

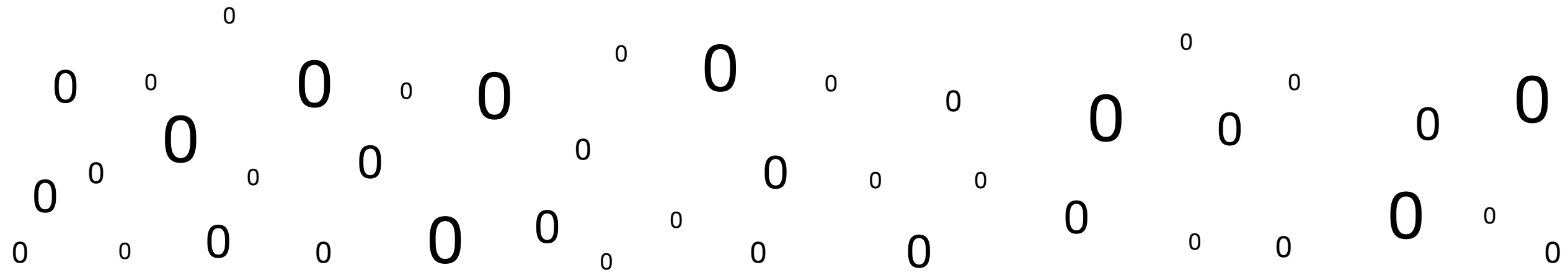


Conceptions of zero and the semantic congruence effect: Evidence from children and adults

Nicholas A. Vest & Martha W. Alibali

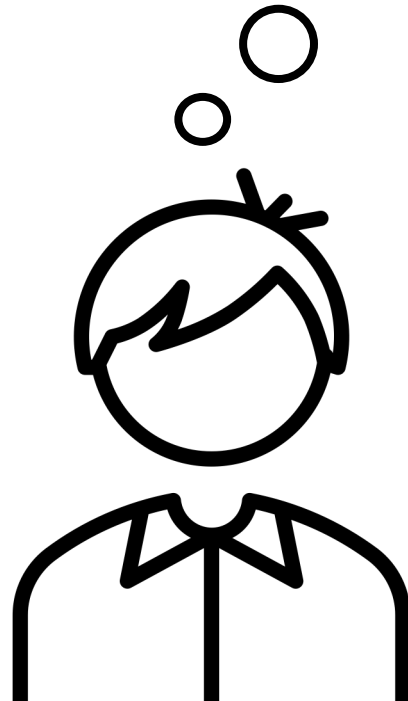
Department of Psychology, University of Wisconsin-Madison

What is zero?



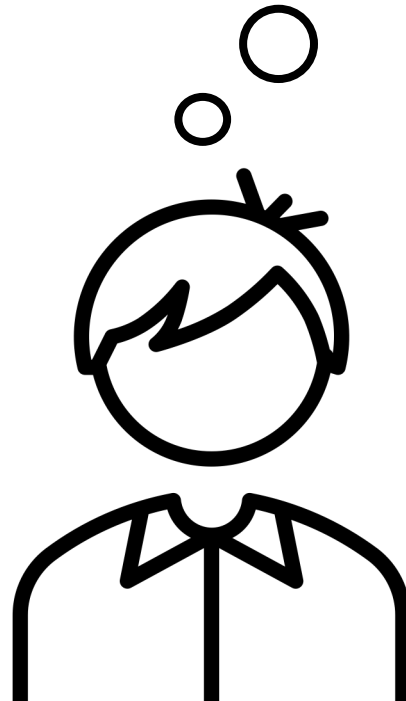
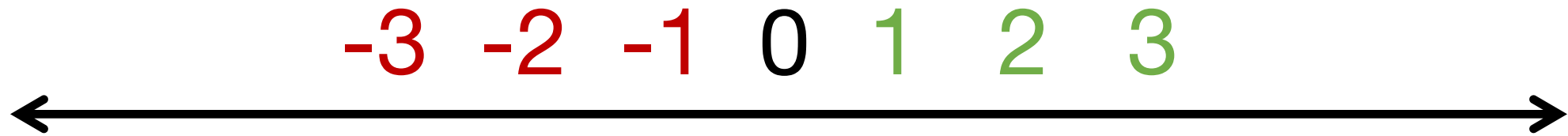
I dunno...

(Bialystok & Codd, 2000; Wellman & Miller, 1986; Wynn, 1998)

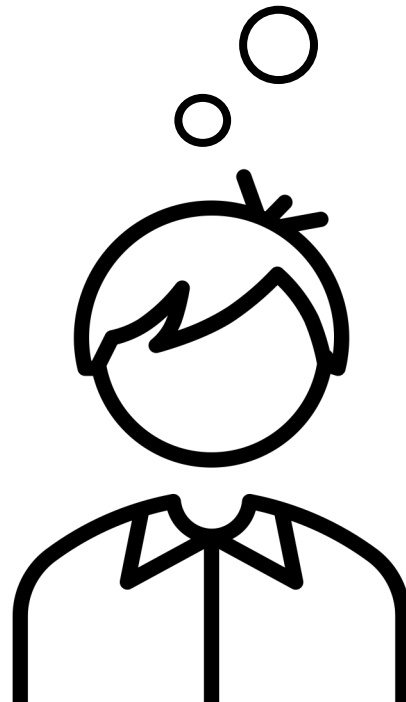
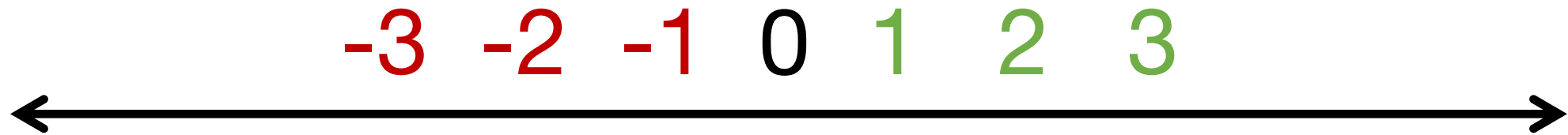


“Zero is nothing”



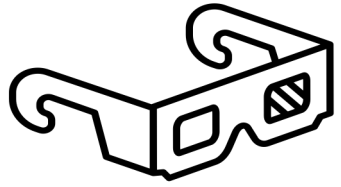


“Zero is the symmetry point
between positive and negative
numbers”



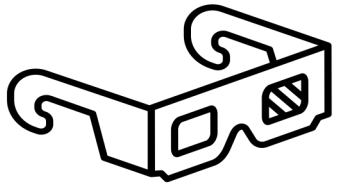
“Zero is the symmetry point
between positive and negative
numbers”

Symmetry Concept



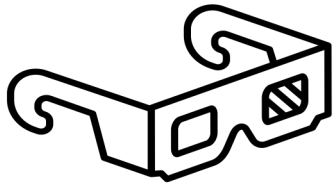
Concepts of zero





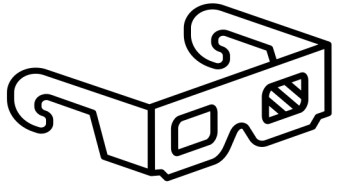
?





Magnitude
(Siegler, 2016)



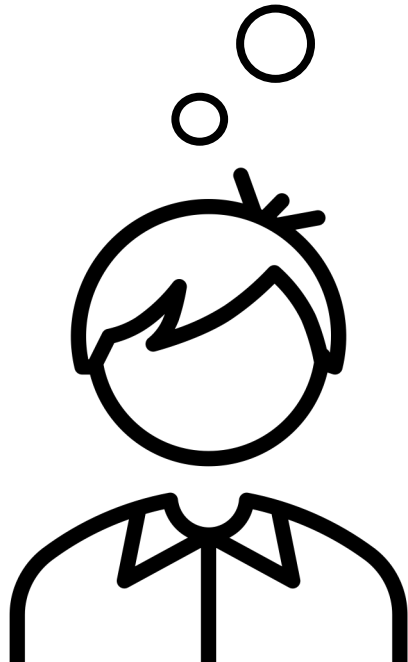


Concepts of zero?

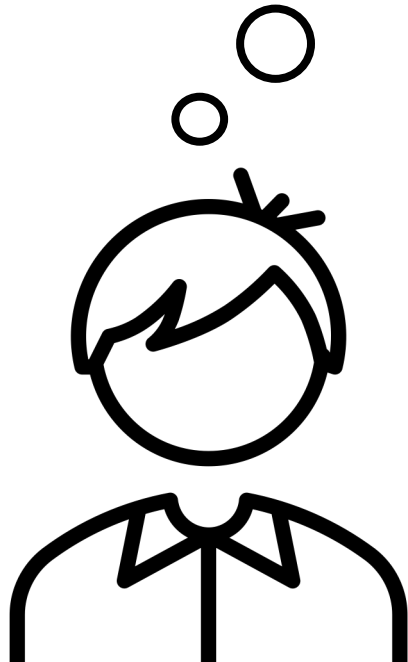
Magnitude
(Siegler, 2016)



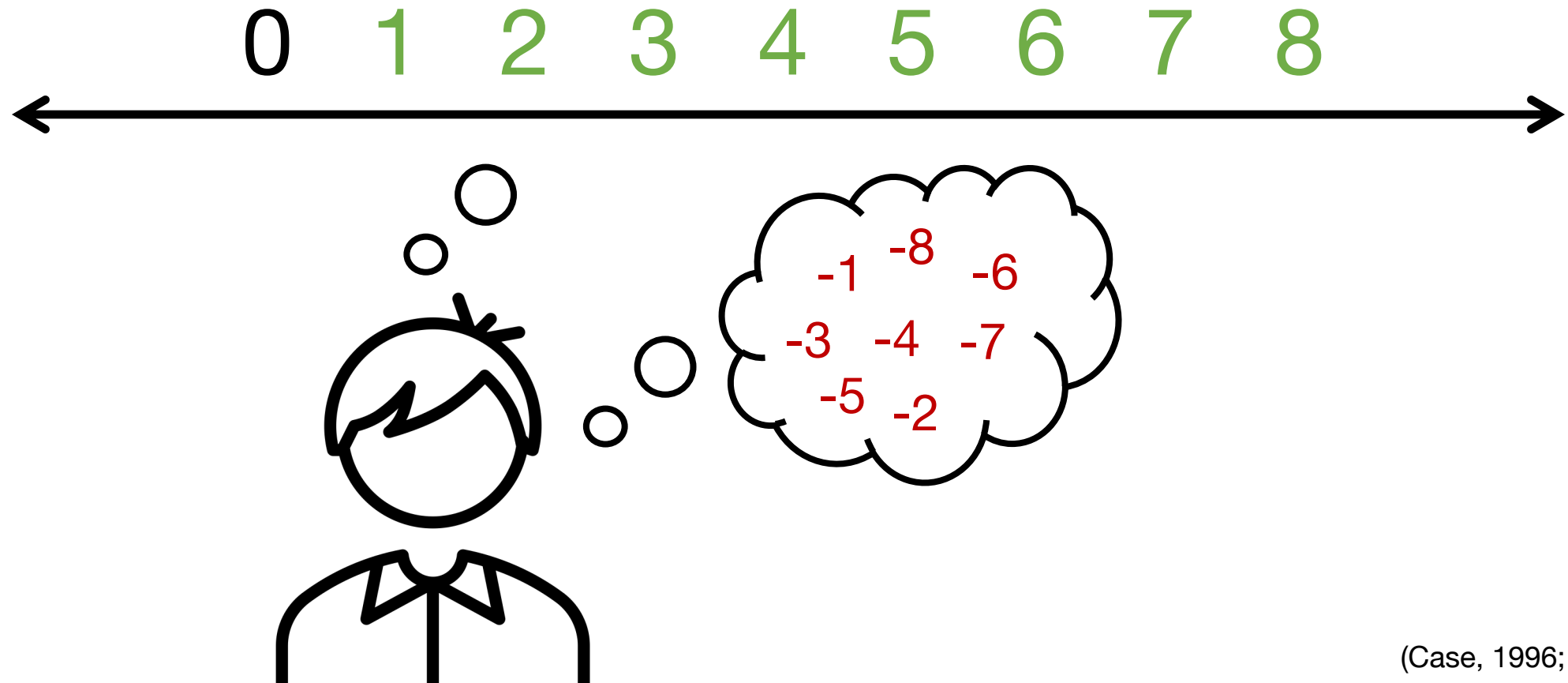
“Zero is nothing”



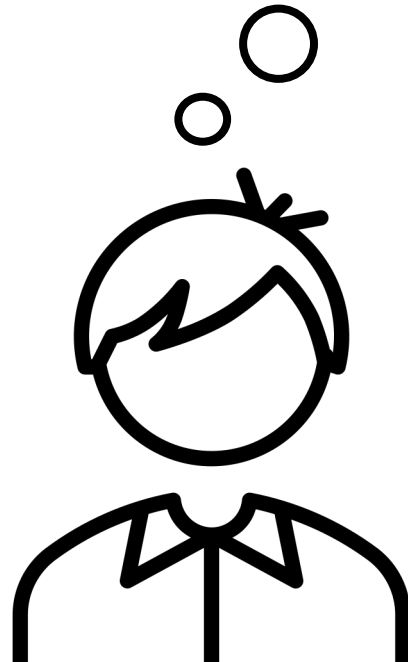
“Zero is nothing”



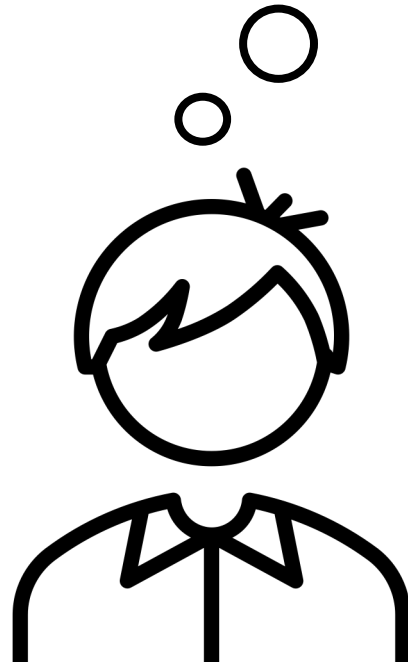
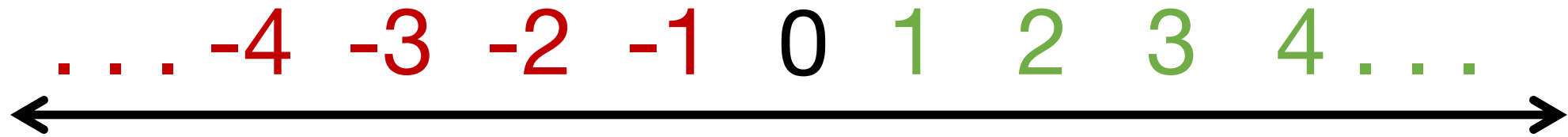
“Zero is nothing”



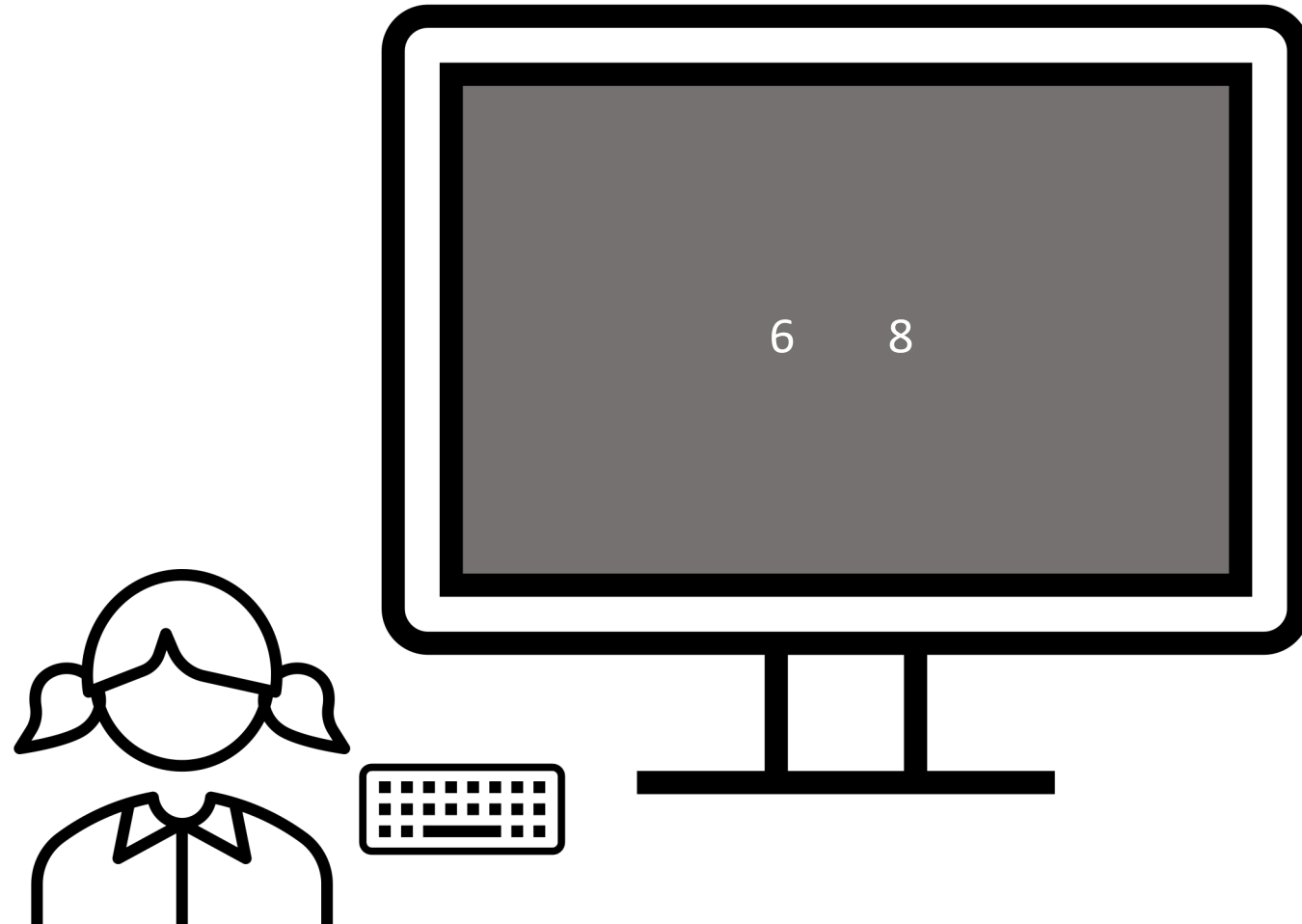
“Zero is the **symmetry point**”



“Zero is the **symmetry point**”

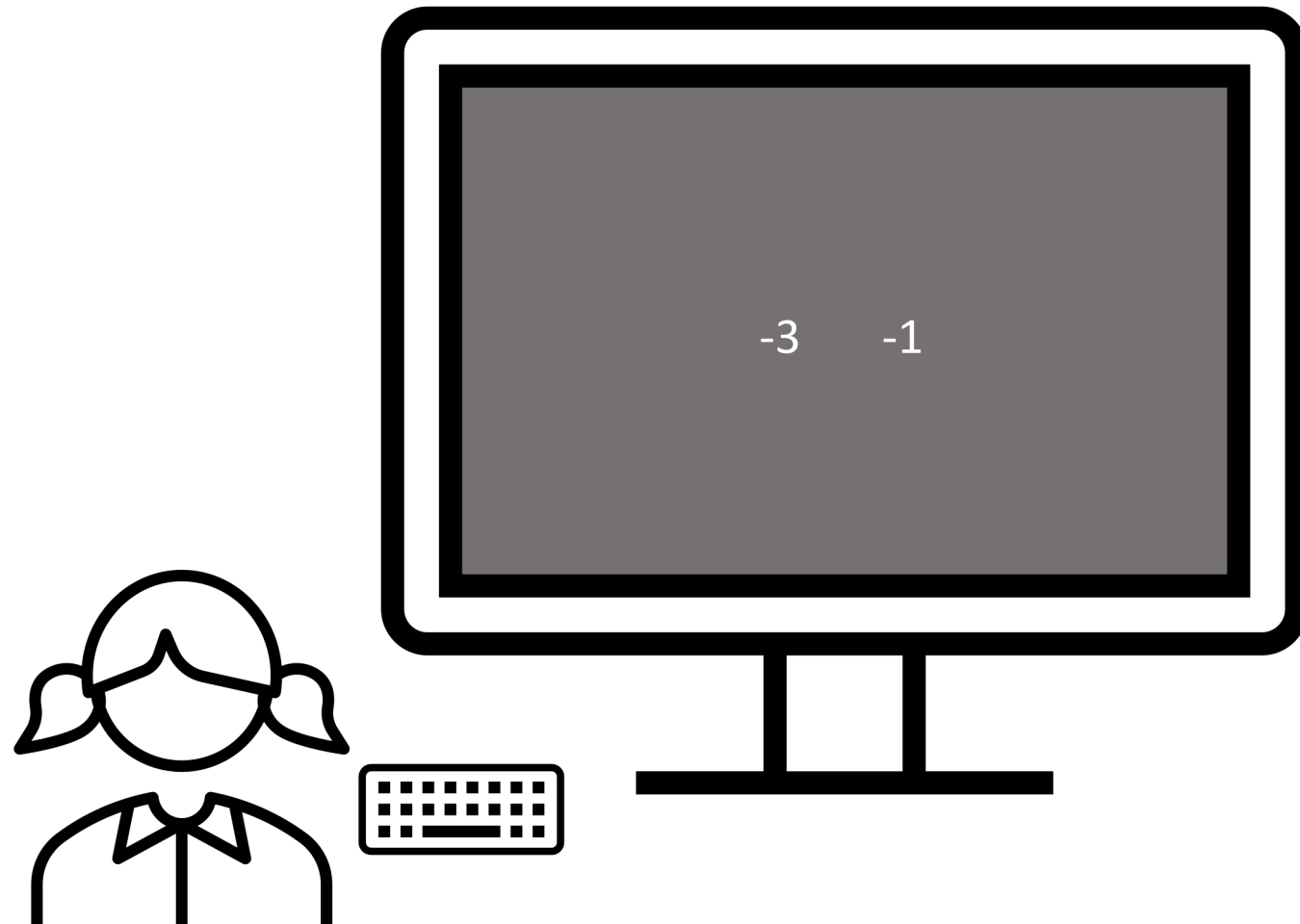


How can we test magnitude understanding for integers?



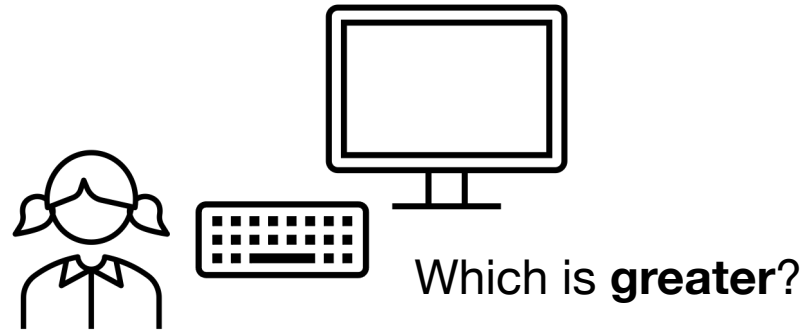
RT to choose the
greater/lesser number

How can we test magnitude understanding for integers?



RT to choose the **greater/lesser** number

Semantic Congruence Effect (SCE)



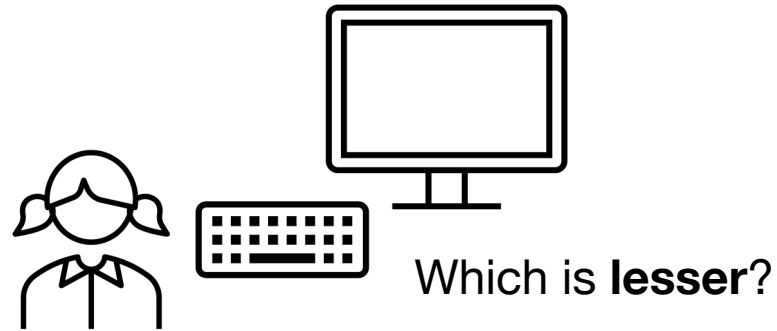
7 9



-1 -3



Semantic Congruence Effect (SCE)



7 9

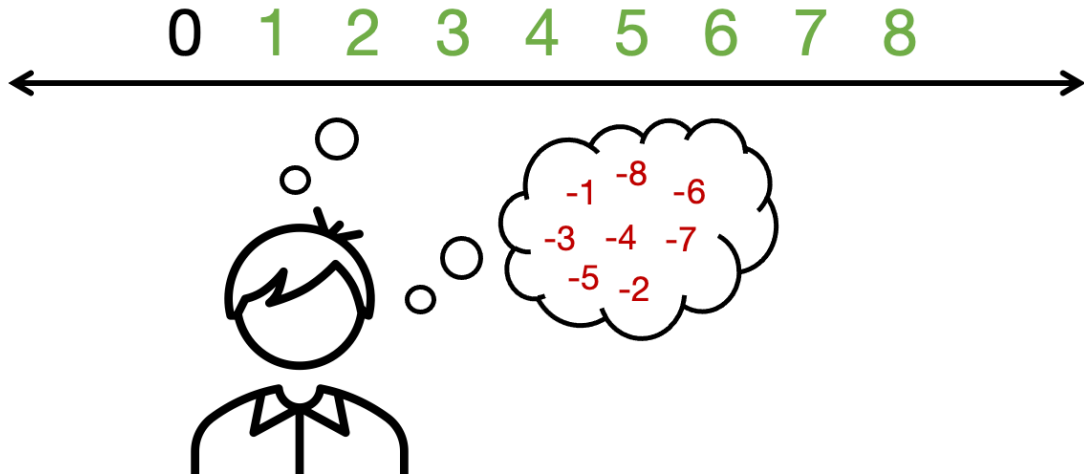


-1 -3



Low Symmetry

Undifferentiated negative number magnitudes



SCE?

High Symmetry

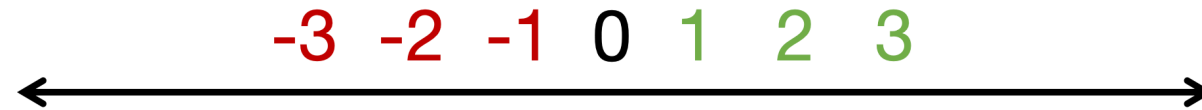
Well differentiated negative number magnitudes



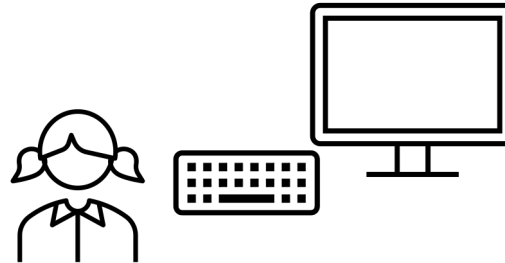
Strong SCE

Current study

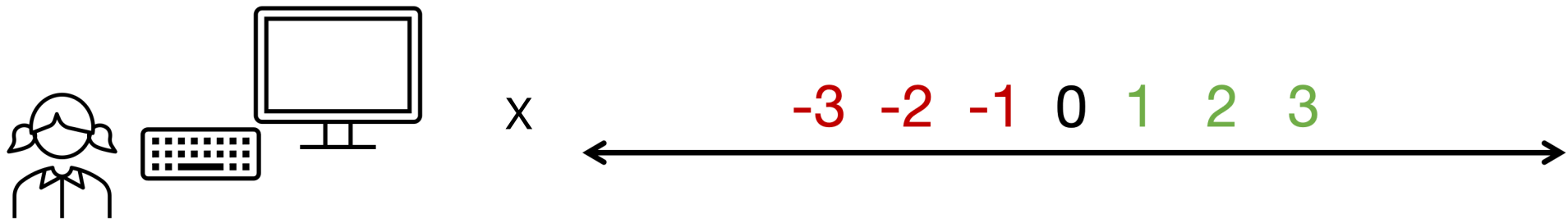
Do adults and children hold a symmetry conception of zero?



Do adults and children display a SCE for positive AND negative pairs?



Does the SCE for negatives vary depending on conception of zero?





Experiment 1: Evidence from Adults

Method



Department of Psychology UW Psychology Research Participation

UW PSYCHOLOGY RESEARCH PARTICIPATION

User ID

Password



Log In

Forgot Password?

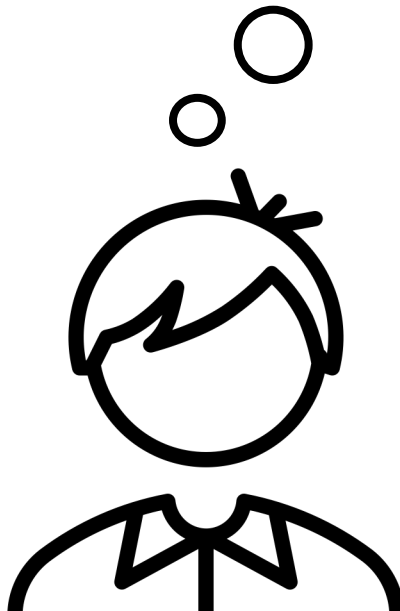
N = 55 college students

What is zero?

What is zero?



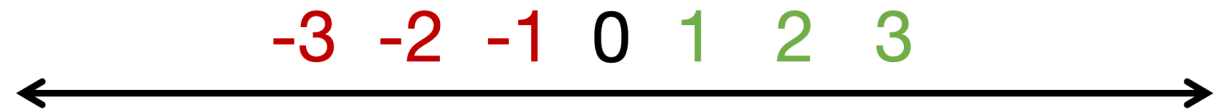
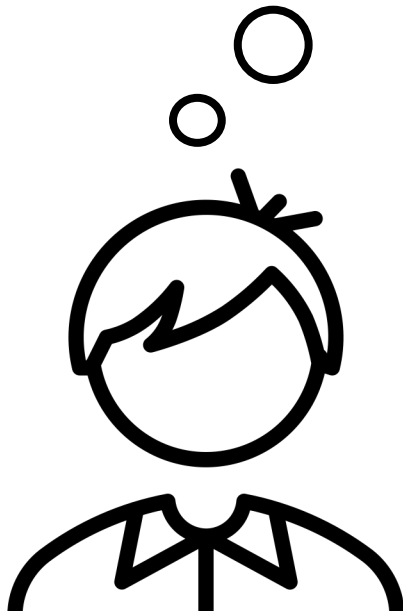
“Zero is nothing, like there are zero marbles in the jar”



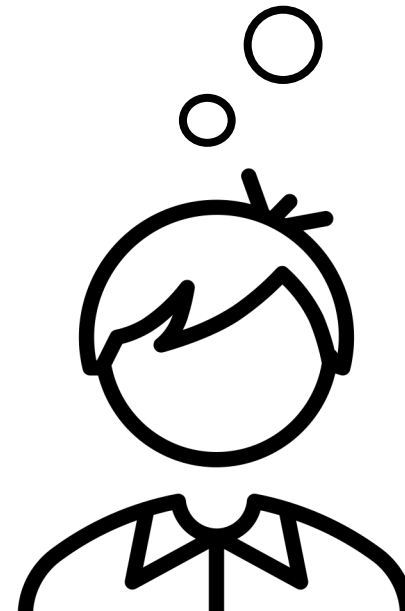
What is zero?



“Zero is nothing, like there are zero marbles in the jar”



“Zero is in the middle of positive and negative numbers”



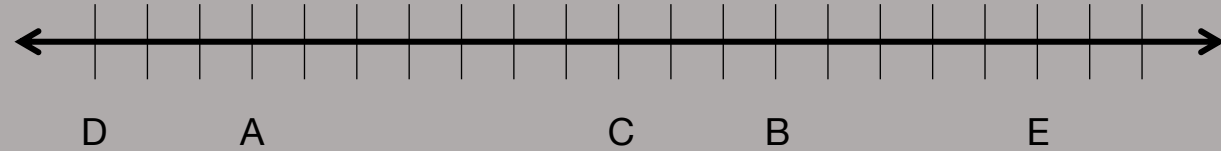
What is zero?

Is zero a number? Why or why not?

What is zero?

Is zero a number? Why or why not?

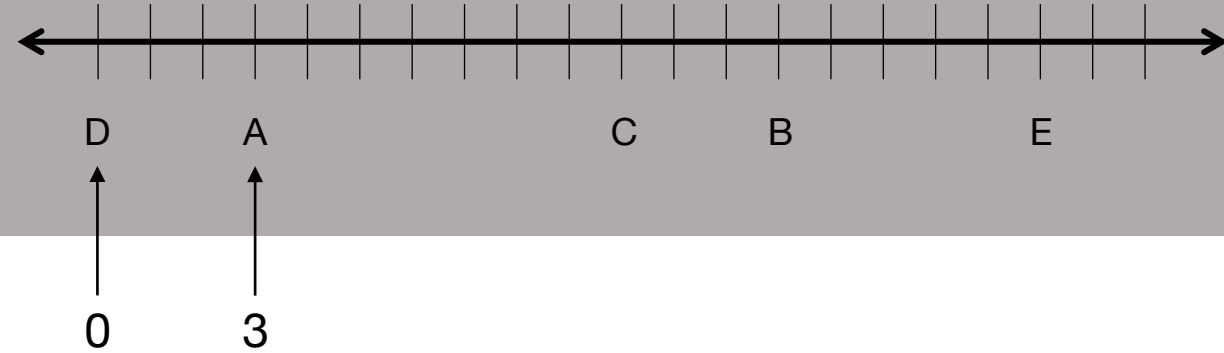
Choose the letter where you think the number 3 is on a number line



What is zero?

Is zero a number? Why or why not?

Choose the letter where you think the number 3 is on a number line

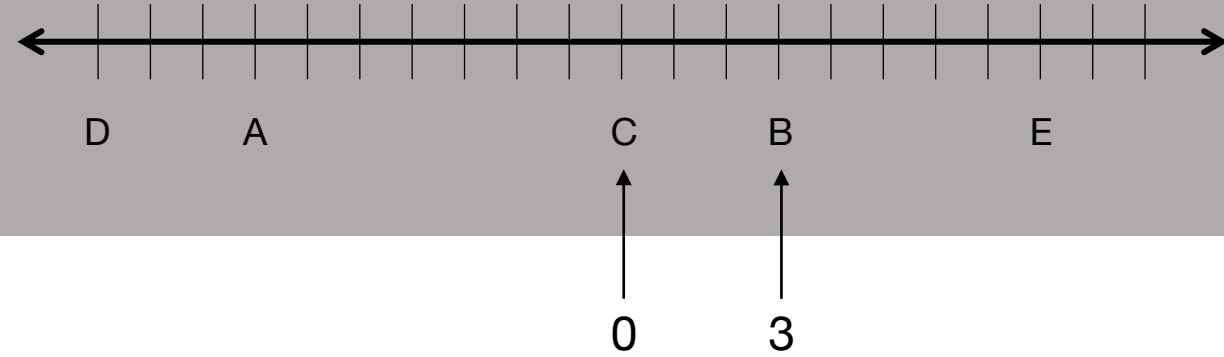


“Zero is nothing”

What is zero?

Is zero a number? Why or why not?

Choose the letter where you think the number 3 is on a number line

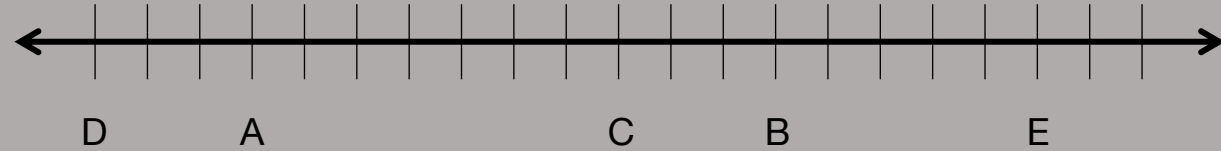


Symmetry Concept

What is zero?

Is zero a number? Why or why not?

Choose the letter where you think the number 3 is on a number line

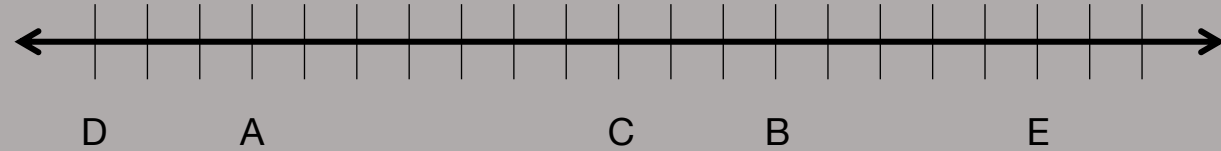


Symmetry score = sum of symmetry responses on these three items

What is zero?

Is zero a number? Why or why not?

Choose the letter where you think the number 3 is on a number line

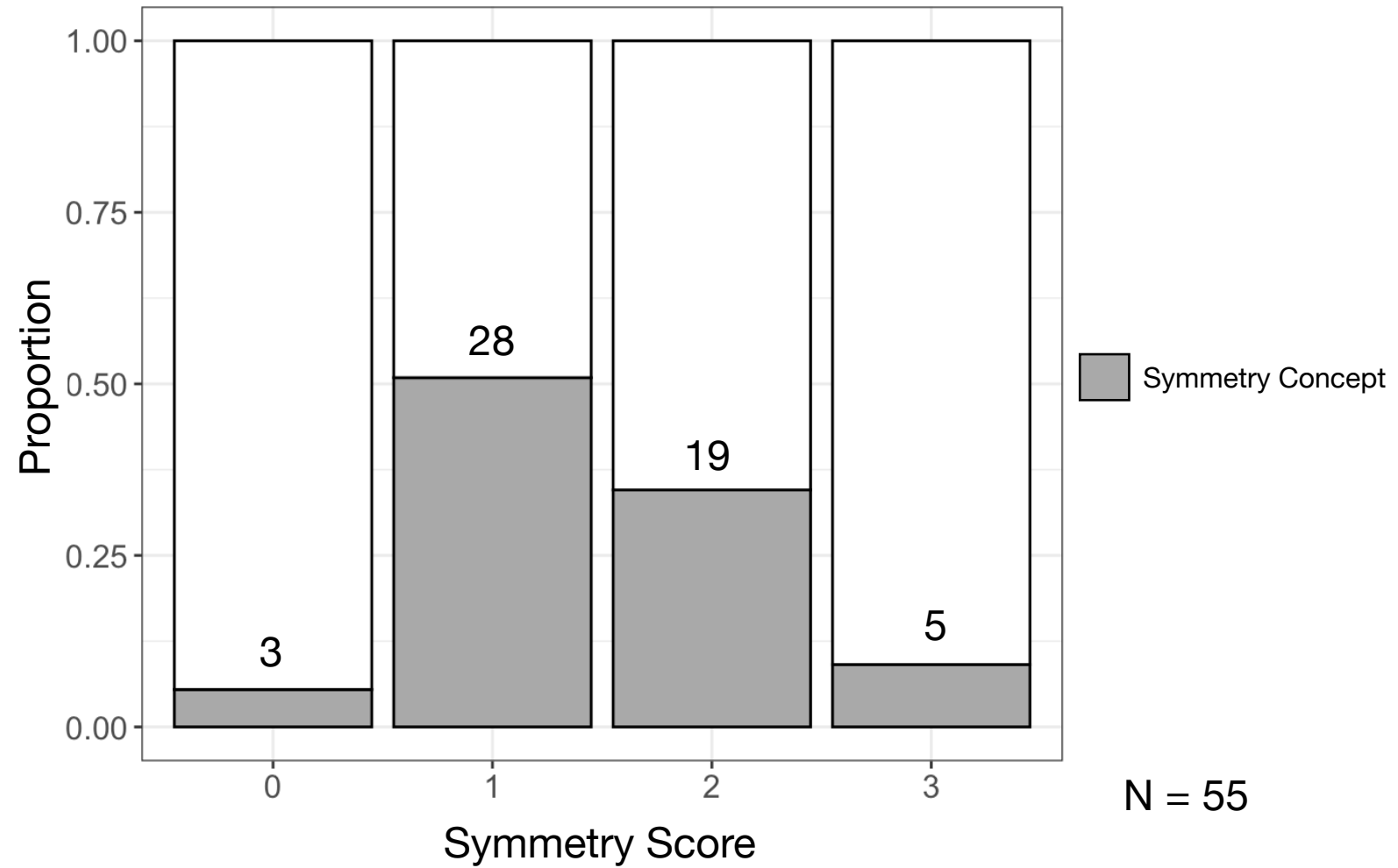


RT

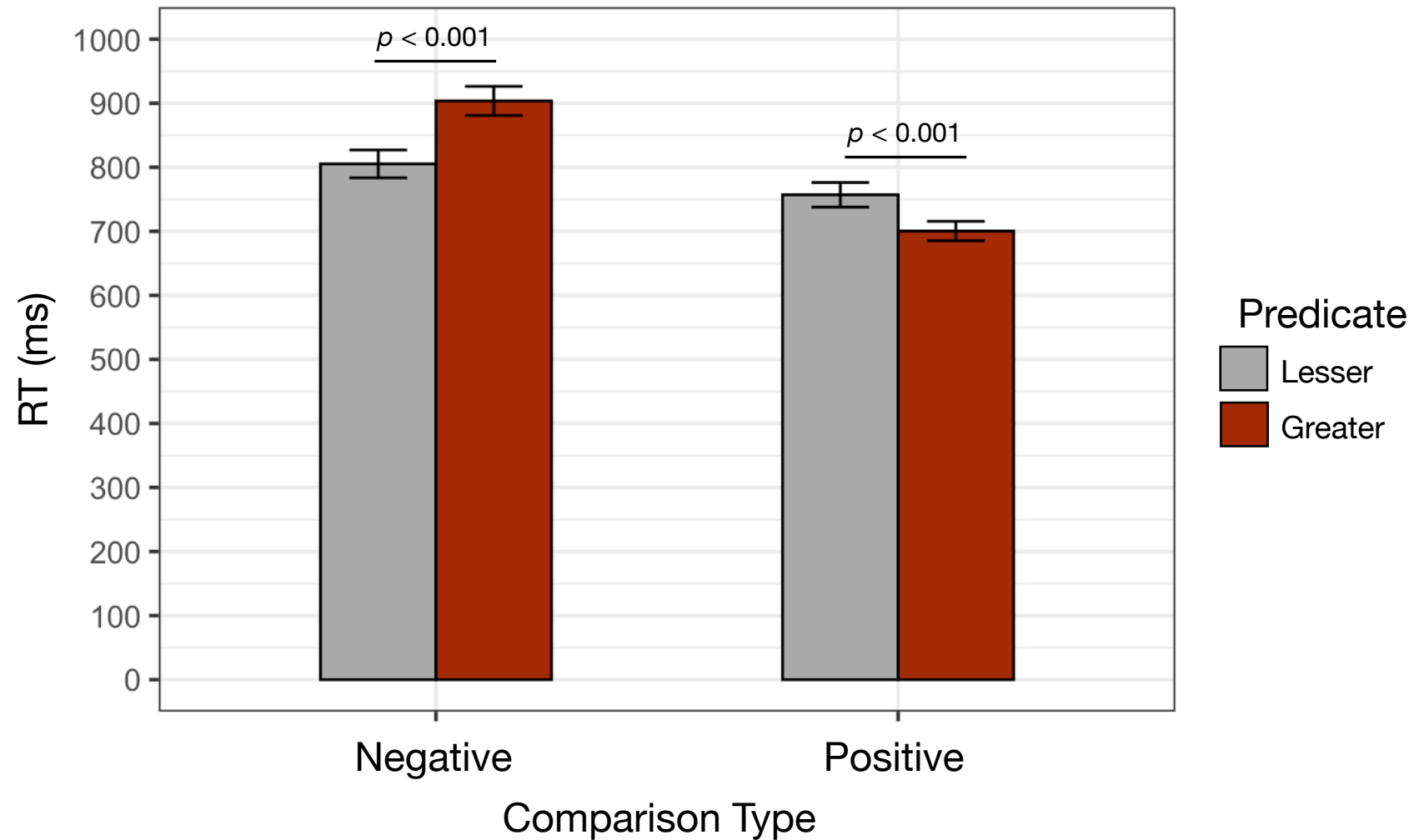
Which is greater/lesser?

Results

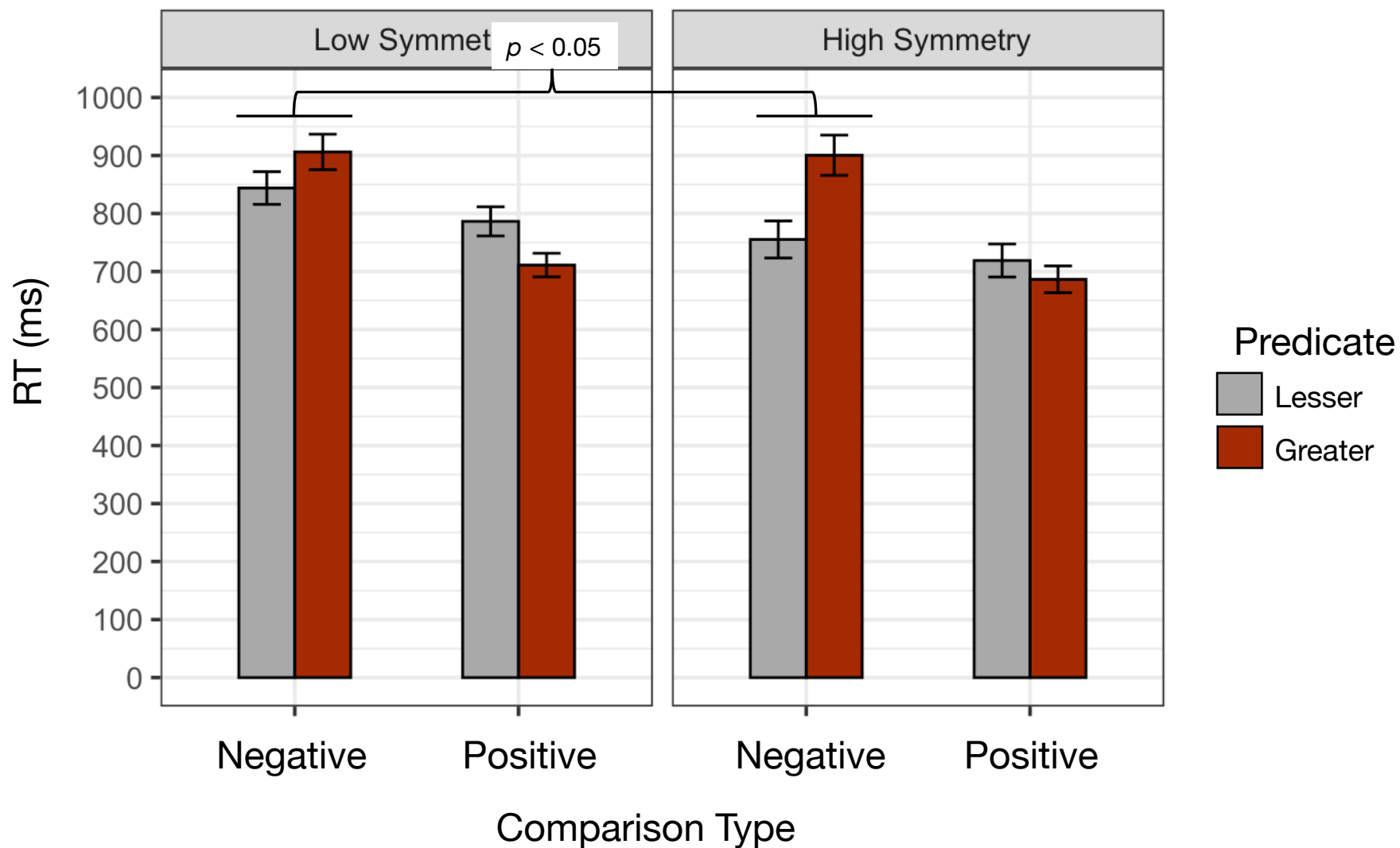
Do adults hold a symmetry conception of zero?



Do adults display a SCE for positive and negative pairs?



Does the SCE for negatives vary depending on conception of zero?

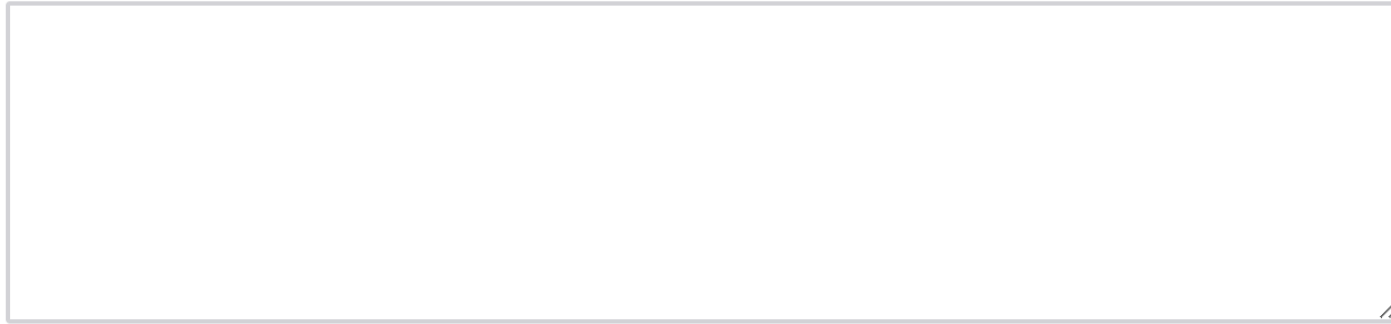


Experiment 2: Evidence from Children

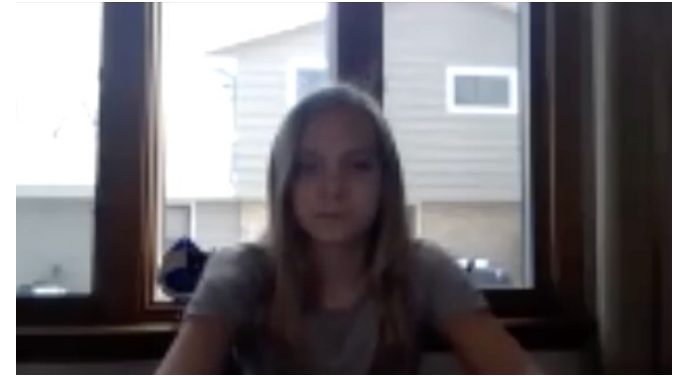
Method

Instructions: Explain your answer below.

What is zero?



qualtrics^{XM}



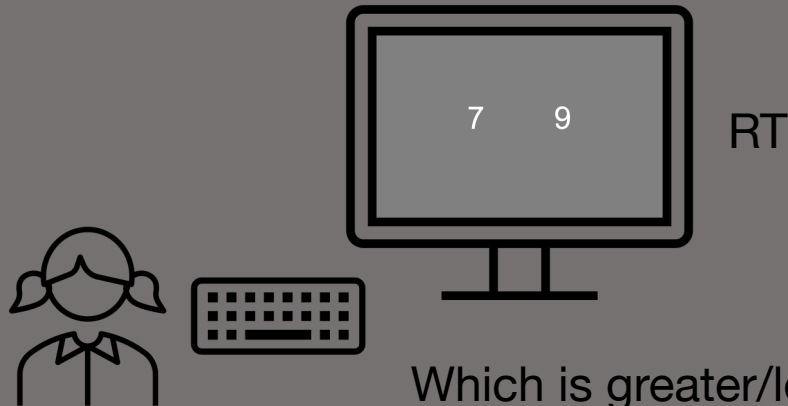
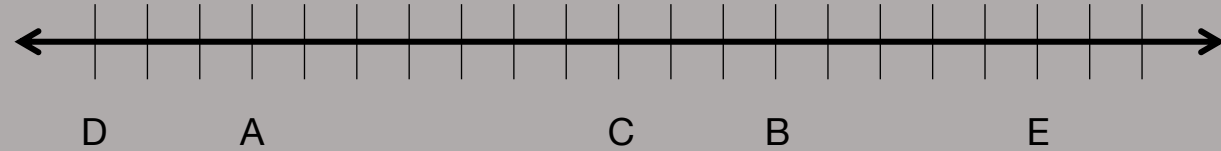
zoom

N = 54 fifth, sixth, and seventh-grade children

What is zero?

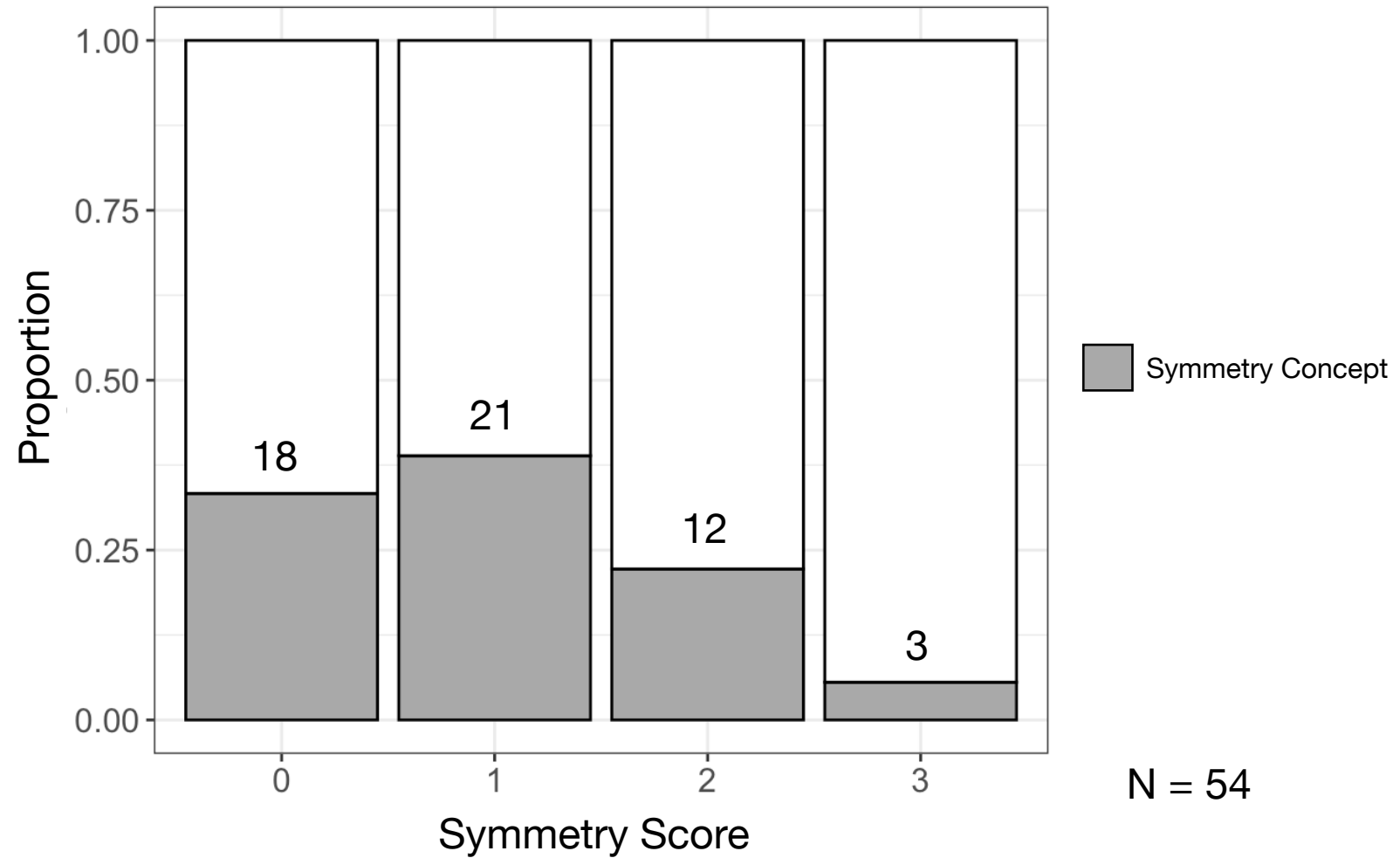
Is zero a number? Why or why not?

Choose the letter where you think the number 3 is on a number line

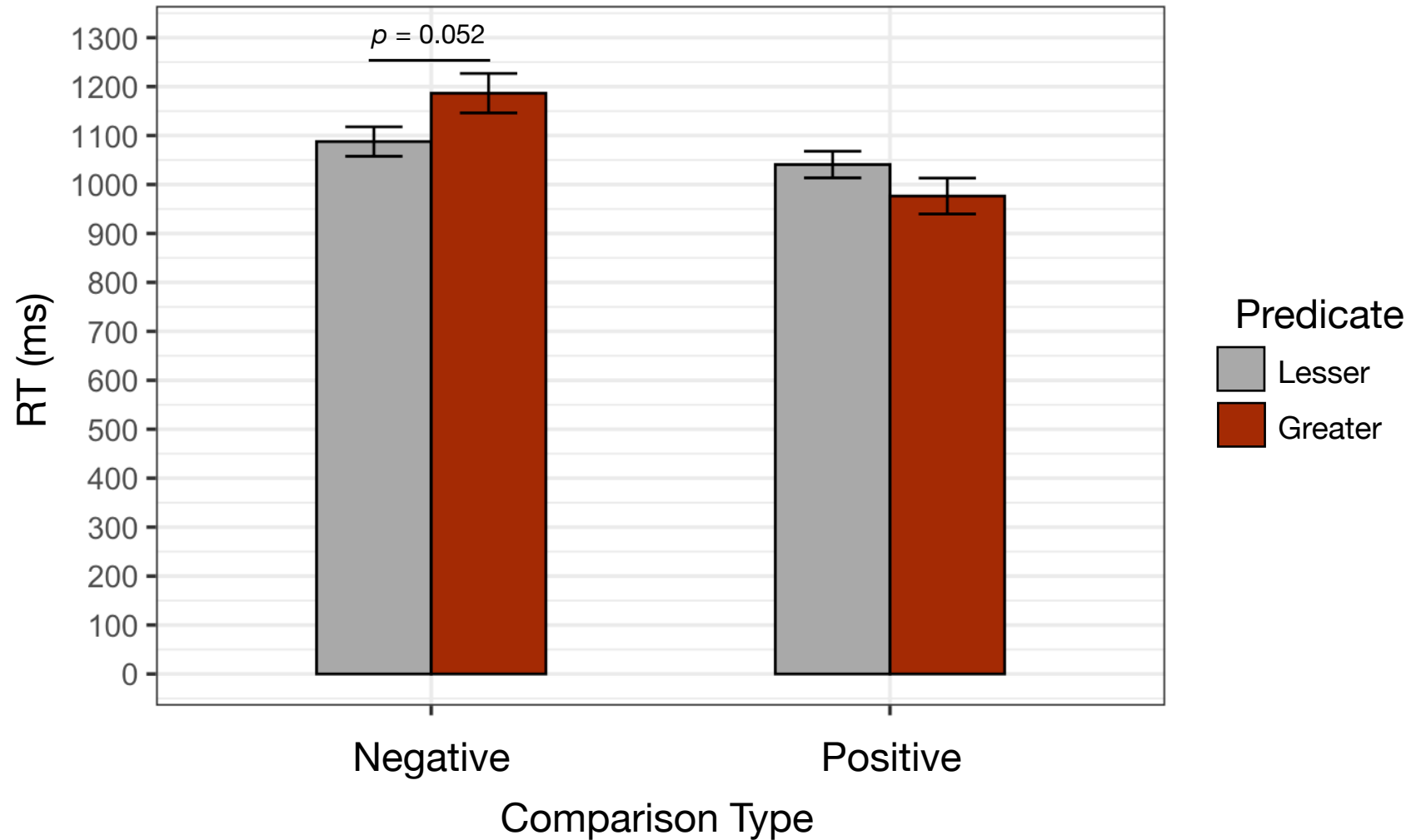


Results

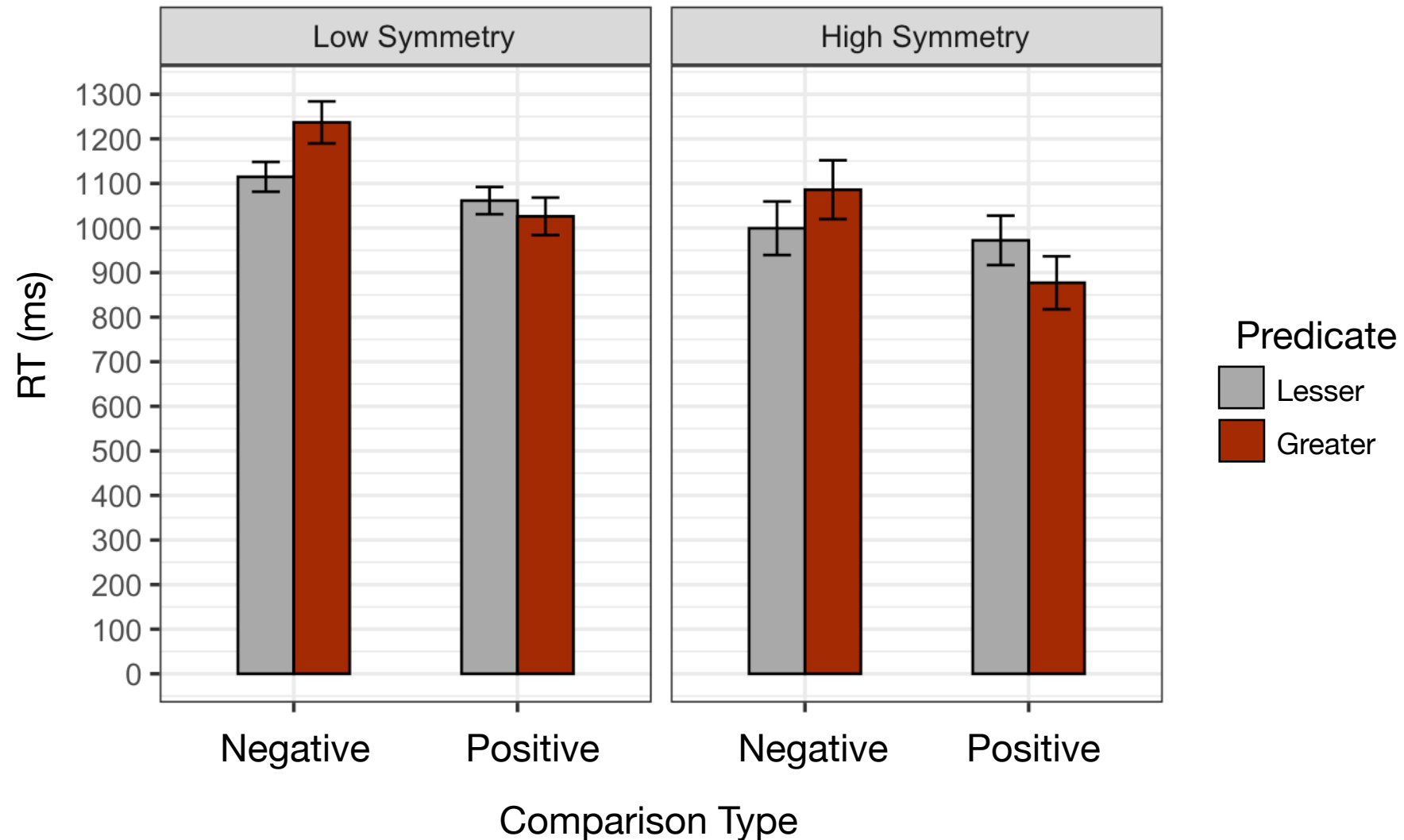
Do children hold a symmetry conception of zero?



Do children display a SCE for positive and negative pairs?



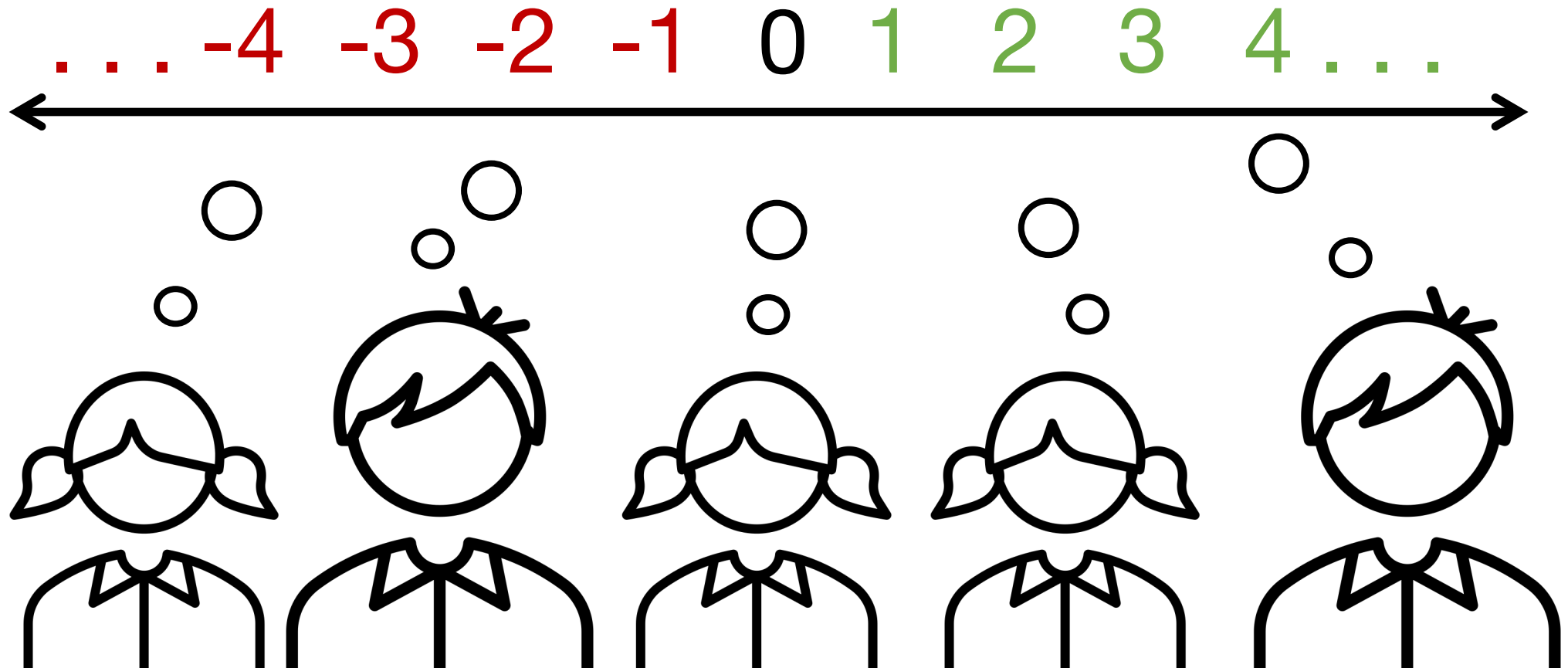
Does children's SCE for negatives vary depending on conception of zero?



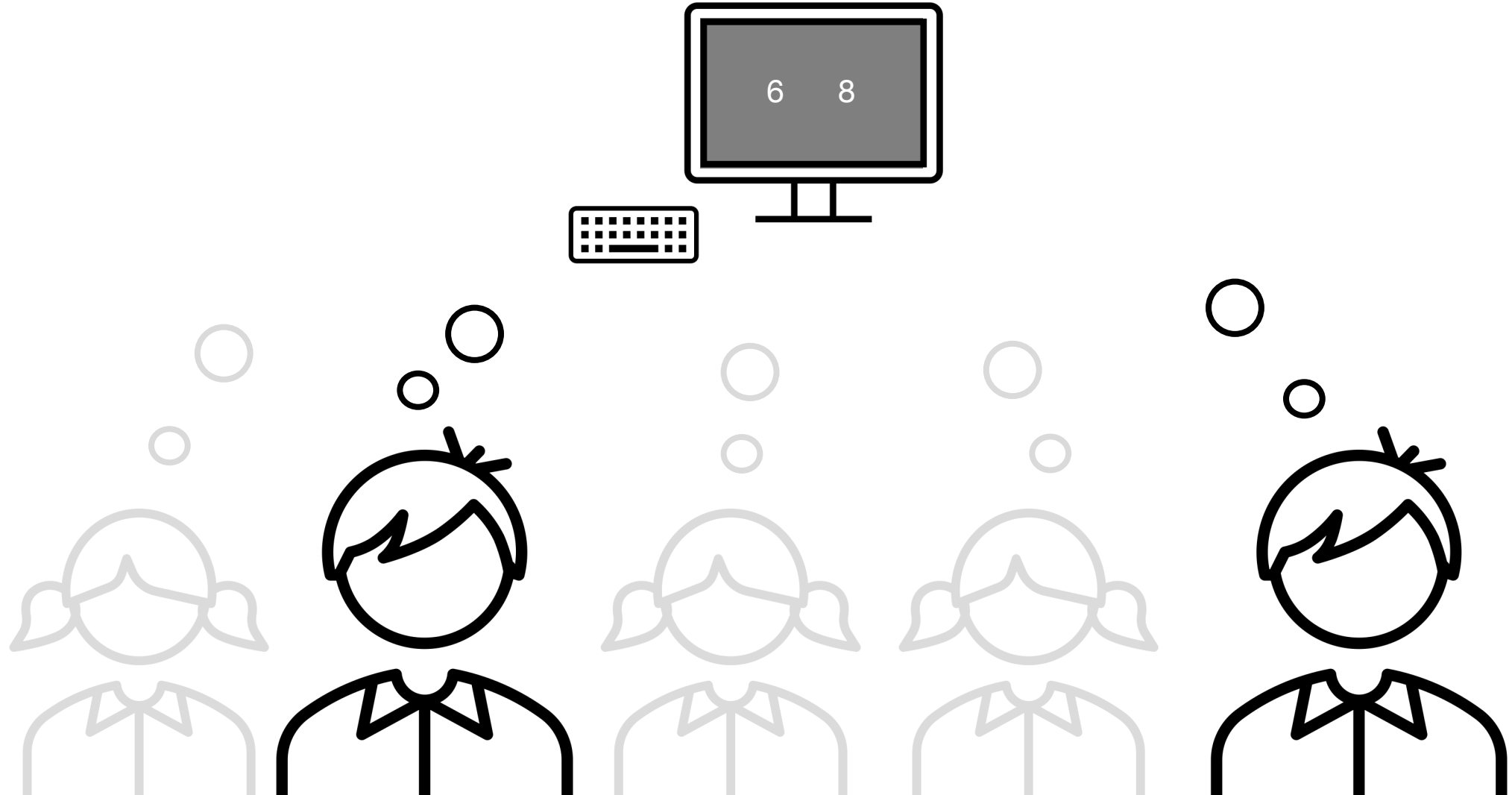
General Discussion



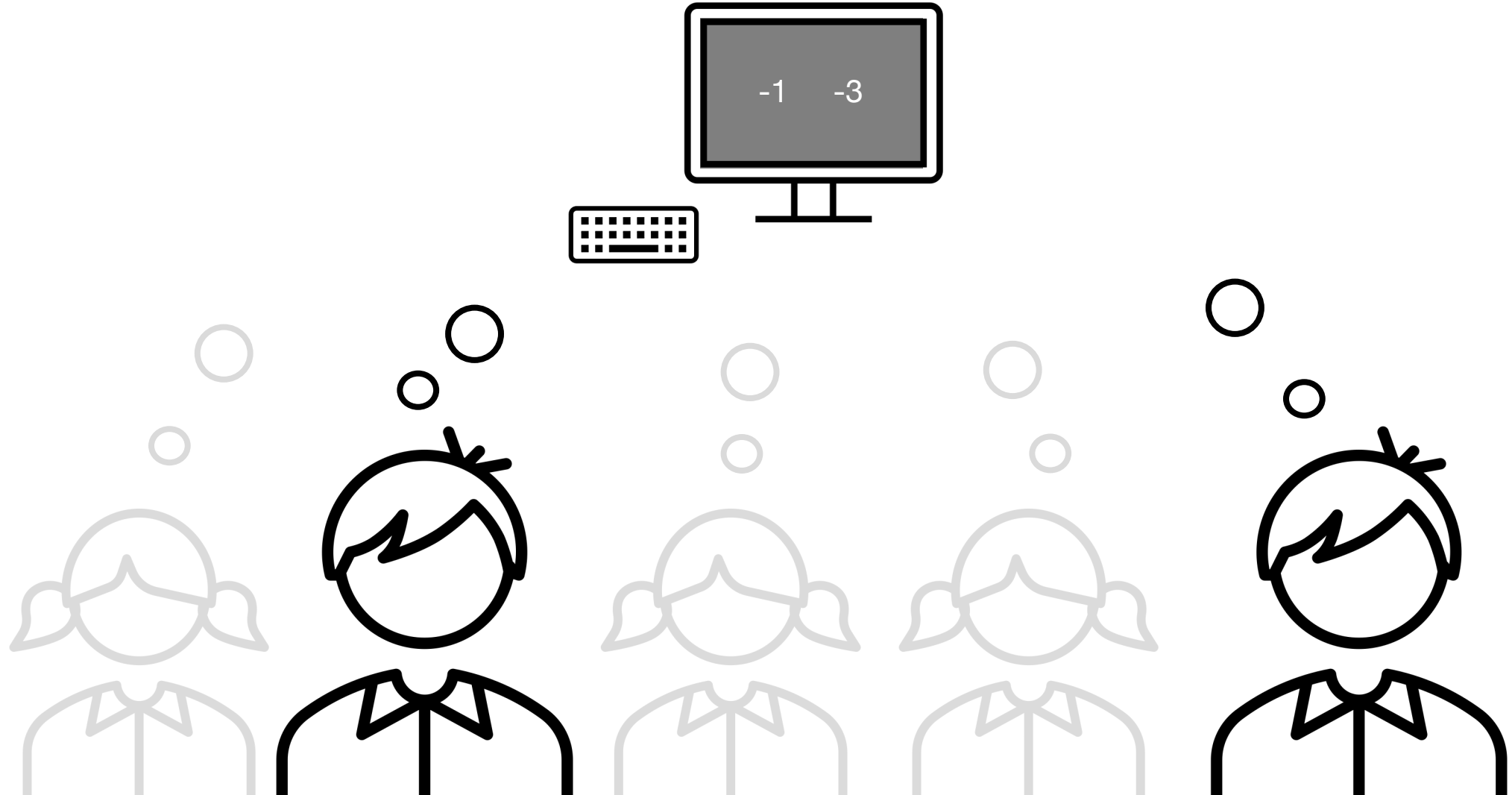
Do adults and children hold a symmetry conception of zero?



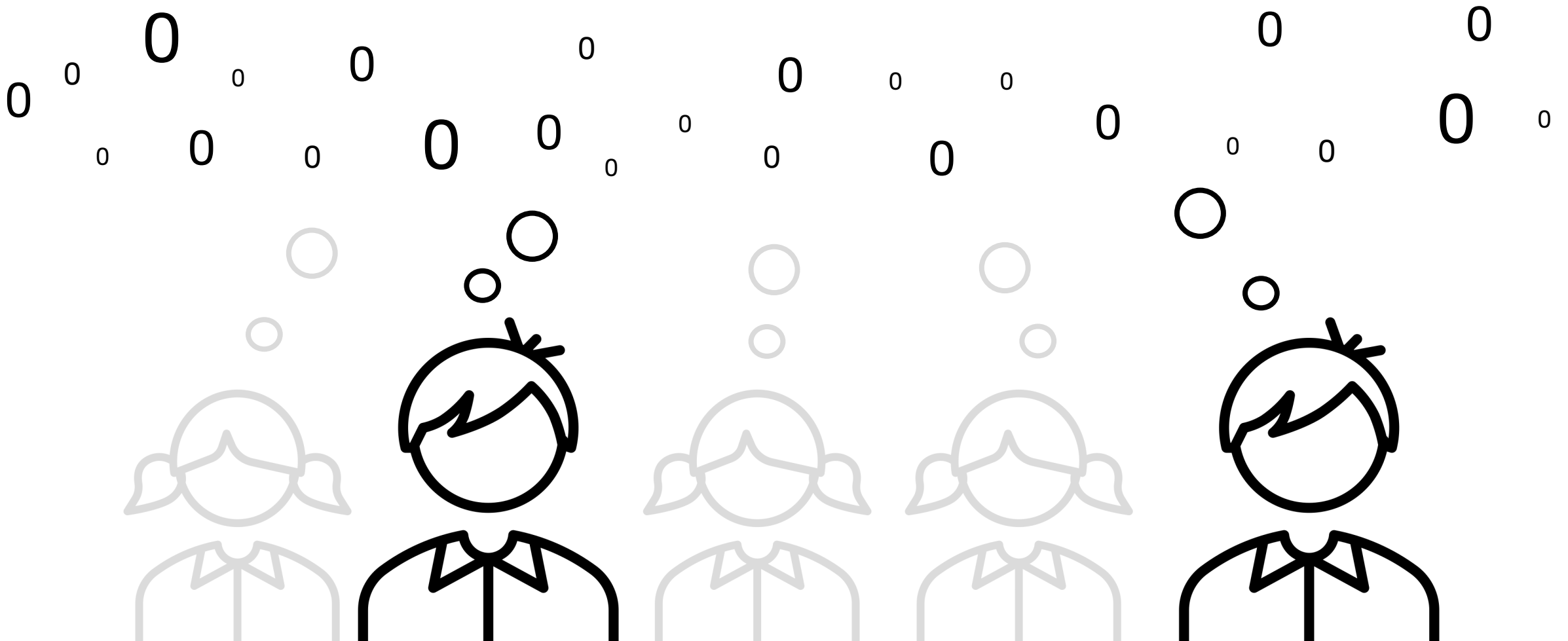
Do adults and children display a SCE for positive
AND negative pairs?



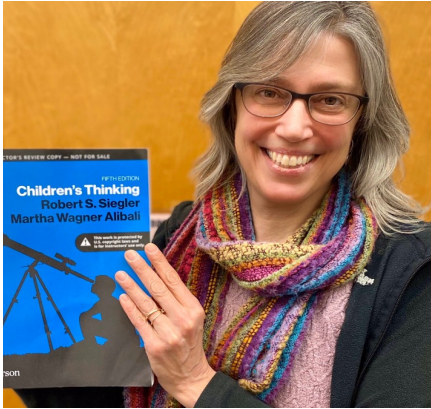
Do adults and children display a SCE for positive
AND negative pairs?



Does the SCE for negatives vary depending on conception of zero?



Thank you!



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@mwalibali



navest@wisc.edu



@nicholas_vest



(not pictured: Jennifer Murray)

Cognitive Development and Communication Lab

