Superior Memory: An example of the benefits of examining individual differences in cognitive psychology

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The Benefits of Considering Individual Differences in Cognitive Psychology, with the Example of Highly Superior Autobiographical Memory: Commentary on Logie (2018)

I agree with Logie (2018) that there is potentially much to be gained now from cognitive psychology research that investigates individual differences. I would add the caveat, and Logie alludes to this too, that the traditional approach of comparing experimental conditions has been more productive than any other and has led to useful general theories (and descriptions of cognitive phenomena) in the areas of perception, attention, memory, and reasoning. Research with experimental-condition comparisons utilizing random assignment has revolutionized psychology and brought a well-rounded understanding of the mind that far surpassed the contribution to psychology before the field used such methods. Nevertheless, because many reliable foundational theories (or general principles) have now already been established using this experimental method, it may now be a good time to incorporate more individual differences research, including investigating of how different people perform the same research task (as Logie suggests). Such research could either modify general theories or generate specific explanations of cognitive phenomena within a narrow focus (e.g., explanations of mechanisms within atypical samples).

Consider as an example the usefulness of individual difference measures in research on people with highly superior autobiographical memory (HSAM; LePort et al., 2012; Parker, Cahill, & McGaugh, 2006; Patihis et al., 2013; Patihis, 2016). People with HSAM report being able to remember autobiographical information from almost every day in their lives (usually from mid childhood onwards, with the date and day of week recalled as well). Individuals with HSAM also demonstrate very high accuracy in recalling important news events and date of those events. In general, people with HSAM do not appear to use mnemonic techniques to help them

remember (in contrast to memory athletes; Wilding & Valentine, 1994). HSAM is puzzling because it initially appeared unclear whether general theories of memory would have to be changed to explain HSAM, or whether specific explanations would emerge to help understand HSAM within those existing broad theories. The study of individual differences in HSAM appears to have achieved the latter. Although there was some discussion as to whether HSAM demands an adjustment of basic memory theory (e.g., Marshall, 2008), basic theories of memory remained intact, and indeed aided in explaining HSAM in a grounded way. Before such basic cognitive research (i.e. before the 1960s) we would have been much more likely to be taken in by HSAM, and to conclude that some people record memories like a videotape. That didn't happen, at least within the research community (unfortunately in the media it was a different matter, e.g., see House, 2015). What did emerge were specific explanations of probable mechanisms within the small group of people with HSAM.

Based on past experimental memory research, and existing models of memory, we were skeptical that people with HSAM recalled autobiographical information like a video camera as had been reported anecdotally by some individuals with HSAM. We wondered whether people with superior autobiographical memory reconstruct memories from memory traces as had been found in previous experimental work with undergraduate participants. Cognitive psychology experiments with undergraduates established some general theories and findings. These include theories and findings related to attention (what is not attended to is mostly lost; Treisman, 1969; Treisman & Gelade, 1980); short term and long term memory (e.g., Atkinson & Shiffrin, 1968), working memory (Baddeley & Hitch, 1974), the reconstructive nature of memory (e.g., Bartlett, 1932; Loftus, 2005; Kolodner, 1983), and domain specific expertise (Ericsson & Charness, 1995). All of these theories, in combination, guided us to be skeptical that HSAM individuals

were remembering everything, that they were doing so without error, and that they were doing so in a way akin to recording a video. That skepticism turned out to be warranted, and was an excellent guide for our research program.

What researchers found is that people with HSAM had domain specific memory ability that did not extend to other aspects of memory (LePort et al., 2012; LePort, Stark, McGaugh, & Stark, 2016; LePort, Stark, McGaugh, & Stark, 2017) and importantly did not appear to contradict the theory that memory is stored as partial traces and reconstructed (Patihis et al., 2013). We found, for example that HSAM individuals had about average susceptibility to associative memory errors (false recognition of words that were not presented in lists, but were associated semantically to words that were presented), something we would have predicted from past research, but not from anecdotal self-report. This was one clue that supported the hypothesis that their memory may be reconstructed using a combination of memory traces and current knowledge and cognitions, rather than the hypothesis that individuals with HSAM possess photographic memory. We found that HSAM individuals were also susceptible to changing their memory of photographic slideshows when misleading suggestions were embedded in post-event narratives. We also found that a similar percentage of HSAM individuals were susceptible to distortion of their memory of non-existent footage of a plane crash on September 11th, 2001, compared to age-matched controls. All of these results did not overturn our basic theories of reconstructive memory, source monitoring, the bottleneck of attention, the decay of memory, nor of consolidation theory. The value of the research was that it was potentially a risky experiment (see Popper, 1962) that could potentially have revealed falsifying evidence of those preceding theories and explanations of how memory worked. By putting people with the strongest memories known to science—some of whom reported recalling

memory like a video—through memory experiments that measured whether their memory was reconstructive and malleable, we in effect supported those previous theories. We might speculate that all people are susceptible to reconstructive memory errors, even those with strong memory.

To further attempt to explain the phenomenon of HSAM, various researchers used a number of individual differences measures (LePort et al., 2012; LePort et al., 2017; Patihis, 2016). Although this research led to no modification of general memory theories, it was very effective in generating plausible specific hypotheses of this rare memory ability. From this research, it became plausible that the reasons why HSAM individuals remembered so much autobiographical information were the tendency to obsess (LePort et al., 2012), the tendency to become fully absorbed into new events, and the tendency to be highly imaginative (i.e., fantasy prone; Patihis, 2016, effect size r = .58). Other plausible explanations complement these (e.g., biology of the brain; LePort, 2012; Santangelo et al., 2018). These tendencies to obsess, absorb, fantasize, and imagine deeply would need to be stable over decades in order to result in daily strong consolidation. That consolidation would be aided by absorption into events as they occur and the rehearsal that accompanies tendencies to fantasize and obsess. This also would explain why people without these tendencies do not develop HSAM. People without HSAM may be able to mimic people with HSAM by practicing similar attentional and memory processes for a few days, but without the underlying personality tendencies, they will not keep that going for years and decades. Without using these individual differences measures, we would still be blind to how and why this unusual memory ability exists. Although individual differences research is often correlational (e.g., in HSAM research you cannot experimentally manipulate personality or hippocampal size for the long time frame necessary), such research helped us form plausible hypotheses.

Although the investigation into HSAM did not modify general memory theories, on occasion the investigation of unusual individuals and/or individual differences measures may change or generate such theories. A classic example of this is the case of H.M. (Scoville & Milner, 1957; Milner, Corkin, & Teuber, 1968). Bilateral removal of hippocampi revealed that the temporal area of the brain is important in forming new memories, and this research in turn aided in the formation of general memory theories, including memory consolidation theory (e.g., see McGaugh, 2000; Squire, 1986; Squire & Alvarez, 1995). So not only can consideration of individual differences help form specific explanations for individuals with unusual cognition, it sometimes can help generate or modify general theories.

Logie (2018) presents some interesting arguments for more individual difference considerations in cognitive psychology. At this stage, with many general cognitive processes apparently explained, a focus on individual differences may be fruitful. In this commentary, I gave the example of how individual differences helped us understand superior autobiographical memory. In other memory distortion research even null relationships between cognitive tasks and individual difference measures can be illuminating (e.g., Bernstein, Scoboria, Desjarlais, & Soucie, 2018; Patihis, Frenda, & Loftus, 2018). Such null results might suggest the cognitive processes in question are not especially trait dependent, and instead may be dominated by cognitive mechanisms common to all (see Patihis, 2018). Logie suggests that we are yet to fully investigate how different people use different cognitive mechanisms for the same task, and this would be interesting to investigate further. Although Logie's emphasis is on considering individual differences, cognitive psychology's initial approach of comparing aggregate experimental groups on a task has been productive, and will probably continue to be so in the future.

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Cognitive learning is a style of learning that focuses on more effective use of the brain. To understand the process of cognitive learning, itâ€™s important to know the meaning of cognition. Cognition is the mental process of gaining knowledge and understanding through the senses, experience and thought. Cognitive learning theory merges cognition and learning to explain the different processes involved in learning effectively. The cognitive learning process aims to chart the learning process for optimal thinking, understanding and retention of what we learn. When you master the fundamentals of c... In describing memory phenomena in natural language, a spatial metaphor is typically employed. Memories are considered to be objects that are stored in a mind space, and the process of retrieval is conceived as a search for these objects. It is argued that this metaphor has been carried over into many of the popular theories of memory in cognitive psychology and that seemingly diverse theories employ the same underlying set of assumptions.Â The spatial metaphor is evaluated, and the role of analogical explanation in psychology is briefly considered. One result of the increasing number of analogical models is the proliferation of hypothetical mental constructs that are only loosely connected to behavioral measures. â€œThe psychology of individual differences is largely the study of group differences. This study classifies individuals by age, traits, sex, race, social class and so on, and observes the differences within and between those groups. Physical, mental, social and cultural differences etc. are being studied, under individual differences.â€ â€“ John P.De Ceeceo.Â Spranger, for example, has classified personalities into six types: (a) Theoretical, (b) Economic.Â Individual differences are caused by economic condition of the parents and the education of the children. It is not possible for the children of two economic classes to have a similarity and equality. Role of Individual Differences in Education Lecture 2. History of cognitive psychology â— Historical roots of cognitive psychology. Structuralism (Wundt). Functionalism (James).Â Sperling's experiments on sensory memory. The difference between short-term memory and working memory. Structure of long-term memory (E. Tulving). Lecture 6. Memory errors and distortions â— Theories of forgetting (displacement, trace decay, repression, interference). â— Eyewitness testimony.Â Jeopardy game on general knowledge in cognitive psychology Individual home assignment: 1) Read all your lecture notes and recommended literature to prepare for the Jeopardy! 2) Choose one of the categories and prepare 3-5 questions for your classmates (you will not. be able to answer your own questions). Cognitive psychologists, however, have been more concerned with the science of cognitive control (e.g., Cohen, Dunbar, & McClelland, 1990; Miller & Cohen, 2001; Monsell & Driver, 2000) and afford it more importance in infor-mation processing (e.g., Pashler, Johnston, & Ruthruff, 2001).Â The â€œcocktail party effectâ€ is a good example of attentional capture (e.g., Conway, Cowan, & Bunting, 2001).Â Individual differences in WMC should influence how well the accessibility of representations is managed and behavioral expres-sions are controlled in situations in which there is distraction or interference, or in situations that are novel or that involve some time pressure. The concept of WMC is closely tied to the tasks that are used to measure it.