The Effect of Body Posture on a Visualization Task: A Test of Gravitational Frame of Reference

The purpose of this study was to test the effect of body posture on gravitational frame of reference of visual imagery.  According to Chisholm, Kingston & Risko (2013), there is increasing research regarding the bi-directional relationship between body movement or posture and cognition; called embodied cognition (EC).  In short, the theory of EC is body position or movement can impose thoughts or feelings, just as thoughts and feelings entice body movement.   The study of how posture can affect perception is an important component to understand human cognition.

 For example, Calviano, Petrone, and Levine (1987) demonstrated an environmental frame of reference for visualization in their study with stroke patients who demonstrated a left visual neglect. In that study, participants who suffered a stroke in the right hemisphere which resulted in a left side visual hemineglect, as well as some control participants, were asked to view objects or words while either in a vertical sitting position or laying on one of their sides. Participant feedback after experiment revealed the environmental viewpoint dictated visual perception in addition to the body’s mid-line axis.

Conversely, Luyat and Gentaz (2002) examined the effect of visual reproduction of orientation while the body and head was being tilted.  Participants were asked to do production and replication tasks while their body was tilted in different angles.  The replication tasks included viewing an object either in a vertical position or while laying in different body and head tilt positions.  After the participants observed the object, the object was moved and participants were asked to reproduce the objects previous position.  Production tasks required participants to place the object in certain angles while holding body and head tilts.  Overall, the results failed to replicate the gravitational based frame of reference from their research.  However, the researchers suggested  a gravitational frame of reference may be more consistent when participants are asked to make a forced choice (similarly to the current study).

Van Elk & Blanke (2014) had participants visually identify a colored hand of a rotating human figure.  During the experiment, the participants themselves were also rotating simultaneously although not always in the same direction as the figure they observed. Results showed an ability to identify the correct hand more promptly when the participants were traveling in the same direction as the figure.  The findings support the theory which claims spatial perception is affected by a current physical position.

In addition to this cognition research, Carney, Cuddy, & Yap (2010) took saliva samples from participants after they had held a certain postural pose.  The saliva was tested for cortisol and testosterone levels in order to detect a change in cognitive processes based on the spinal manipulation.  In the study, participants held a stance associated with either higher power or lower power.  A higher power pose is a body position associated with confidence while a lower power position is associated with submissiveness.  Cortisol and testosterone levels were checked before and after the stance for comparison.  The results showed elevated levels of testosterone and decreased cortisol levels from participants who held a higher power  pose.  Also, decreased testosterone with increased cortisol levels were found in the lower power pose group.  Thus, saliva samples showed postural effects on cortisol and testosterone levels.

 Welker, Oberleitner, Cain & Carre (2013) also examined the relationship between different level of power poses on cognitive process. Participants either held a slouch pose (lower power) or an upright position (higher power pose) during which time they were either socially excluded or included. Results showed an increased response from those who were excluded while in a power pose and those who held the less powerful position were less affected by social exclusion. Welker et. al interpreted the data as an indicator that a person’s posture dictated their perception.

In contrast of supporting EC research, Chisholm et al. (2013) found there was not a consistent change in one’s cognitive state based on the body movement.  Participants were asked to lean forward or backwards while doing tasks which required focus, such as searching or word recall. Results suggested participants leaned forwards in order to focus better on a task.  In short, the participants showed a change in body posture because of an initial cognitive task; which is the opposite of EC.

The current study applied the body posture concept to healthy adults during a standard visualization.  In line with Calviano et al. (1987) finding, it was hypothesized, participants who laid on their right side during task visualization would have an gravitational frame of reference to produce a left-to-right visualization; which correlates to gravity’s top-to-bottom processing.  In turn, we expected participants who laid on their left side during task visualization to experience a right-to-left visualization.

**Method**

**Participants**

Participants were recruited from Eastern Oregon University undergraduate psychology students, as well as the authors’ social media (Facebook and YouTube) networks. Undergraduate students were offered extra credit points for participation at the professor’s discretion; no other compensation was offered.  Participants were eligible as long as they could access the experimental instructions on YouTube, perform the physical requests of the experiment, and understand the language (English) of the instructions. Based on the work of Calviano, Petrone, and Levine (1987), who used fifteen participants in a within-participants design, this study used thirty participants since this is a between-participants design.

**Materials and Procedure**

YouTube (a video-sharing website) was used to deliver the informed consent, experimental instructions, and debriefing.  Email was used to communicate experimental results from participant to researcher. After participants watched the informed consent video, they selected one of two experimental conditions based on the month of their birth.  The participants then watched a video with instructions to orient their body posture into lying on their left side, or lying on their right side.  Next, participants were instructed to imagine two basketball players on a court facing each other, one with a basketball and the other awaiting the pass.  Participants were instructed to visualize the pass.

**Design**

In this between-subjects design, participants were assigned to either condition A or condition B based on the month of his or her birth.  A birth month of January, March, May, July, September, and November assigned the participant to condition A and February, April, June, August, October and December assigned condition B.  In condition A, participants were instructed to lie on their right side.  In condition B, participants were instructed to lie on their left side.  Once participants completed the visual imagery task, they were asked to email the primary author which player (the one on the right or left) initiated the pass and to which condition they were assigned.  Subjects followed a link at the end of the experimental video to a debriefing video.

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