English speakers and American Sign Language (ASL) signers extend the metaphor
MORE IS UP to subset/superset relationships for quantification

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Introduction
❖ English speakers demonstrate a MORE IS UP metaphor in speech and gesture production, e.g., stock prices are rising, a lower number (Lakoff & Johnson, 1980)
❖ MORE IS UP has been further confirmed in reading and processing studies (Langston, 2002; Sell & Kaschak, 2012; Winter, Perlman, & Matlock, 2013)

MORE IS UP in ASL
❖ ASL shares the MORE IS UP metaphor for cardinals (e.g., sign for INCREASE)
❖ ASL also extends the metaphor to subset/superset relationships (Davidson & Gagne, 2014)
❖ Akin to this “vertex,” signs produced higher on the vertical axis refer to larger domains
❖ Different set sizes signed at different heights
❖ “All of [my friends]” “All of [like people in the world]”
❖ Occurs with quantifiers, verbs, and pronominal IX-axes

Method
❖ English non-signers (N=4) were presented with 13 prompts, which included quantifiers
❖ Pantomime and co-speech gesture were elicited
❖ Each gesture referring to quantification was coded for change in height and/or width relative to the participant’s most recent quantificational gesture.

Results
1. Set increase with corresponding increase in height
❖ PROMPT: There’s a zombie attack at Yale. Everyone in my suite became a zombie. Then everyone in my college became a zombie. Then everyone in the world became a zombie. Suddenly had become a zombie. Except for me.

2. Set increase with corresponding increase in width and height
❖ PROMPT: There’s a lottery at school. Someone in my suite is going to win a shirt. Someone in my college is going to win a bag. Someone at Yale is going to win a lot of money.

3. Set decrease with corresponding decrease in height
❖ PROMPT: The flu is bad this year. Everyone got sick, including my family.

4. No overall set increase results in no increase in height
❖ PROMPT: I have two twin brothers. Everyday this week, my one twin brother and his friends played soccer against my other twin brother and his friends. Some days, my one brother’s team did better. Some days, my other brother’s did better. Everyday no matter who did better, afterward everyone would go out for a drink.

Cross-cultural research
❖ Sign language: In both Nicaraguan and Japanese Sign Languages, the vertical axis is used to convey subset/superset relationships, as in ASL
❖ “All of us [here]” “All of us [here in Nicaragua]”
❖ Gesture: Research is currently being conducted on the extension of the metaphor in co-speech gestures and pantomimes of Nicaraguan and Japanese speakers

Conclusions
❖ English speaking non-signers extend the metaphor of MORE IS UP to abstract subset/superset relationships in gesture (see ex. 1-3), but, unlike signers, gesture uses the horizontal and vertical axes together to express set increases with superset relationships (see ex. 4)
❖ Gesture and sign research in the USA, and preliminarily cross-culturally support the existence of a general cognitive bias consistent with the metaphor
MORE IS UP extended to set/superset relationships

Research questions
❖ Is vertical height also used by non-signers in their gesture to carry information about subset/superset relationships?
❖ If vertical height is used by non-signers, is it used in the same linguistic contexts?

References

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Conclusion