Psychology
2013. Vol.4, No.8, 619-621
Published Online August 2013 in SciRes (http://www.scirp.org/journal/psych)
http://dx.doi.org/10.4236/psych.2013.48088

Social Inhibition of Vection*

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Received May 31st, 2013; revised June 29th, 2013; accepted July 15th, 2013

The purpose of this study was to examine whether the social interaction can affect vection strength. We compared the strength of self-motion perception (vection) with and without an audience (two people in addition to the participant) present during stimulus presentation. We presented the optical flow (dots' expansion) for 40 seconds and obtained vection duration and latency and we also obtained the subjective strength of vection via magnitude estimation. We found that vection was inhibited by the presence of an audience. We speculate that audience presence might distract the attention of participants from the vection, depriving them of the attentional resources inhibited vection.

Keywords: Vection; Social Inhibition; Audience

Introduction

Self-motion perception as determined solely by visual cues is called "vection" (e.g. Fischer & Kornmüller, 1930). Stimulus attributes for the effective induction of vection have been extensively studied (Seno et al., 2009). Relationships between vection and attention (Seno et al., 2011a), time perception (Seno et al., 20011b), memory (Seno et al., 2013), the effect of alcohol consumption (Seno & Nakamura, in press), cognitive bias (Palmisano & Chan, 2004) and quantity perception (Seno et al., 2011c) have also been reported, as well as relationships between vection and multiple modalities (e.g. Riecke et al., 2009), personality attributes of observers (Seno et al., 2011d), and aging and development (Haibach et al., 2009; Shirai et al, 2012). Furthermore vection enhanced a type of visual illusion (Fukuda & Seno, 2012) and the semantic meaning could affect vection strength (Seno & Fukuda, 2012). Multiple aspects of the human mind are involved in vection. One important issue that has not been addressed is the impact of social psychological factors on vection. We focused on social facilitation and inhibition of vection.

An "audience effect" has been established in the field of social psychology (Travis, 1925), in which the existence of an audience can facilitate or inhibit the performance of a participant. Even when the presence of an audience is not logically related to the execution of a task, audience presence can modulate the performance of a participant. In most cases, the dominant task outcome is facilitated by the presence of an audience, and the non-dominant task outcome is inhibited (review in Zajonc, 1965). It has been also reported that arousal levels are increased by audience presence (Mason & Brady, 1964). Considering previous studies, we predicted that vection could be modulated by audience presence. In our previous vection studies, vection was reported in 70% of all stimulus presentation period (Seno et al., 2011a, 2011b, 2011c, 2011d), and was thus the dominant task outcome. We predicted that perception of vection would be facilitated and that the duration of vection would be elongated by audience presence. In this case, our study would be the first to report that the perception of vection can be altered by social context.

*The author was supported by Funds for the Development of Human Resources in Science and Technology (Japan Science and Technology Agency) This work is supported by Program to Disseminate Tenure Tracking System, MEXT, Japan.

Method

Participants

Eleven adult volunteers participated in the experiment. The volunteers were either graduate or undergraduate students (7 females and 4 males; aged 20 to 25 years) with no reported visual or vestibular abnormalities. They previously attended some vection experiments. Thus the task of reporting vection was easy and accustomed task for them.

Apparatus

Stimuli were generated and controlled by a computer (MB543J/A, Apple) and presented on a plasma display (3D Viera, 50-inch, Panasonic, with 1024 × 768 pixel resolution at a 60 Hz refresh rate). The experiment was conducted in a dark chamber.

Stimuli

We used an expanding optical flow pattern, which was created by positioning 16,000 dots at random inside a simulated cube and moving the observer's viewpoint to simulate a forward self-motion of 16 m/s. The stimuli were identical to those used by Seno et al. (2010), and the duration of the stimulus was

fixed at 40 seconds. The stimuli were displayed on a 50-inch plasma display with a viewing distance of 57 cm.

Participants

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Audiences

Two adult male graduate students. They were 22 and 23 years old and did not know the purpose of this experiment. They kept watching the participant during the stimulus presentation. They stood on the right and left sides of the participants with 60 cm distances. They did not speak anything.

Procedure

The participants completed the task either alone or in the presence of an audience, which consisted of two third persons. The audience stood beside the observer and watched their performance throughout the experiment (**Figure 1**).

Eight trials were conducted for each condition, and participants were asked to press a button when they perceived self-motion. At the end of each trial, the participants were instructed to rate the subjective strength of vection using a scale from 0 (no vection) to 100 (very strong vection). The participants reported these values using a keyboard. The with- and without-audience conditions were counterbalanced over the eleven participants. The participants were given complete instructions before the experiment began.

Result

The results were shown in **Figure 2**. Substantial vection was reported in both the with- and without-audience conditions. Latency and duration of vection was shorter and longer, respectively, in the without-audience condition. The reported values were larger in the without-audience condition than in the with-audience condition. T-tests revealed significant differences between the with- and without-audiences conditions for all three measures (latency, $t(10) = 3.47$, $p < .01$; duration, $t(10) = 2.29$, $p < .05$; magnitude, $t(10) = 2.18$, $p = .05$).

Discussion

We concluded that the strength of vection was larger in the without-audience condition, and thus, contrary to our prediction, found evidence for the social inhibition of vection by an audience. Even though perception of vection was the dominant task outcome it was inhibited by audience presence. In subjective reports, some participants said that their attention had been distracted from the vection stimulus by the presence of an audience. Vection indication requires attentional resources (Seno et al., 2011a). Thus, the presence of an audience during the task may be distracting.

Additionally, we conducted an informal observation with three naïve participants in which we placed two cardboard boxes instead of audiences beside the participants. Then vection

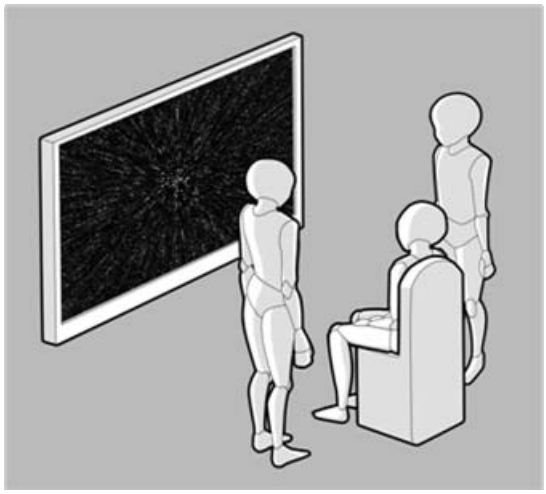

Figure 1.
A schematic illustration of the environment of experiment (with-audience condition).

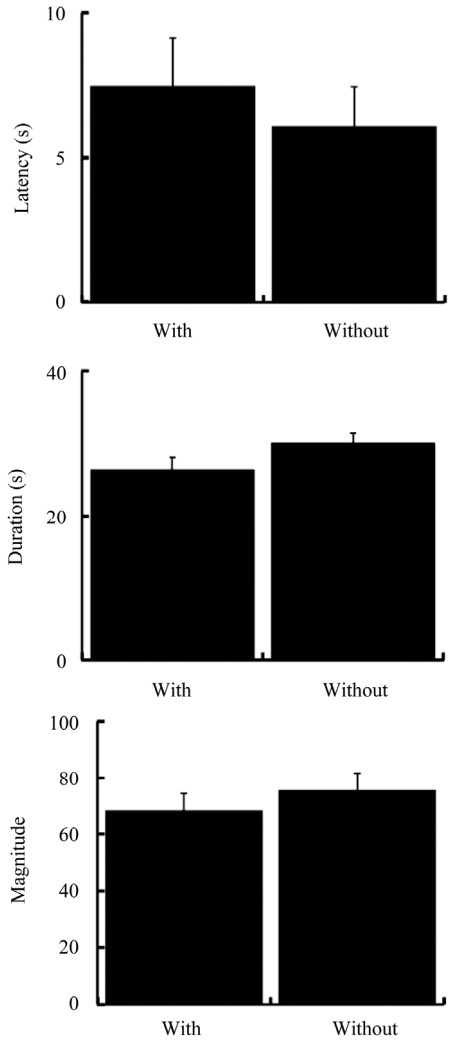

Figure 2.
The latency, duration, and magnitude of vection in the with- and without-audience conditions.

strength was not changed in that condition. Thus the effect of being things was not obtained. The audience of human was the critical factor for inhibition of vection.

We also should consider the gender effect of the audience. In this study, we employed two male audiences. In the future study, all variations of male and female audiences should be examined. We examined only the case of two male audiences. This was the limitation of our study, we should note. In future, further examination of various types of audiences should be examined.

We conclude that, social context (presence of an audience) can affect vection strength. This could be an important demonstration of an instance in which social context can alter perception, although further research is necessary to clarify this relationship.

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