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The Basics:

1. What was the broad question being asked by this research project? What was the specific question being asked by this research project?
    a. Summarize the background information on the research topic in three sentences.
    b. What is the gap in the literature identified by the researchers? What question(s) are they trying to answer? What is their hypothesis and what should happen if the author's hypothesis is true?
    c. What are alternative hypotheses?

General: How does divided attention impact memory for important or valuable information?
Specific: If a learner is studying while multi-tasking or more passively distracted, will that matter to how much divided attention impacts later memory?
Background: They go over the costs of multitasking, and also suggest that you can sometimes remember the most critical information even when you're of a participant group or in a circumstance that might be associated with memory impairments, but that this effect requires an awareness of the distractors around you. People generally know that divided attention is bad, but they tend to not think about it in relation to themselves and don't adjust their own performance. Divided attention also reduces cognitive resources.

Hypothesis-1: The costs of multitasking may not be as bad for simple distractors relative to a divided-attention task, so there might not be differences in 'strategizing' across distractor/divided attention types.
Hypothesis-2: Multitasking could hurt memory such that people in the divided attention condition vs. distractors start prioritizing the most important information to accommodate for their divided attention.

2. What experiments were done to test the hypothesis or investigate the research question?
    a. Explain the task design – what are participants instructed to do and what is being measured? Think about the independent and dependent variables.

E1: undergraduate students studied six lists of 20 words while completing a digit-detection task (press space bar when they heard a sequence of three odd digits) or listening to unfamiliar or familiar background music (six songs each from pilot study corresponding to each studied list). Have an original and replication sample of N = 96. Pertaining to open science: acknowledged that familiarity with background music was *exploratory* and not something they had hypotheses about from the start. 4 conditions: full-attention, divided attention, familiar music, unfamiliar music. Memory is explicit: told they would have to recall those words. Replication experiment folks also completed a working memory capacity task. Open science related: they basically said that working memory capacity didn't affect any of the results, so you can contact the author for those results (instead of putting in a supplementary text? Or just posting online). They manipulated how important each item was by assigning them different "point" values.

E2: The digit detection task might have been too hard, so then you don't know whether participants paid attention to the high-value items in spite of divided attention or whether

attention was just not divided (i.e., they did so poorly, it's hard to tell whether they actually made doing the task well a real goal). So they used three different tone detection tasks (low vs. high-pitched tones) that were presented simultaneously during the word item's presentation. 1-back condition: current tone same as previous tone? Tone-monitoring condition: high or low tone? Paired-tones condition: are the two tones the same?

3. What evidence supports each of the conclusions?
    a. Before you read the discussion, summarize the main findings and link each one back to the research question(s). How does each result inform the hypothesis?

E1: People did poorly on the digit-detection task. People in the divided-attention condition remembered fewer words than participants in the other conditions (Figure 1, Table 1). Participants were more likely to remember the words that had a higher point value (Figure 1, Tables 2-3), and this effect increased with continued task experience (Figure 2 – i.e., a learning/practice effect). They confirm these effects with Bayesian analysis, quantifying the evidence for the null hypothesis relative to the alternative.

E2: Participants in full-attention condition remembered more items than people in the other three conditions (Table 4). The number of items recalled increased with experience on the task. No differences among the 3 conditions. Again, participants tended to remember higher value items with more experience on the task (Figures 4-5; Tables 5-6). Performance on the tone detection tasks was better than the digit-detection, so they felt that this task did divide attention.

4. What are the major conclusions?
    a. What do the results add to the field? How do the researchers interpret their findings? Summarize any limitations identified by the researchers.

Despite impaired recall in the divided-attention conditions (tone-detection conditions, digit-detection task) (but not music), participants also remembered individual items that were "worth" more points on the task with more experience, suggesting that they selectively attended to items that were worth more.

The Critique:

1. Is the paper well written? How do you know? For week 2 & later, use this space to practice headlines & summaries of the articles via tweets.

I found some of the writing to be obscure. It seemed like they stated their hypotheses many different times, but each time it was a phrasing that was a bit confusing, and some of the subtleties were hard to grasp.

Example tweet summaries and/or headlines will be detailed in class.

2. Do the conclusions seem logical given the data processed? Why or why not? Another way of thinking about this: do the results adequately support the conclusions that are drawn? Are there alternative explanations for the findings? What inferences about the hypotheses and questions can be made based on these results?

Yes and no. I think their results are the function of their study design. It's hard to say that pple

were “strategizing” when they ended up remembering the higher point items; they don’t have any report or methods really to measure that. How much is the memory recall a function of working memory? They refer to “encoding” but recall is right after each list presentation.

3. Are the conclusions important? How do you think this relates to everyday behavior?

I think it’s important to consider how factors around us may impede our own memory and result in unanticipated effects from multitasking. I think I’d be interested in knowing more about the ‘strategies’ the authors posited at the beginning, with regard to how people can become aware of their own multitasking and how bad that is for them.

4. What were the best aspects of the research presented, and how could the research be improved? Name at least one way to improve the experiment.

The conditions aren’t equal: the people in the music condition didn’t have to detect anything while listening to music, but the people doing a digit span task did. On one level, the music is sort of ‘attentional capture’, while the digit span task is about goals (told by expter to do this task). The same goes for the tone-detection conditions – now it’s about competing top-down goals, but is that the same as the real-world examples they set up at the beginning?

I would’ve liked to see them test participants’ memories for the unfamiliar songs. If they were just completely ignoring the songs, they shouldn’t do better than chance performance. It’d also have been interesting to know whether or not they remembered the temporal order of how songs were played to them; again, if they paid some information to the songs, perhaps their encoding of the order would’ve been better. Real-world multi-tasking does often have the conflicts that they mentioned at the start of the study, and this study doesn’t seem to mimic the same “stakes” in remembering the information. Moreover, in the example of students studying material, many teachers don’t tell them the most important information to remember.

5. How would you follow-up this experiment or study?

See comments above. I also think that the real-world version of this is that students either know what the ‘highest value’ items are or they do not – not a version where they learn the task over time and recognize how many high value items there are.

Additional Resources: What are the basic concepts that you need to know to understand the science presented in your paper? What other information or resources would help you better understand the paper? This is helpful to consider for your science communication pieces. *Selective attention, divided attention, working memory capacity*, etc.

Further Questions:
Write at least five comments or questions about the article to discuss with the class.

1. Does this match what you would think of multitasking?
2. Why do you think the unfamiliar/familiar music didn’t result in differences?
3. Are you generally aware of multitasking being bad for memory but do it anyway?
4. Do you think that you strategize when multitasking?
5. Do you think we would get different results with multitasking in different forms (e.g., driving a car – automatic behavior – while listening to an audiobook)?