Working memory model essay | an analysis

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The model of working memory is a multi-component model, developed in 1974 by Baddeley Hitch. The model is based on an earlier model of memory called the multi-store model (MSM) (Atkinson & Shiffrin, 1968). The WM model was established in order to overcome the problems that arose due to the simplicity of the MSM. There is strong empirical research evidence supporting two of the components of the WM model. However, very little empirical research exists that can support the most important component of the model, the central executive (CE), and the most recent addition to the model, the episodic buffer (EB).

The CE is a processor of information of any modality; it is a system that coordinates the other ‘ slave’ systems of WM, enabling information to travel in a bidirectional manner between long-term memory (LTM) and WM, and also allocating mental resources appropriately. The CE also has control of our attention, in terms of what information we obtain from the environment. The capacity of the CE is limited, explaining why it controls the direction of our attention to correctly have control of what our senses perceive from our surrounding environment. However, the CE is a speculative concept, therefore cannot be easily researched. Considering the WM model is formed on the basis of the CE controlling the ‘ slave’ systems, it is difficult to perceive the accuracy of this model of memory with little empirical evidence to support the foundation of the model.

The phonological loop (PL) has a limited capacity and works when acoustic information activates the auditory system neurones in the brain. The information is ‘ heard’ and then held in the phonological store (PS) for approximately 1-2 seconds, decaying afterwards if not rehearsed. A

secondary component called the articulatory control process allows for sub-vocal rehearsal of information stored in the PS to occur, therefore the information continues on the PL and decay is stopped.

Research conducted by Baddeley et al. (1975) provides strong empirical evidence which proposes that the capacity of the PL is related to the speed of speech during sub-vocal rehearsal. Evidence shows that participants were better at recalling from a list of short words, rather than longer words. This suggests that during sub-vocal rehearsal, more words can be rehearsed in the 2-second time frame from the shorter list, thus showing improved memory span among participants. Further evidence comes from Baddeley, Lewis & Vallar, (1984), who found that PL capacity decreases when articulatory suppression occurs. This is where irrelevant speech during a task, ‘ fills up’ the articulatory control process, and suppresses sub-vocal rehearsal. Although this research supports the idea of articulatory suppression, the extent to which this research is significant can be questioned. This is because “ memory span may drop on average from 7 to 5 digits” (Baddeley, 2000, p. 417) which suggests the auditory information has not decayed, and is still being stored in the STM. Therefore because the level of support this research supplies is questionable, it decreases the strength of this model.

A second ‘ slave’ system from the working model of memory is the visuo-spatial sketch pad (VSSP), which is responsible for the storing and processing of visual and spatial information. The ‘ mental rotation task’ (Shepard & Metzler, 1971) provides an example of how the VSSP works within WM, demonstrating that participants can mentally rotate a 3D shape made out of

cubes in order to identify if two shapes are identical. Research found that the more the shape was rotated, the more difficult the participant found the task of rotating and identifying the shape, demonstrating the functioning of the VSSP.

Like the PL, the VSSP also has limited capacity and duration of information storage. However, the two components are assumed by Baddeley & Hitch to be two distinct components. To test this, Baddeley et al. (1975) used a dual-task paradigm called the ‘ Brooks matrix test’ (Brooks, 1967) that required the use of either spatial (VSSP), or verbal (PL) components, alongside, either, a pursuit tracking task involving spatial processing, or on its own. The outcomes of the studies provided evidence consistent with Baddeley et al.’s assumptions. However, when both tasks required the same processing system (VPSS), performance decreased as a result of competition. This provides empirical evidence for the roles of both the PL and the VSPP, emphasising the multi-component nature of the WM model.

In the year 2000, Baddeley added another ‘ slave’ system to the WM model, called the episodic buffer (EB). The role of the EB is to connect information across the modalities; so that the three components can be manipulated and have chronological and episodic meaning. However, this is a newly constructed, very abstract component requiring in-depth research in order to provide empirical evidence for its functioning within WM. As of date, there is little research evidence to support, nor oppose the role of the EB, therefore proving a weakness to the overall accuracy of WM as a model of memory.

The WM model and its components have been extensively researched, developed and built on by Baddeley and his colleagues over many years. This suggests that although the model defines memory in a way that has been successfully empirically tested, it is still a simplistic model of memory, constrained by its speculative nature and in need of further study in order to accurately define a true model of WM. As Baddeley explains in his own report in 2000, “ unravelling the complexities [of the working model of memory] is likely to provide a fruitful and potentially tractable activity for many years to come.” (Baddeley, 2000, p. 423)