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

Krista E. Strother & Amanda Walker

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.

References

Calviano, R., Petrone, P. N., & Levine, D. M. (1987). Left visual spatial neglect is both environment-centered and body centered. *Neurology, 37*, 1179-1183.

Carney, D. R., Cuddy, A. M. C., & Yap, A. J. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science, 21*,1363-1368. doi:10.1177/0956797610383437

Chisholm, J. D., Kingstone, A. & Risko, E. F. (2013). The embodiment of focus: Investigating the impact of leaning behavior on our cognitive state and other’s perception of our cognitive state. *Journal of Experimental Psychology: Human Perception and Performance, 39*, 100-110. doi:10.1037/a0028444

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Van Elk, M., & Blanke, O. (2014). Imagined own-body transformations during passive self-emotion. *Psychological Research, 78*, 18-27. doi:10.1007/s00426-013-1486-8

Welker, K. M., Oberleitner, D. E., Cain, S., Carre, J. M. (2013). Upright and left out: Posture moderates the effects of social exclusion on mood and threats to basic needs. *European Journal of Social Psychology, 43*, 355-361. doi:10.1002/ejsp.1944

**IRB**

**Project title**

The Effect of Body Posture on a Visual Imagery Task: A Test of Gravitational Frame of Reference.

**Significance**

The purpose of this study is to test the effect of body posture on visual imagery.  Calviano, Petrone, and Levine (1987) demonstrated that the gravitational frame of reference affects perception in patients with visual neglect (abnormal blindspot).  Specifically, the side they lied on (right vs. left) altered what they perceived.  A gravitational frame of reference refers to an individual’s awareness of gravitational direction despite a change in their visual frame of reference, i.e. head tilt.  The current experiment attempts to extend Calviano, Petrone and Levine’s finding concerning the effect of body posture in relation to the gravitational frame of reference on visualization.

Other research has demonstrated that posture can affect neuroendocrine levels (Carney, Cuddy, & Yap, 2010).  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.

Since posture impacts biochemical responses in the body, we hypothesized it is possible for posture to impose effects on imagery.  Further, we hypothesize participants who lie on their right side, while imagining a scene with a horizontal motion component in an ambiguous direction, will tend to perceive that motion in the direction in which gravity pulls.  Thus, we expect individuals lying on their right side to interpret the motion as moving left to right, consistent with downward motion due to gravity and vice versa.

**Proposed Procedures**

Participants will be instructed via a YouTube video to lay on either their right side or their left side, and then perform a visualization: “Imagine you’re looking at two basketball players facing each other from the side.  The ball is passed from one player to the other.  Which player passed the ball, the one on the right or the one on the left?”  Participants will be asked to email their answer and condition assignment to the primary researcher.

**Number of Required Participants**

Calviano, Petrone, and Levine (1987) used fifteen participants in a within-participants design.  As this is a between-participants design we would like at least fifteen participants in each condition (total of 30 participants).

**Participant Recruitment**

Participants will be recruited from Eastern Oregon University’s undergraduate psychology students, and through the researchers’ social media (e.g. Facebook).

**Exclusion Criteria**

This experiment will exclude participants under the age of 18, individuals with an inability to easily lie down, and individuals unable to read English.

**Potential Risks**

Potential risks for this study are minimal and include normal risks associated with changes of posture.  There is risk of identity exposure through a third-party observer during submission of results, but this is true of most online interactions.  The primary researcher will take precautionary action to protect the identity of participants (see Protecting Anonymity/Confidentiality).

**Compensation**

Some participants recruited through their classes might be offered extra-credit at the discretion of their instructors.  No other compensation will be provided for participation.

**Protecting Anonymity/Confidentiality**

If the participants email the researcher, the researcher will save the message in an encrypted folder and delete the original message to protect the participants’ identities.

**Use of Results**

This research is part of the investigators’ capstone project and will be presented in a poster that displays the findings of whether body posture affects visual cognition.  If the findings are significant, they may be written up for publication.

**Debriefing**

After viewing the YouTube video, participants will be directed to a debriefing video link.  The debriefing will contain the purpose and true nature of the study, the hypothesis, contact information for the researcher, and contact information to the Chair of Eastern Oregon University’s IRB if they should feel their rights have been violated.  The debriefing video will end with a statement of appreciation to the volunteer for their participation.

References

Calviano, R., Petrone, P. N., & Levine, D. M. (1987). Left visual spatial neglect is both   environment-centered and body centered. *Neurology, 37*, 1179-1183.

Carney, D. R., Cuddy, A. M. C., & Yap, A. J. (2010). Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science, 21*,1363-1368. doi:10.1177/0956797610383437

**Informed Consent** for Body Posture’s Effect on Visualization- Scrolling script provided via YouTube video

**Purpose of Study**

The purpose of this study is to determine how body posture affects visualization.

**Methods of Study**

If you choose to participate in this experiment you will watch another YouTube video with a set of instructions.  You will be asked to lie down and visualize an event.  After answering a question about what you imagined,  you will be asked to submit your responses via email to **strothk@eou.edu**, who will be the only one to know your identity.

**Criteria to Participate**

You must be 18 or older to participate and have the ability to read English fluently.  You must also be able to lie down.

**Risks & Benefits of Participating**

The risks associated with this experiment are minimal and include any risks that occur when you watch a short film, including boredom. Additionally, as this experiment will require you to change position, you should take care as you change posture.  Submitting your responses via email also could expose your identity to third parties  To mitigate that risk, the researcher will encrypt the data and delete the original message. There are significant potential benefits to students, faculty, the University, and the scientific community associated with participating in this project. Research participants will gain a firsthand understanding of what the scientific process involving human research is like. Participation will also enable the researchers to contribute to scientific understanding of human behavior which can bring prestige to the researchers, the University, and increase the value of degrees issued from Eastern Oregon University.

**Your Rights & Responsibilities**

You have the right to be informed of the nature of the study, its methods, and the potential risks and benefits of participating in the study. You have the right to participate voluntarily and the freedom to withdraw from the study for any reason. You also have the right to be protected from harm and have your identities protected.  You also have the right to learn more about this study and to contact the proper authorities (see below) should you have concerns about this study.

You have the responsibility to participate to the best of your ability if you choose to participate and are eligible for this study. This responsibility to participate to the best of your ability does not override your rights to withdraw from the study.

**Who To Contact**

If you are interested in learning more about this study or have questions you can contact this study’s primary investigator: strothk@eou.edu. If you believe that any of your rights have been violated, you should contact the Chair of the University’s Institutional Review Board: Charles Lyons at clyons@eou.edu.

**Agreement**

By clicking on the link to an experiment video, you affirm that you are 18 or older and that you understand the basic purpose and methods of this study, the risks and benefits associated with participating in this study, and your rights and responsibilities as a research participant.  You also affirm that you have the opportunity to ask questions related to your participation in this study before you participate. Finally, you consent to participate in this study and you agree that you have provided this consent voluntarily.