Spanning attention: what really goes on between perception and action?

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Abstract

In human factors and ergonomics, the most widely accepted model of attention in information processing is Wickens' (1980) multiple resources theory. Nevertheless, in its purest form, the multiple resource model does have its flaws, such as how to explain problems with mental underload, and why two tasks that ostensibly draw on separate resource pools can still interfere with each other. Meanwhile, in the psychological literature, Baddeley's (1986) working memory model has many echoes to multiple resource theory, yet there is surprisingly little acknowledged overlap between the two. This paper presents a review and critique of these key models in the cognitive and human factors literature, and draws synergies across them to propose a more parsimonious role for attention in the human information processing chain. Whilst neither multiple resources nor working memory alone offer all the answers, the key conclusion from this discussion is the need for a general reservoir of attentional resources which feeds the modality-specific subsystems. Although taking a theoretical perspective, the issues are relevant to a variety of applied contexts where dynamic human performance depends on the balance between task demands and available resources.

Introduction

For nearly 30 years now, performance modelling and prediction in human factors and ergonomics has been largely dominated by one approach: the multiple resources theory put forward by Wickens (1980, 2002). Wickens (ibid.) deduced the existence of separate pools of resources as a response to, and to account for, observations of dual-task performance which were expected to result in interference. Whilst multiple resources theory (MRT) has rightly become the seminal applied model in this field, for the closely related discipline of cognitive psychology it is working memory (WM) which attracts all of the pure, theoretical research. Baddeley's (1986, 2003) model was developed as an advance on more simplistic categories of memory, but as an active system it seems to account for similar phenomena as MRT, and even has a familiar structure to it. Where MRT has visual/spatial and auditory/verbal pools, WM invokes the visuospatial sketchpad and the phonological loop. Thus whilst the two models hail from different backgrounds and purport to address different