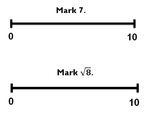
I WANT TO READ ON MY OWN

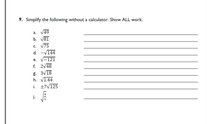
IF YOU'RE "JUST BROWSING" AND WANT TO READ INDEPENDENTLY, CHECK OUT THIS LEFT PANEL. PLAY AROUND WITH THE INTERACTIVE PROMPTS !

TRY ANSWERING THESE THREE PROMPTS

MC: FLIP PAPER UP TO REVEAL ANSWER



NLE: FLIP PAPER UP TO REVEAL ANSWER

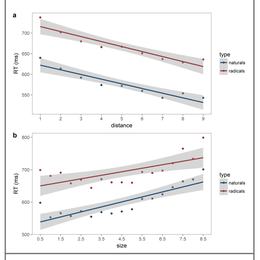


SYMBOLS: FLIP PAPER UP TO REVEAL ANSWER

TO UNDERSTAND HOW PEOPLE UNDERSTAND THE IRRATIONALS, WE ADMINISTERED THE MC AND NLE TASKS. WE ALSO GAVE A NOVEL SYMBOL SYSTEM ASSESSMENT COMPOSED OF CONCEPTUAL AND PROCEDURAL ITEMS (N = 81 UNDERGRADS, 90 MIN).

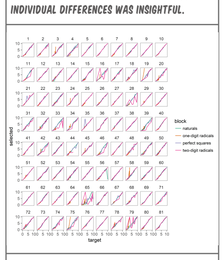
WHICH PROCESSES UNDERLIE PERFORMANCE ?

MC: WE REPLICATED THE CANONICAL DISTANCE & SIZE EFFECTS FOR RADICALS EXPRESSIONS.



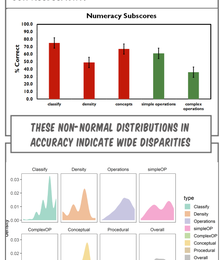
DOES THIS IMPLY THAT MAGNITUDE REPRESENTATIONS ARE USED TO UNDERSTAND RADICALS EXPRESSIONS ?

NLE: WE FOUND GENERALLY HIGH PERFORMANCE ACROSS THE 4 BLOCKS OF THIS TASK, BUT BREAKING DOWN THE RESULTS TO UNCOVER INDIVIDUAL DIFFERENCES WAS INSIGHTFUL.

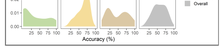


SOME PARTICIPANTS STRUGGLED WITH TWO-DIGIT RADICAL EXPRESSIONS.

SYMBOLS: PARTICIPANTS STRUGGLED TO APPLY THE ARITHMETIC RULES FOR IRRATIONALS ON OUR ASSESSMENT.



THESE NON-NORMAL DISTRIBUTIONS IN ACCURACY INDICATE WIDE DISPARITIES



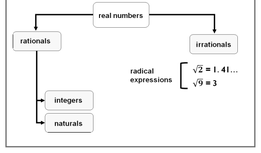
OSF.IO/7X34N · JAY@RISHI.PUB PURAV "JAY" PATEL, SASHANK VARMA

MENTAL REPRESENTATION AND PROCESSING OF RADICAL EXPRESSIONS

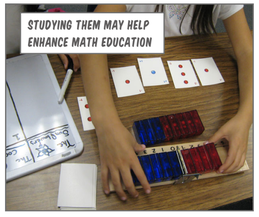
HOW DO WE UNDERSTAND IRRATIONAL NUMBERS ?

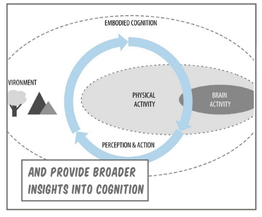
THIS STUDY IS PART OF OUR BROADER RESEARCH PROGRAM THAT EXPLORES HOW IMPERCEPTIBLE NUMBER SYSTEMS ARE UNDERSTOOD.

NUMERICAL COGNITION HAS FOCUSED ON NUMBER SYSTEMS BESIDES THE IRRATIONALS.



STUDYING THEM MAY HELP ENHANCE MATH EDUCATION





BY STUDYING MORE ABSTRACT NUMBER SYSTEMS LIKE THE IRRATIONALS, WE MAY HAVE SIMILAR INSIGHTS INTO INSTRUCTION AND COGNITION.

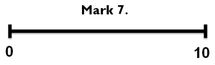
WE EXPLORED THIS BY USING THREE COMMON TASKS.

WE ADMINISTERED THE MC, NLE, AND SYMBOL SYSTEM TASKS IN A BETWEEN-SUBJECTS LAB EXPERIMENT (N = 81 UNDERGRADS, 90 MIN).

1. MAGNITUDE COMPARISON: PRESS "Z" IF THE LEFT NUMBER IS GREATER OR "M" IF IT'S THE RIGHT NUMBER.

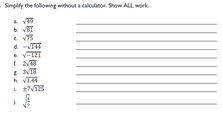
1. NATURALS - GREATER	(N = 102)
2. NATURALS - LESS	(N = 102)
3. RADICALS - GREATER	(N = 102)
4. RADICALS - LESSER	(N = 102)

2. NUMBER LINE ESTIMATION: PARTICIPANTS MARKED THE SPATIAL LOCATIONS OF NATURAL NUMBERS, PERFECT SQUARES, AND IRRATIONALS (SINGLE & DOUBLE DIGIT).



1. NATURALS - GREATER	(N = 11)
2. NATURALS - LESS	(N = 11)
3. RADICALS - GREATER	(N = 11)
4. RADICALS - LESSER	(N = 11)

3. SYMBOL SYSTEM EXPERTISE: ASSESSED CONCEPTUAL AND PROCEDURAL KNOWLEDGE OF IRRATIONAL NUMBERS & PERFECT SQUARES



1. NUMBER CONCEPTS	(N = 8)
2. DENSITY CONCEPTS	(N = 2)
3. OPERATION CONCEPTS	(N = 2)
4. ARITHMETIC	(N = 17)

WE THANK ERIK ANDERSON, MARTIN VAN BOEKEL, SOO-HYUN IM, & OUR PILOT PARTICIPANTS

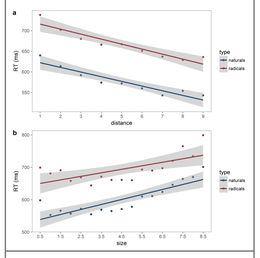
I'M CURIOUS...TELL ME MORE

OUR PARTICIPANTS GENERALLY PERFORMED WELL ON THE MC & NLE TASKS, PERFORMING WORST ON THE SYMBOL SYSTEM TEST.

RESULTS: MC, NLE, & SYMBOL SYSTEM TEST

WE FOUND 7 PERCEPTUAL FLUENCY PROBLEMS THAT ONLY EXISTED IN THE MACHINE CONDITION. THESE MAY DRIVE THE EFFECT.

MC: WE REPLICATED THE CANONICAL DISTANCE & SIZE EFFECTS FOR RADICALS EXPRESSIONS.



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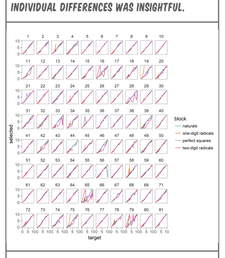

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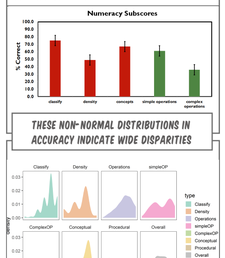

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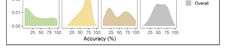

HOW CAN WE UNCOVER STUDENTS' PROCESSES ?

WE ARE ONLY NOW BEGINNING TO INFER THE COGNITIVE PROCESSES UNDERLYING THESE PERFORMANCE PATTERNS.

WE WILL ANALYZE THE STRATEGY SELF-REPORTS FOR THE NUMBER LINE ESTIMATION TASK TO DETECT STRATEGIES USED.

FOR THE ARITHMETIC ASSESSMENT, WE WILL CODE THE SCRATCH WORK TO INFER DIFFERENCES IN STRATEGIES USED.

CEHD

NO FUNDING ACKNOWLEDGED PURAV "JAY" PATEL, SASHANK VARMA