### Single and Dual-Process Theories of the Remember-Know Paradigm

When we remember episodes, we can experience the retrieval of information in different ways. These different experiences can be observed experimentally in the remember-know (RK) paradigm introduced by Tulving (1985). In RK tasks, subjects must judge whether items were previously seen (i.e. recognised) and critically, report the basis for their judgements: either they “remembered” the prior occurrence of the item (R) or that they simply “knew” that they had seen it without any accompanying information about the prior occurrence (K). As a concrete example of these experiences, imagine seeing a man on the bus: you feel that you have met before, but you cannot quite remember who he is. Concentrating, you consider and eliminate some possibilities: he is not a co-worker, a relative, or a celebrity. Eventually, you remember seeing him behind a glass counter with cuts of meat-- he’s the butcher from the supermarket! This, Mandler’s (1980) classic “butcher on the bus” example, illustrates the difference between remembering and knowing, and the attached explanation makes some assumptions about how we arrive at these different states of awareness about the past, principally that there are two memory processes at work. First, there is an initial “context-free” feeling of familiarity that enabled recognition of the man without conscious control, followed by a conscious, effortful search process which enabled his identification. Explanations such as this one, which involve two qualitatively different memory components, are known as *dual-process* models of episodic memory retrieval. Generally, these processes are referred to as familiarity, which corresponds to the first process in the prior example, and recollection, which corresponds to the latter, although the precise distinctions between the two processes vary between specific models which fall under the dual-process framework (Atkinson & Juola, 1974; Gardiner, 2001; Jacoby et al., 1997; Rajaram, 1996; Raaijmakers & Shiffrin, 1992; Yonelinas, 1994). In Gillund and Shiffrin’s (1984) Search of Associative Memory (SAM) model, recognition involves a global matching process, whereas recall involved cue-dependant sampling and recovery [dual-process structure can be seen in many models]. In the influential Yonelinas (1994) dual-process model, familiarity is characterised as a continuous measure of the likelihood the stimulus was previously encountered, while recollection functions in a discrete fashion and is subject to a threshold, such that it returns the full episode of the previous encounter on a proportion of attempts but fails absolutely otherwise. We return to this particular dual-process model later in relation to source memory. The dual-process framework naturally explains circumstances where the man is not identified as the butcher: familiarity has enabled recognition, but recollection has failed (Jacoby et al., 1997). Although intuition may tempt a direct mapping of familiarity and recollection, as processes, to knowing and remembering, as outcomes respectively, there are two complications that should be noted. The first reason is that RK judgements are not process-pure, meaning that recollection as well as familiarity can contribute to successful recognition, which is a general criticism of attempts to dissociate consciously controlled and unconscious influences on cognitive tasks (Wainwright & Reingold; 1996; Wixted et al., 2010). The second reason is that two different memory outcomes do not necessarily imply the existence of two retrieval mechanisms, and *single-process* models which take this view offer competing explanations of these distinctions. The SDT interpretation of RK judgements is that the difference between responses is where this criterion is placed: stimuli which exceed an initial criterion elicit a “know” judgement, while stimuli that also exceed a higher criterion are further deemed to be “remembered” (Figure 2).

In single-process accounts of the RK paradigm, “remember” and “know” judgements reflect different levels of confidence imposed on the product of a single retrieval mechanism, such that remembering requires a more stringent decision criteria (i.e. a higher level of confidence) to be met than knowing (Donaldson, 1996; Dunn, 2004; Hirshman, 1998; Inoue & Bellezza, 1998; Ratcliff et al., 1995). This approach draws on the terminology of the signal detection theory (SDT) so is referred to as the SDT interpretation (Dunn, 2004).

Diagram

Description automatically generated

The difficulty with distinguishing between dual-process and SDT explanations of the RK paradigm lies with limitations of the task. To distinguish between recollective and nonrecollective memory, we cannot rely on introspection/subjective judgement as with the RK procedure (Wixted et al., 2010). One way of addressing this is to use separate tasks, like recognition and source memory tasks, which differ in the demands placed upon memory. [Need to expand if keeping in]