Editorial

Accuracy, Causes, and Consequences of Monitoring One's Own Learning and Memory

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People have a striking capability to learn and remember information, but at the same time, they are prone to suffer from forgetting and memory flaws such as false memories. It is therefore crucial that people would be able to distinguish between their own memory successes and memory failures. To do so, they create a mental model of their ongoing memory-related cognitive activity, a process known as metamemory monitoring (Nelson & Narens, 1990). When learning for an upcoming exam, for example, learners can monitor their learning by assessing the likelihood that they will remember the studied materials on the exam and distinguishing between materials that they are already likely to remember and materials that require more study (Rhodes, 2016).

In a previous topical issue of *Zeitschrift für Psychologie*, we addressed new directions in metamemory research (Undorf & Halamish, 2020), focusing on new methods (e.g., computational neuroimaging, Kelley et al., 2020), and emerging research questions (e.g., reactivity of metamemory judgments, Halamish & Undorf, 2020; Tekin & Roediger, 2020; role of fluency vs. beliefs in metamemory, Kuhlmann et al., 2020; Mendes et al., 2020). The collection of papers in this topical issue addresses a long-standing issue in metamemory research: the accuracy of metamemory monitoring, its causes, and its consequences.

Monitoring accuracy has been a key research topic since the very early studies on metamemory monitoring. Initially, researchers assumed that monitoring is based on direct access to the ongoing cognitive activity and therefore is always accurate (Hart, 1965). Soon enough, however, it turned out that although monitoring judgments are quite accurate by and large, they reveal striking errors and biases under certain conditions (e.g., Benjamin et al., 1998) such as over- or underconfidence, a failure to distinguish between to-be-remembered and to-be-forgotten items, and a failure to take the effect of various factors (e.g., study strategy, retention interval, material difficulty) into account when monitoring memory performance (Rhodes, 2016). These findings gave rise to the notion that rather than having direct access to memory, metamemory monitoring is inferential in nature. People utilize various cues to infer the state of their learning and remembering, and the validity of these cues determines the accuracy of metamemory monitoring (Koriat, 1997). Research further suggests that the accuracy of metamemory monitoring has crucial consequences, as people self-regulate their learning and remembering based on the monitoring output (Metcalfe & Finn, 2008; Murphy & Castel, 2020). Therefore, accurate metamemory monitoring supports effective self-regulation of learning and remembering, and there is much to gain by fostering more accurate monitoring.

The collection of papers in this topical issue of *Zeitschrift für Psychologie* provides novel insights into the accuracy, causes, and consequences of metamemory monitoring.

Hausman et al. (2021) systematically review research on strategies that help students to accurately monitor their learning and understanding in educational settings. Based on the reviewed research, they present practical suggestions for how students and teachers can improve monitoring accuracy. Their recommendations are captured by the wait-generate-validate principle: *Wait* before you judge your learning, *test* your memory by actively generating the studied information, and *validate* the content you have generated.

Improving monitoring accuracy, however, does not necessarily improve performance. Dunlosky et al. (2021) examine boundary conditions for beneficial effects of highly accurate monitoring of learning on self-regulation and performance. Three experiments showed that excellent monitoring accuracy enhances restudy efficacy provided (1) that learners effectively control their restudy decisions, (2) that restudying promotes learning, and (3) that memory performance prior to restudying is imperfect. This study reconciles prior discrepancies in studies on the

consequences of memory monitoring and reveals when excellent monitoring can benefit self-regulated learning and learning outcomes.

The other two papers in this issue focus on the relations between characteristics of learning and memory and the accuracy of metamemory monitoring. Clark et al. (2021) report six experiments that address how memory and metamemory for word pairs are impacted by errorful generation – wrongly predicting the target word prior to encoding. Their study showed that memorial benefits of errorful generation are confined to conditions under which learners make semantic guesses for semantically related word pairs. Importantly, judgments of learning (JOLs) indicated that learners were metacognitively unaware of the beneficial effects of generating errors. Thus, Clark et al. (2021) demonstrated that errorful generation leads to inaccuracies in memory monitoring.

Toth and Daniels (2021) examine the accuracy of JOLs for controlled and automatic forms of recognition memory. Across two experiments, participants studied and recognized names, faces, or faces and names of better- and lesser-known actors. At the test, recollect/familiar/no-memory judgments were used to assess the subjective experiences associated with memory retrieval. Results showed that prior knowledge increased JOL accuracy, whereas adding contextual details at study impaired JOL accuracy. Also, JOL accuracy was more strongly tied to recollection than to familiarity.

In sum, the four papers in this topical issue reveal factors that predict the accuracy of metamemory monitoring during learning, highlight strategies that can be used to increase it, and clarify under what conditions accurate monitoring is expected to enhance learning outcomes. Taken together, this collection of papers provides important new theoretical and practical insights into the nature, causes, and consequences of metamemory monitoring accuracy.

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