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# TURNED UPSIDE DOWN: BODY POSITION AFFECTS AVAILABILITY OF WORDS RELATED TO VERTICAL SPACE.

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## Introduction

Earth's gravity provides an omnipresent reference for spatial verticality. This gives us a conceptual idea of what is down and up in the world. Human cognition has developed within this physical frame, resulting in mental spatial concepts. These are also reflected in human language; the meaning of many words referring to objects, actions or locations rely on such spatial concepts, becoming an integral part of their meaning. The view of embodied language postulates, when hearing or speaking spatial words like "down" or "up", mental concepts are reactivated (e.g., Barsalou, 2008). These concepts are grounded on experiences stemming from our interactions and perceptions with the world within its physical constraints. This reactivation creates meaning and leads to comprehension. The objective of the present study was to examine whether bodily experiences stemming from different body positions (upright, supine and head-down) can induce reactivations of mental spatial concepts. In line with the view of embodied language we expect a strong influence on the availability of related words.

## Material & Methods

Healthy adult participants (N=24) had to memorize four German adjectives from the word-category "up" (e.g. "hoch/high") and four from the word-category "down" (e.g. "tief/low"). In a first test condition, while avoiding visual input, participants were positioned upright, supine and head-down. In every position, participants performed a random word generation task by recalling and producing the adjectives forty times with a frequency of 0.5 Hz as randomly as possible. In a second test condition, tactile cues were additionally masked by a massage mat while random word generation.

## Results

We measured the number of words of each word-category in every body position. Interestingly we found, in both test conditions, a highly significant interaction of body position and word-category, showing more down- and fewer up-related adjectives in supine and head-down position, while the opposite was the case in upright position.

## Discussion & Conclusions

This result shows that body positions increase the cognitive availability of congruent spatial concepts. Such findings call for further investigations with spatial language, particularly when the physical context changes more dramatically; we expect cognitive consequences e.g., for life in microgravity, especially when we consider long-term stays like on a mission to mars. Additionally, our work also advances the theory of grounded cognition, showing the functional relevance of sensorimotor representations for the availability of mental spatial concepts.

## References

1. Barsalou, L. W. (2008). Grounded cognition. Ann. Rev. Psychol., 59, 617-645.

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