



The effects of divided attention at study and reporting procedure on regulation and monitoring for episodic recall



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ABSTRACT

Eyewitnesses regulate the level of detail (grain size) reported to balance competing demands for informativeness and accuracy. However, research to date has predominantly examined metacognitive monitoring for semantic memory tasks, and used relatively artificial phased reporting procedures. Further, although the established role of confidence in this regulation process may affect the confidence–accuracy relation for *volunteered* responses in predictable ways, previous investigations of the confidence–accuracy relation for eyewitness recall have largely overlooked the regulation of response granularity. Using a non-phased paradigm, Experiment 1 compared reporting and monitoring following optimal and sub-optimal (divided attention) encoding conditions. Participants showed evidence of sacrificing accuracy for informativeness, even when memory quality was relatively weak. Participants in the divided (cf. full) attention condition showed reduced accuracy for fine- but not coarse-grained responses. However, indices of discrimination and confidence diagnosticity showed no effect of divided attention. Experiment 2 compared the effects of divided attention at encoding on reporting and monitoring using both non-phased and 2-phase procedures. Divided attention effects were consistent with Experiment 1. However, compared to those in the non-phased condition, participants in the 2-phase condition displayed a more conservative control strategy, and confidence ratings were less diagnostic of accuracy. When memory quality was reduced, although attempts to balance informativeness and accuracy increased the chance of fine-grained response errors, confidence provided an index of the likely accuracy of volunteered fine-grained responses for both conditions.

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1. Introduction

When individuals remember information about their experiences, they generally also assess the information recalled for likely accuracy. This assessment can be explicit (e.g., an eyewitness might indicate their confidence in the accuracy of a provided detail) or implicit (individuals privately assess the likely accuracy of retrieved information prior to volunteering it; Koriat & Goldsmith, 1996). Explicit expressions of confidence are influential in many real world settings (e.g., police officers, lawyers, and jurors find confident eyewitnesses more compelling than witnesses expressing low confidence). Thus, understanding the confidence–accuracy relation for reported information is a matter of practical importance. However, the extent to which previous investigations of the confidence–accuracy relation speak to memory reporting in applied contexts is limited in important ways (Luna & Martín-Luengo, 2012).

First, detailed examinations of the confidence–accuracy relation for episodic recall are rarely conducted. Research has often focused on

semantic recall, and results from general knowledge domains may not translate to applied episodic recall (e.g., eyewitness recall: Luna & Martín-Luengo, 2012; Perfect, Watson, & Wagstaff, 1993). Although some overlap in the processes supporting episodic and semantic memory is likely, there are dissociable neural correlates for episodic and semantic encoding (Prince, Tsukiura, & Cabeza, 2007), and clinical research demonstrates dissociations in impairment between the two memory systems (Buccione, Fadda, Serra, Caltagirone, & Carlesimo, 2008). Second, previous investigations of recall memory have largely overlooked the potential effects of individuals' implicit assessments of accuracy prior to volunteering responses on the confidence–accuracy relation for those *volunteered* responses.

Individuals reporting information from recall memory face competing demands for informativeness (i.e., provide as much information as possible) and accuracy (i.e., avoid reporting incorrect information). To balance these demands, individuals regulate the *granularity* (i.e., level of detail) of their responses (e.g. Goldsmith, Koriat, & Weinberg-Eliezer, 2002, Weber & Brewer, 2008). Models of strategic memory reporting (Goldsmith et al., 2002; Koriat & Goldsmith, 1996) generally suggest that, when responding to cued recall questions, an individual first attempts to retrieve a highly-detailed, fine-grained

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response. The probable accuracy of this candidate response is assessed and, if it exceeds a preset criterion, the response is volunteered. If the probable accuracy falls below the criterion, the individual attempts to retrieve a less detailed, coarse-grained response. Although, as noted by Goldsmith et al., the regulation process need not begin with a fine-grained response, the key point is that retrieved information must exceed a criterion level of certainty (and informativeness; Ackerman & Goldsmith, 2008) to be volunteered.

Drawing on this conceptually sophisticated account of memory reporting, we were motivated by a number of outstanding questions. The phased recall paradigm typically used to test this regulation (i.e., Koriat and Goldsmith's (1996) 2-phase approach, described below) forces the generation and evaluation of both fine- and coarse-grained responses. The extent to which this phased format accounts for memory performance in reporting tasks more akin to real-world memory reporting (e.g., where individuals provide unimpeded responses to cued recall questions) merits investigation. Similarly, studies using phased reporting procedures have investigated the confidence–accuracy relationship for *all* items at Phase 1 (i.e., for fine- and coarse-grained candidate answers for each question). In applied settings, the confidence–accuracy relation of interest is for subsets of items that are self-selected for reporting at either fine or coarse levels of granularity. Thus, the extent to which confidence–accuracy relations for fine- and coarse-grained responses reported in previous work extend to non-phased reporting tasks requires scrutiny.

Understanding participants' regulation in more naturalistic reporting tasks is an important (and generally overlooked) aspect of studying the confidence–accuracy relation for episodic recall, particularly as the role of confidence in participants' strategic regulation of memory reporting may have implications for the confidence–accuracy relationship for volunteered responses. Note that the term “volunteered” is typically used in studies of report option, where participants decide whether to offer or withhold an answer. We use the term “volunteered” to distinguish between responses that participants may consider during the regulation process (e.g., at Phase 1 of the 2-phase procedure, or spontaneously during a non-phased procedure) and the responses participants ultimately report. Thus, our interest is not in volunteered versus withheld answers, but in answers volunteered at different levels of granularity.

Using a cued-recall paradigm and manipulating attention at encoding, we investigated how participants' regulation strategy, and the confidence–accuracy relationship for volunteered fine- and coarse-grained episodic memory responses, varied according to memory quality. Our objective was not to test existing accounts of the strategic regulation of grain size, but to extend this literature by (i) determining whether previous examinations of grain size regulation extend to non-phased reporting conditions, particularly when episodic memory quality is reduced through divided attention at encoding (Experiment 1), (ii) exploring the extent to which regulation patterns observed in non-phased reporting conditions map onto previous models (Experiment 2), and (iii) examining how the regulation of grain size affects the confidence–accuracy relation for volunteered information (Experiments 1 and 2).

1.1. Strategic regulation of grain size

Previous research tells us a great deal about participants' ability monitor and control memory outputs, but has focused primarily on the mechanisms underlying, and role of confidence in, the regulation of recall memory output. The 2-phase paradigm was designed for this purpose (see Goldsmith et al., 2002; Koriat & Goldsmith, 1996; Weber & Brewer, 2008). In the 2-phase method, participants first provide fine- and coarse-grained responses, with associated confidence ratings, for each question asked. Confidence ratings are then removed and participants commit to one response. Intuitively, participants could adopt one of three reporting strategies. First, participants could report only

coarse-grained responses (maximizing accuracy). Second, they could report only fine-grained responses (maximizing informativeness). Finally, they could use a simple “satisficing” strategy: reporting fine-grained responses when confidence exceeds a preset criterion for accuracy and coarse-grained responses when it does not. Research suggests that, although confidence in the initial fine-grained response is the primary determinant of the ultimately volunteered response, the regulation of grain size conforms to a more sophisticated dual-criterion model where participants volunteer fine-grained responses even when confidence is low in order to satisfy a criterion level of informativeness (Ackerman & Goldsmith, 2008; Weber & Brewer, 2008). This strategy holds under conditions of low knowledge, which may offer insight into participants' monitoring and control of weakened episodic memories (Ackerman & Goldsmith, 2008).

Although informative about the processes underlying the strategic regulation of grain size, two methodological elements, common to investigations of grain size regulation, limit the generalizability of previous findings to memory performance in applied settings. First, previous experiments often used methodologies that produce strong memories (e.g., full attention at encoding). Participants may be more likely to prioritize informativeness when memory is strong and fine-grained details are more readily accessible. That is, participants may *be better able* to provide informative (though potentially inaccurate) responses. Under such conditions participants may also infer, from social maxims of communication (Ackerman & Goldsmith, 2008), that they *should* prioritize informative responses. Coarse-grained responses may not seem sufficiently helpful. Second, the 2-phase paradigm itself may affect control processes. In more naturalistic reporting tasks, individuals typically self-regulate the granularity of their responses and report a single response (cf. explicitly outputting fine- and coarse-grained response alternatives before deciding which to volunteer). In the 2-phase paradigm, having generated a fine-grained alternative, participants may be more inclined to volunteer it, or explicit instructions to generate a coarse-grained response may increase the perceived legitimacy of this option. Alternatively, generating both fine- and coarse-grained responses before deciding which to volunteer may simply alter the way participants retrieve and evaluate candidate responses (cf. Perfect & Weber, 2012, on the regulation of report option).

With respect to the strategic regulation of memory, Experiment 1 investigated participants' regulation of response granularity in a non-phased procedure, and under conditions producing sub-optimal memories. Departing from the 2-phased paradigm is necessary to develop our understanding of grain size regulation – and the implications of this regulation for the confidence–accuracy relation – in non-phased reporting tasks. However, although a non-phased approach permits conclusions about the effects of our manipulations on participants' tendency to provide fine- (cf. coarse-) grained responses, the accuracy of these responses, and the diagnostic value of confidence for these responses, it cannot cleanly differentiate the specific monitoring and control processes that lead to these outcomes. To partially attenuate this problem, Experiment 2 includes a direct comparison of the phased and non-phased reporting procedures.

1.2. Memory quality and monitoring

To further explore the effects of memory quality and grain size regulation on episodic memory output we examined participants' *retrospective* metacognitive monitoring as indexed by resolution (i.e., ability to discriminate correct from incorrect responses) and calibration. Importantly, previous research has generally focussed on monitoring *prior* to the volunteering of information (e.g. Ackerman & Goldsmith, 2008, Goldsmith et al., 2002, Weber & Brewer, 2008). In such cases, monitoring is typically discussed as a “competence” (i.e., an individual's ability to discriminate between information that is more or less likely to be correct prior to volunteering it), rather than a source of diagnostic information for someone external to the individual (e.g., a police officer or

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