for gamification: anchoring gamification in the service marketing literature. Electron. Mark. 27, 21–31. https://doi.org/10.1145/2393132.2393137.

Huotari, K., Hamari, J., 2012. Defining gamification - a service marketing perspective. In: Proceeding of the 16th International Academic MindTrek Conference on - MindTrek '12, pp. 17. https://doi.org/10.1145/2393132.2393137.

Jeannerod, M., 2001. Neural simulation of action: a unifying mechanism for motor cognition. NeuroImage 14, S103–S109. https://doi.org/10.1006/nimg.2001.0832.

Jeong, E.J., Bohil, C.J., Biocca, F.a, 2011. Brand logo placement in violent games. Effects of violence cues on memory and attitude through arousal and presence. J. Advert 40, 59–72. https://doi.org/10.2753/JOA0091-3367400305.

Jiang, Y., Gorn, G.J., Galli, M., Chattopadhyay, A., 2016. Does your company have the right logo? How and why circular- and angular-logo shapes influence brand attribute judgments. J. Consum. Res. 42, 709–726. https://doi.org/10.1093/jcr/ucv049.

Jostmann, N.B., Lakens, D., Schubert, T.W., 2009. Weight as an embodiment of importance. Psychol. Sci. 20, 1169–1174. https://doi.org/10.1111/j.1467-9280.2009.02426.x.

Kalra, A., Shi, M., 2010. Consumer value-maximizing sweepstakes and contests. J. Mark. Res. 47, 287–300. https://doi.org/10.2139/ssrn.310895.

Karam, M., Schraefel, M.C., 2005. A Taxonomy of Gestures in Human Computer Interactions. Eletronics Comput. Sci., pp. 1–45. Tech. Report. https://doi.org/10.1.1.97.5474.

Kim, K., Ahn, S.J.(Grace), 2017. The role of gamification in enhancing intrinsic motivation to use a loyalty program. J. Interact. Mark. 40, 41–51. https://doi.org/10.1016/j.intmar.2017.07.001.

Kim, S., Chen, R.P., Zhang, K., 2016. Anthropomorphized helpers undermine autonomy and enjoyment in computer games. J. Consum. Res. https://doi.org/10.1093/jcr/ucw016.

King, D.L., Ejova, A., Delfabbro, P.H., 2012. Illusory control, gambling, and video gaming: an investigation of regular gamblers and video game players. J. Gambl. Stud. 28, 421–435. https://doi.org/10.1007/s10899-011-9271-z.

Komulainen, J., Tkatalo, J., Lehtonen, M., Nyman, G., 2008. Psychologically structured approach to user experience in games. In: Nordic Conference on Human-Computer Interaction 2008, pp. 487–490. https://doi.org/10.1145/1463160.1463226.

Korhonen, H., Montola, M., Arrasvuori, J., 2009. Understanding playful user experience through digital games. In: International Conference on Designing Pleasurable Products and Interfaces, pp. 274–285.

Kratz, S., Rohs, M., Wolf, K., Müller, J., Wilhelm, M., Johansson, C., Tholander, J., Laaksolahti, J., 2011. Body, movement, gesture & tactility in interaction with mobile devices. In: Proceedings of the 13th International Conference on Human Computer Interaction with Mobile Devices and Services - MobileHCI '11. Stockholm, Sweden. pp. 757–759. https://doi.org/10.1145/2037373.2037506.

Ladouceur, R., Mayrand, M., 1984. Evaluation of the illusion of control : type of feedback, outcome sequence, and number of trials among regular and occasional gamblers. J. Psychol. Interdiscip. Appl. 117, 37046. https://doi.org/10.1080/00223980.1984.9923656.

Lakoff, G., 1987. Women, Fire, and Dangerous Things: What Categories Reveal about the Mind. University of Chicago Press, Chicago. https://doi.org/10.2307/415440.
Lakoff, G., Johnson, M., 1980. Metaphors We Live by. University of Chicago Press, Chicago.
Langer, E.J., 1975. Illusion of control. J. Personal. Soc. Psychol. 32, 311–328. https://doi.org/10.1037/0022-3514.32.2.311.
Lee, S.C., Li, B., Starner, T., 2011. AirTouch: synchronizing in-air hand gesture and on-body tactile feedback to augment mobile gesture interaction. In: Proceedings - International Symposium on Wearable Computers, ISWC. IEEE, pp. 3–10. https://doi.org/10.1109/ISWC.2011.27.
Lee, Y.H., Qiu, C., 2009. When uncertainty brings pleasure: the role of prospect imageability and mental imagery. J. Consum. Res. 36, 624–633. https://doi.org/10.1086/599766.
Liu, D., Santhanam, R., Webster, J., 2017. Toward meaningful engagement: a framework for design and research of gamified information systems. MIS Q 41, 1011–1034. https://doi.org/10.25300/MISQ/2017/41.4.01.
Long, A.C., Landay, J.A., Rowe, L.A., 1999. Implications for a gesture design tool. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems the CHI Is the Limit - CHI '99, pp. 40–47. https://doi.org/10.1145/302979.302985.
MacInnis, D., Price, L., 1987. The role of imagery in information processing: review and extension. J. Consum. Res. 13, 473–491. https://doi.org/10.1086/209082.
McDonald China, 2016. McDonald China public page on Weibo. [WWW Document]. URL. https://weibo.com/mcdonaldsworlds.
McGloin, R., Farrar, K.M., Krcmar, M., 2011. The impact of controller naturalness on spatial presence, gamer enjoyment, and perceived realism in a tennis simulation video game. Presence Teleoperators Virtual Environ. 20, 309–324. https://doi.org/10.1162/PRES_a_00053.
Müller-Stewens, J., Schlager, T., Häubl, G., Herrmann, A., 2017. Gamified information presentation and consumer adoption of product innovations. J. Mark. 81, 8–24. https://doi.org/10.1509/jm.15.0396.
Nuijten, K.C.M., De Regt, A., Calvi, L., Peeters, A.L., 2013. Subliminal advertising in shooter games: recognition effects of textual and pictorial brand logos. Int. J. Arts Technol. 6, 5–21. https://doi.org/10.1504/IJART.2013.050686.
Pecher, D., Boot, I., Van Dantzig, S., 2011. Abstract concepts. Sensory-motor grounding, metaphors, and beyond. Psychol. Learn. Motiv. 54, 217–248. https://doi.org/10.1016/B978-0-12-385527-5.00007-3.
Pecher, D., Van Dantzig, S., Zwaan, R.A., Zeelenberg, R., 2009. Language comprehenders retain implied shape and orientation of objects. Q. J. Exp. Psychol. 62, 1108–1114. https://doi.org/10.1080/17470210802633255.
Ping, R.M., Dhillon, S., Beilock, S.L., 2009. Reach for what you like: the body's role in shaping preferences. Emot. Rev. 1, 140–150. https://doi.org/10.1177/1754073908100439.
Prinz, W., 2010. Perception and action planning. Eur. J. Cogn. Psychol. 9, 37–41.
Quek, F., McNeill, D., Bryll, R., Duncan, S., Ma, X.-F., Kirbas, C., McCullough, K.E., Ansari, R., 2002. Multimodal human discourse: gesture and speech. ACM Trans. Comput. Interact. 9, 171–193. https://doi.org/10.1145/568513.568514.
Reczek, R., Haws, K.L., Summers, C.A., 2014. Lucky loyalty: the effect of consumer effort on predictions of randomly determined marketing outcomes. J. Consum. Res. 41, 1065–1077. https://doi.org/10.1086/678052.
Rempel, D., Camilleri, M.J., Lee, D.L., 2014. The design of hand gestures for human-computer interaction: lessons from sign language interpreters. Int. J. Hum. Comput. Stud. 72, 728–735. https://doi.org/10.1016/j.ijhcs.2014.05.003.
Richter, G., Raban, D.R., Rafaeli, S., 2015. Studying gamification: the effect of rewards and incentives on motivation. Gamification in Education and Business. Springer International Publishing, pp. 21–46. https://doi.org/10.1007/978-3-319-10208-5_2.
Robson, K., Plangger, K., Kietzmann, J.H., McCarthy, I., Pitt, L., 2015. Is it all a game? Understanding the principles of gamification. Bus. Horiz. 58, 411–420. https://doi.org/10.1016/j.bushor.2015.03.006.
Ruiz, J., Li, Y., Lank, E., 2011. User-defined motion gestures for mobile interaction. In: Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems - CHI '11. ACM Press, pp. 197. https://doi.org/10.1145/1978942.1978971.
Sánchez, J.L.G., Vela, F.L.G., Simarro, F.M., Padilla-Zea, N., 2012. Playability: analysing user experience in video games. Behav. Inf. Technol. 31, 1033–1054. https://doi.org/10.1080/0144929X.2012.710648.
Scheible, J., Ojala, T., Coulton, P., 2008. MobiToss. In: Proceeding of the 16th ACM International Conference on Multimedia - MM '08. ACM Press, pp. 957. https://doi.org/10.1145/1459359.1459532.
Schell, J., 2015. The Art of Game Design: A Book of Lenses.
Schunk, D.H., 1983. Ability versus effort attributional feedback: differential effects on self-efficacy and achievement. J. Educ. Psychol. 75, 848–856. https://doi.org/10.1037/0022-0663.75.6.848.
Seaborn, K., Fels, D.I., 2015. Gamification in theory and action: a survey. Int. J. Hum.-Comput. Stud. 74, 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006.
Shen, H., Sengupta, J., 2012. If you can't grab it, it won't grab you: the effect of restricting the dominant hand on target evaluations. J. Exp. Soc. Psychol. 48, 525–529. https://doi.org/10.1016/j.jesp.2011.11.003.
Shen, H., Zhang, M., Krishna, A., 2016. Computer interfaces and the "direct-touch" effect: can iPads increase the choice of hedonic food. J. Mark. Res. 53, 745–758.
Shen, L., Fishbach, A., Hsee, C.K., 2015. The motivating-uncertainty effect: uncertainty increases resource investment in the process of reward pursuit. J. Consum. Res. 41, 1301–1315. https://doi.org/10.1086/679418.
Simmons, W.K., Martin, A., Barsalou, L.W., 2005. Pictures of appetizing foods activate gustatory cortices for taste and reward. Cereb. Cortex 15, 1602. https://doi.org/10.1093/cercor/bhi038.
Skalski, P., Tamborini, R., Shelton, A., Buncher, M., Lindmark, P., 2011. Mapping the road to fun: natural video game controllers, presence, and game enjoyment. New Media Soc. 13, 224–242. https://doi.org/10.1177/1461444810370949.
Skinner, E.A., 1996. A guide to constructs of control. J. Pers. Soc. Psychol. 71, 549–570. https://doi.org/10.1037/0022-3514.71.3.549.
Sweetser, P., Wyeth, P., 2005. GameFlow: a model for evaluating player enjoyment in games. Comput. Entertain. 3https://doi.org/10.1145/1077246.1077253. 3.
Tamborini, R., Bowman, N.D., 2010. Presence in video games. Immersed in Media Telepresence Theory, Measurement & Technology. pp. 87–109. https://doi.org/10.1007/978-3-319-10190-3.
Tamborini, R., Skalski, P., 2006. The role of presence in the experience of electronic games. *Playing Video Games: Motives,* Responses, and Consequences.
Thelen, E., Smith, L.B., 1995. A dynamic systems approach to the development of cognition and action. J. Cogn. Neurosci. 7, 512–514. https://doi.org/10.1162/jocn.1995.7.4.512.
Tucker, M., Ellis, R., 2001. The potentiation of grasp types during visual object categorization. Vis. Cogn. 8, 769–800. https://doi.org/10.1080/13506280042000144.
Tucker, M., Ellis, R., 1998. On the relations between seen objects and components of potential actions. J. Exp. Psychol. Hum. Percept. Perform. 24, 830–846. https://doi.org/10.1037/0096-1523.24.3.830.
van Gelder, T., Clark, A., 1998. Being there: Putting brain, body and world together again. Philos. Rev. 107, 647. https://doi.org/10.2307/2998391.
Vatavu, R.D., Zaiti, I.A., 2012. Automatic recognition of object size and shape via user-dependent measurements of the grasping hand. Int. J. Hum. Comput. Stud. 71, 590–607. https://doi.org/10.1016/j.ijhcs.2013.01.002.
Walsh, P., Zimmerman, M.H., Clavio, G., Williams, A.S., 2013. Comparing brand awareness levels of in-game advertising in sport video games featuring visual and verbal communication cues. Commun. Sport 2. https://doi.org/10.1177/2167479513489120.
Williamson, R.J., Brewster, S.A., Vennelakanti, R., 2013. Mo!Games: evaluating mobile gestures in the wild. In: Proceedings of the 15th ACM on International Conference on Multimodal Interaction - ICMI '13, pp. 173–180. https://doi.org/10.1145/2522848.2522874.
Wilson, M., 2002. Six views of embodied cognition. Cognition 9, 1–19. https://doi.org/10.3758/BF03196322.
Wobbrock, J.O., Morris, M.R., Wilson, A.D., 2009. User-defined gestures for surface computing. In: Proceedings of the 27th International Conference on Human Factors in Computing Systems - CHI 09. ACM Press, pp. 1083. https://doi.org/10.1145/1518701.1518866.
Wobbrock, J.O., Myers, B.A., Aung, H.H., 2008. The performance of hand postures in front- and back-of-device interaction for mobile computing. Int. J. Hum. Comput. Stud. 66, 857–875. https://doi.org/10.1016/j.ijhcs.2008.03.004.
Wu, J., Liu, D., 2007. The effects of trust and enjoyment on intention to play online games. J. Electron. Commer. Res. 8, 128–140.
Yi, M., Hwang, Y., 2003. Predicting the use of web-based information systems: self-efficacy, enjoyment, learning goal orientation, and the technology acceptance model. Int. J. Hum. Comput. Stud. 59, 431–449. https://doi.org/10.1016/S1071-5819(03)00114-9.
Yoo, J.-W., Hwang, W., Seok, H., Park, S., Kim, C., Choi, W., Park, K., 2010. Cocktail: exploiting bartenders' gestures for mobile interaction. Int. J. Mob. Hum. Comput. Interact. 2, 44–57. https://doi.org/10.4018/jmhci.2010070104.
Zatorre, R.J., Halpern, A.R., 2005. Mental concerts: musical imagery and auditory cortex. Neuron 47, 9–12. https://doi.org/10.1016/j.neuron.2005.06.013.
Zhao, X., Xie, H., Zou, X., 2012. Gaze-gesture interaction for mobile phones. In: Proceedings of the 2012 7th International Conference on Computing and Convergence Technology, pp. 1030–1033.
Zwaan, R.A., Taylor, L.J., 2006. Seeing, acting, understanding: motor resonance in language comprehension. J. Exp. Psychol. Gen. 135, 1–11. https://doi.org/10.1037/0096-3445.135.1.1.

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