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Promoting cognitive flexibility by varying cognitive load? An empirical study on arithmetic reasoning

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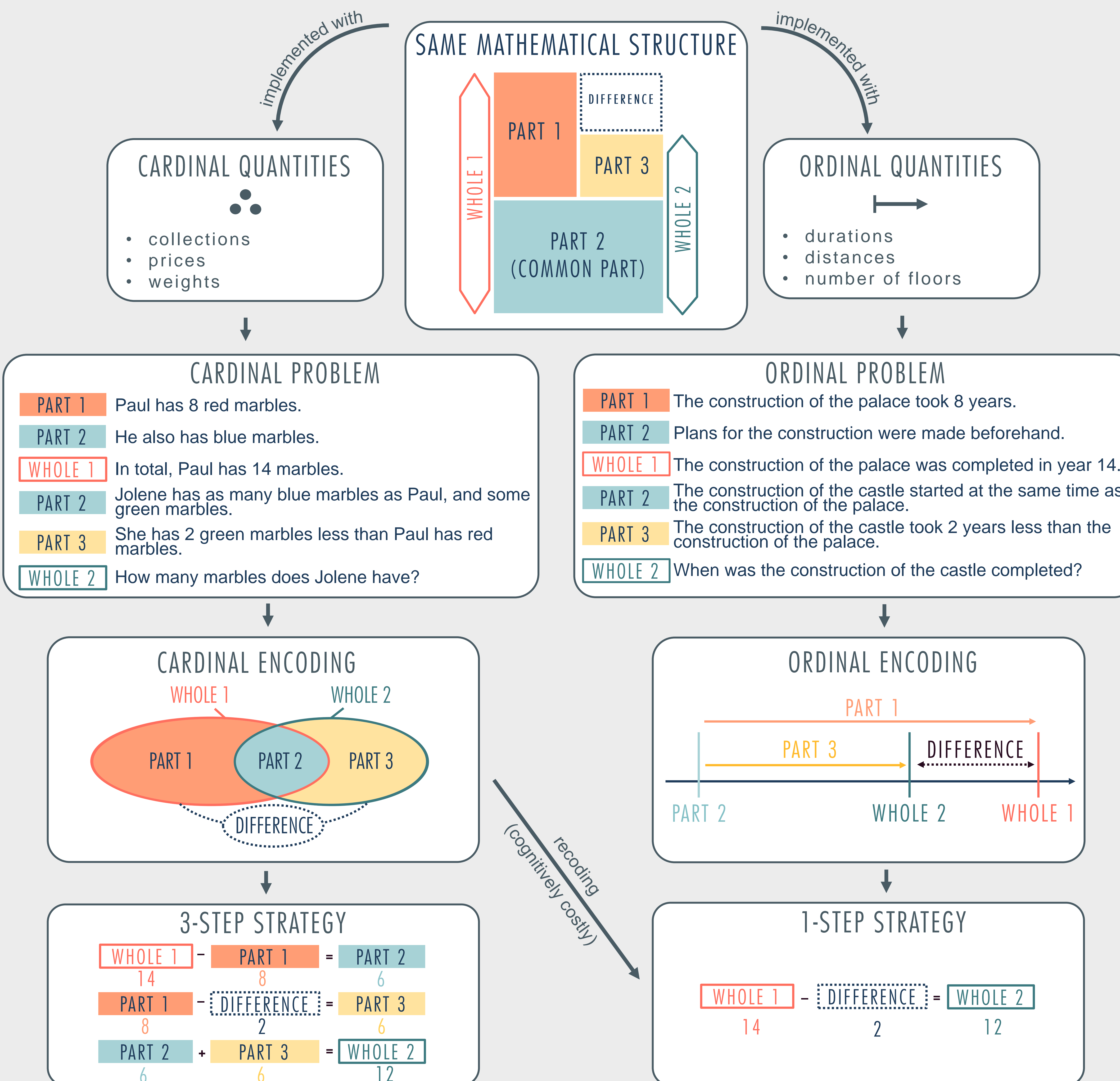
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What makes it possible to consider a problem from **different perspectives** and find a counter-intuitive solution? **Cognitive flexibility** is thought to play a crucial role in helping learners **recode** their initial encoding of a situation (Clément, 2022; Gros & Gvozdic, 2022). Yet, identifying the best conditions to promote such flexibility remains an arduous task, especially since recoding is **cognitively costly** (Gros et al., 2019). According to **Cognitive Load Theory** (Sweller, 2015, 2016), varying the amount of available cognitive resources may either foster or hinder performance on a task (Sweller et al., 2019; Puma & Tricot, 2019). Here, we investigated the **interaction** between cognitive flexibility and cognitive load using **arithmetic word problems** whose optimal solution requires a perspective change (Gros et al., 2021).



➤ Will an **increase in cognitive load** have a **stronger effect** on **cardinal** problems than on **ordinal** problems?

EXPERIMENT 1



PARTICIPANTS

145 French students ($M = 31.26$ y, $SD = 13.00$ y)



DESIGN

Online experiment with 12 problems and a dual task.
 - 6 **cardinal** problems (requiring a recoding)
 - 6 **ordinal** problems (no recoding necessary)



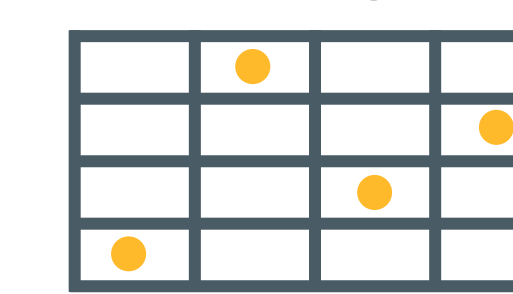
PROBLEM SOLVING INSTRUCTIONS

"Try to solve the problems using as few steps as possible"

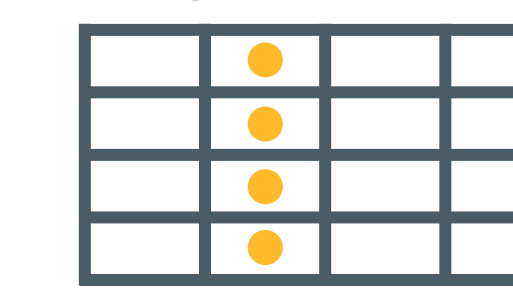


COGNITIVE LOAD VARIATIONS

Extraneous cognitive load added using a *dot memory* task.



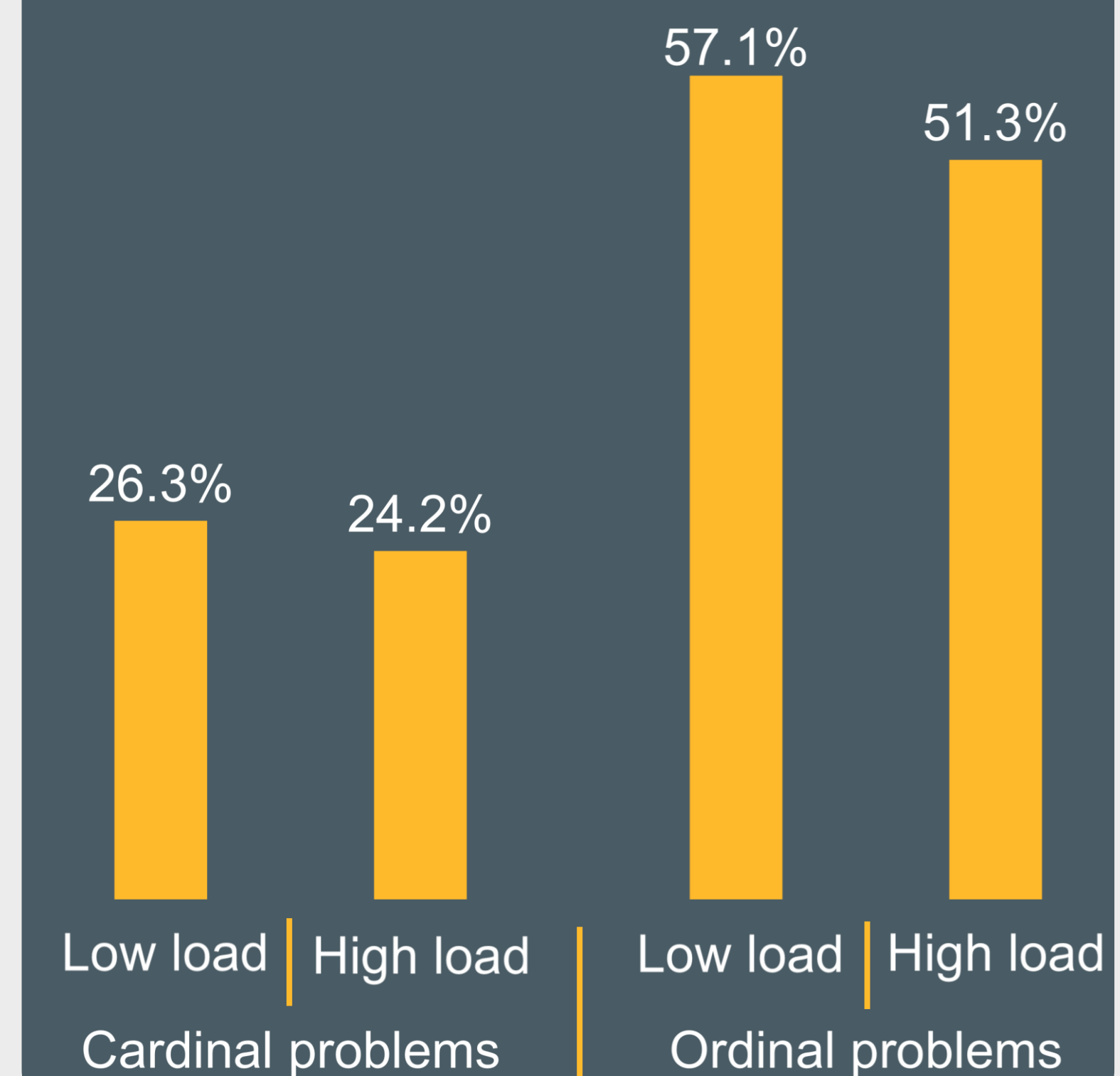
high load



low load

PRELIMINARY RESULTS

Rate of use of the 1-step strategy for problems with correct dot recall



EXPERIMENT 2



PARTICIPANTS

40 English speaking Mturkers ($M = 41.21$ y, $SD = 9.82$ y)



DESIGN

Online experiment with 18 problems.
 - 6 **cardinal** problems (requiring a recoding)
 - 6 **ordinal** problems (no recoding necessary)



PROBLEM SOLVING INSTRUCTIONS

"Try to solve the problems using as few steps as possible"



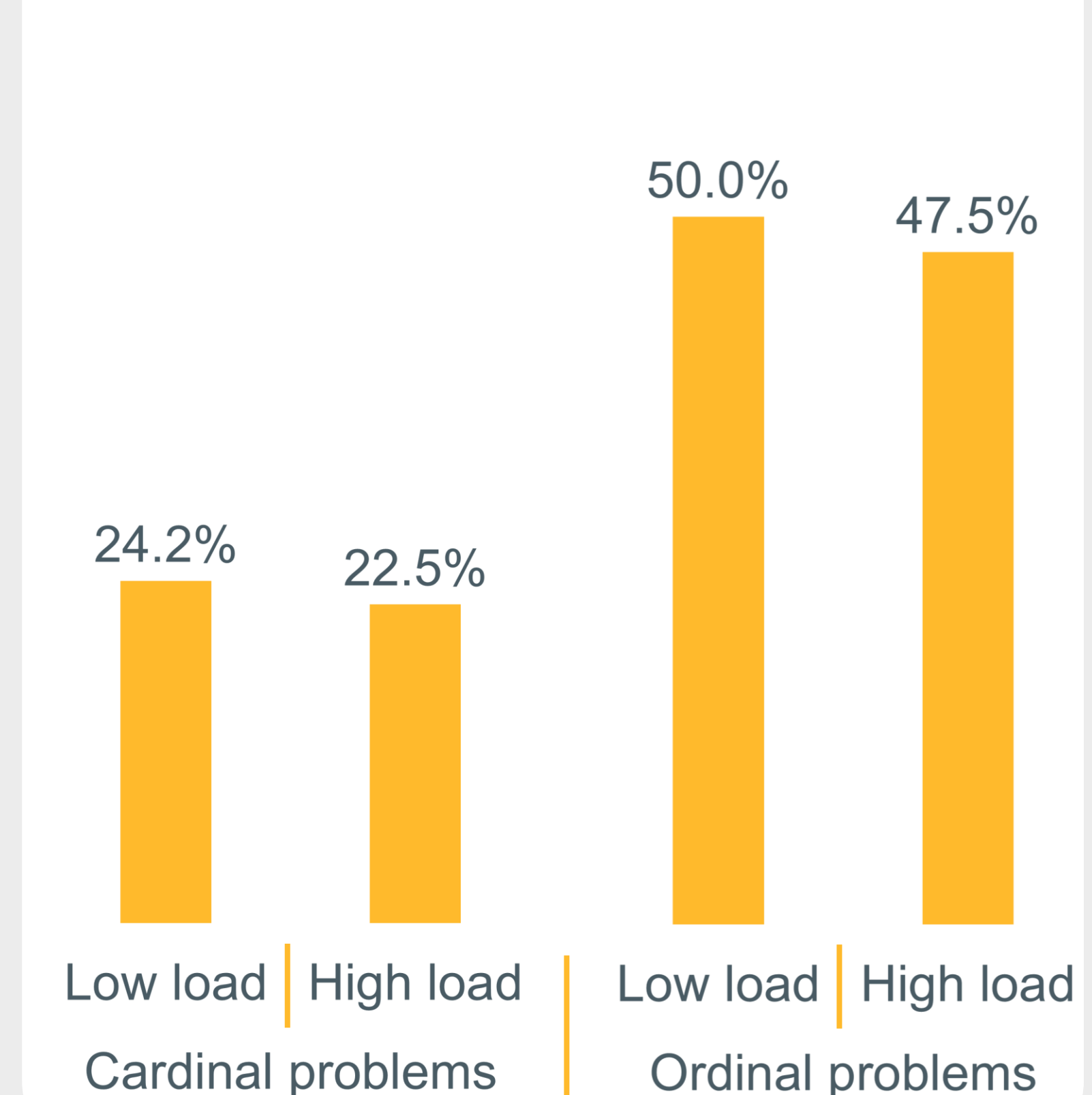
COGNITIVE LOAD VARIATIONS

Intraneous cognitive load variations using different numerical values.

- **Lower** range values (e.g., 8; 14; 2)
- **Higher** range values (e.g., 83; 148; 26)

PRELIMINARY RESULTS

Rate of use of the 1-step strategy



DISCUSSION

Although these results are only preliminary, it appears that in both experiments, the effect of the **cardinal-ordinal** distinction **overshadowed** that of the **cognitive load**. Surprisingly, the variations of cognitive load (either extraneous or intraneous) **did not seem to interact** with the type of problem used. We intend to further investigate this issue by introducing stronger variations in cognitive load.

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