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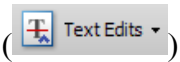
- Use the **Text Edits tool** (

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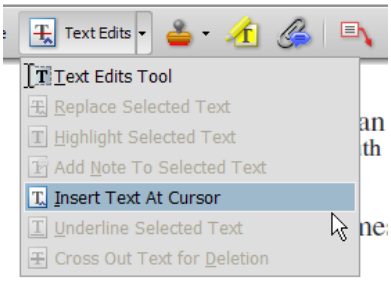

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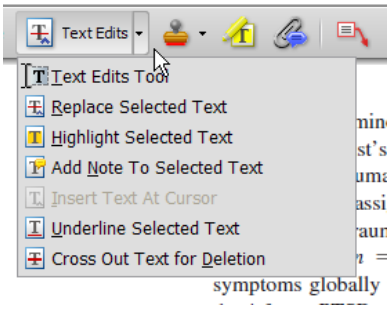

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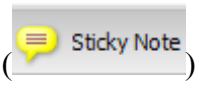
- Use the **Sticky Note tool** (

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Experiment 4: Comparative Optimism as a Function of Self-Presentation and Event Valence

	Event					
	Positive		Negative		Total	
Self-presentation	*M*	*SD*	*M*	*SD*	*M*	*SD*
Public/student	3.46	0.13	3.60	0.10	3.53	0.12
Public/expert	2.66	0.12	2.78	0.13	2.73	0.13
Control	2.39	0.11	2.46	0.09	2.43	0.11
Total	2.84	0.47	2.95	0.50		

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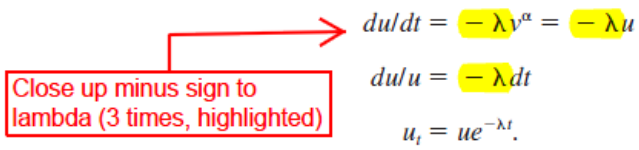

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Introspecting in the Spirit of William James: Comment on Fox, Ericsson, and Best (2011)

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Fox, Ericsson, and Best's (2011) thoughtful justification of the use of think-aloud protocols for revealing the stream of consciousness comes on the centennial of the death of William James, history's greatest practitioner and advocate of introspection. This confluence naturally invites speculation about how James might have responded to the analysis of Fox et al. I suggest that although James would likely view the think-aloud procedure as a scientifically rigorous form of introspection, he would also admonish us not to overlook its limitations. Most notably, although the think-aloud procedure readily captures substantive verbal thoughts, it is less able to capture inchoate cognitions. The conclusion that verbal protocols are nonreactive also raises several additional issues. First, the nonreactivity of thinking aloud does not necessarily speak to its validity. Second, the conclusion that verbal protocols are benign is at odds with recent findings in which verbalization impairs performance on various tasks. I suggest that whereas James might express some concerns regarding aspects of conscious thought that may be overlooked by the think-aloud procedure as well as some caution regarding the possible situations in which thinking aloud might still be reactive, he would almost certainly be pleased to see introspection finally getting the scientific grounding that it deserves.

The year 2010 marks the centennial of the death of William James (1842–1910), whose uncanny knack for using his own introspective skills to eloquently capture subsequently verified cognitive processes has led him to be one of the more highly quoted psychologists of all time. One hundred years after the demise of this remarkably prescient psychologist, it is an intriguing exercise to speculate about what he would have to say about the current state of psychology. Sadly, James' frustration with the narrow-mindedness of the field eventually led him to denigrate psychology as "a nasty little subject," but what would he say about it today?

For James, an understanding of psychology started with the introspective process. He noted that "introspective observation is what we have to rely on first and foremost and always" (James, 1890/1918, p. 185). Thus, it seems likely that the first issue that James would consider in assessing psychology today is whether the field has progressed in its development of a science of introspection. Undoubtedly he would be chagrinned to see the degree to which the field has generally avoided introspection as a source of scientific evidence. However, it seems likely that he would be encouraged by the efforts of some to develop and validate scientific techniques for elucidating the *stream of consciousness*, a term that he coined (James, 1890/1918). Thus, it seems reasonable to conjecture that were James to review the state of psychology today he would quickly zero in on modern introspective approaches such as those associated with experience sampling, both in the field (Hurlburt & Heavy, 2006; Kahneman et al., 2004) and in the lab (Christoff, Gordon, Smallwood, Smith, & Schooler, 2009; Smallwood & Schooler, 2006); contemplative practices (Lutz, Slagter, Dunne, & Davidson, 2008; Wallace, 2007); neurophenomenology (Jack & Shallice, 2001; Varela & Shear, 1999); and perhaps, above all, the think-aloud approach thoughtfully articulated by Ericsson and Simon (1980, 1993) and rigorously evaluated in the recent meta-analysis by Fox, Ericsson, and Best (2011).

In the following commentary I offer some speculations about the kind of reflections that I imagine William James might have had about the analysis by Fox et al. (2011). These musings are followed by some possible reasons for the discrepancies between our frequent finding of disruptive effects of verbalization and the conclusions of Fox et al. that think-aloud protocols are nonreactive.

A Brief Summary of the Analysis by Fox et al. (2011)

The essential conclusion of Fox et al. (2011) is that thinking thoughts out loud while performing an objectively verifiable task provides an effective and nonreactive technique for revealing the cognitive operations underlying performance. This conclusion is based on a meta-analysis of 95 studies that included (a) a silent control and a think-aloud condition that followed the recommended instructions of Ericsson and Simon (1980), (b) an objective outcome, and (c) necessary statistical information for meta-analysis. On the basis of this meta-analysis the authors found that thinking aloud does not qualitatively alter performance on tasks that require an objectifiable answer, that providing explanatory accounts tends to improve performance, and that thinking aloud may slow responses. The authors concluded that think-aloud pro-

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tocols are a generally nonreactive and valid tool for revealing cognitive processes.

What Would William James Say?

Cognizant of the impossibly large shoes that I am attempting to fill, I acknowledge at the outset that I possess neither James' perspicacity nor his capacity for eloquence. Nevertheless, I hope that I can capture at least a hint of the spirit of the reaction that I believe he might have. Were James somehow resurrected and given the opportunity to review the state of psychology today, it seems likely that he would view the think-aloud approach developed by Ericsson and Simon (1980, 1993) and evaluated by Fox et al. (2011) as perhaps the closest approximation to a science of introspection that the field has yet to see. Notably, although James relied heavily on introspection himself, he was never able to adequately develop a rigorous technique that could be readily adopted by the field. Thus, he would, in all likelihood, express admiration for the Ericsson and Simon model (1980, 1993), which integrates a theoretical understanding of human information processing with a methodological approach for minimizing the reactivity of introspection and maximizing its validity. He would also, I believe, be appreciative of Fox et al.'s careful and systematic efforts to document how the think-aloud procedure can reveal the inner workings of the mind without unduly changing the contents of thought. Surely, he would be impressed by the many situations in which this technique can be employed without influencing performance and would be struck by the numerous insights about the process of verbal thought that it reveals. Given his struggles to develop a science of introspection, he would certainly be grateful to Fox et al. for their efforts to legitimize a scientifically grounded approach for revealing the stream of internal thought, an endeavor that James viewed as pivotal to understanding the mind.

Although James would certainly be appreciative of Fox et al.'s (2011) efforts to revitalize psychology's attention to revealing the stream of consciousness, it seems probable that he might also express some cautionary notes about the limits and possible pitfalls of their technique. As Fox et al. observed, James was aware of not only the pivotal role that introspection must play but also its many limitations. One central limitation of the think-aloud procedure that James would have been likely to acknowledge is its inability to capture the ineffable mental processes that span between one thought and the next. James (1890/1918) distinguished two distinct aspects of the stream of consciousness: substantive reportable thoughts and transitory leaps between thoughts.

James (1890/1918) believed that the substantive parts of the stream of consciousness readily lent themselves to introspective consideration but the transitive parts did not, noting the following: "The attempt at introspective analysis in these cases is in fact like seizing a spinning top to catch its motion, or trying to turn up the gas quickly enough to see how the darkness looks" (p. 244).

Essentially, the challenge of introspecting upon the transitory aspects of the stream of consciousness stems precisely from the fact that they are so transitory. They lack the terra firma of an idea that can be verbalized, entailing a host of alternative associations of which the mind must select but one.

James would have been likely to acknowledge the great value of the think-aloud procedure reviewed by Fox et al. (2011) for illuminating the substantive steps in the stream of consciousness. However, he might well admonish Fox et al. for downplaying the transitory elements between these steps. The issue of the nonverbal transitory aspects of thought is largely lacking from the analysis of Fox et al. Even Ericsson and Simon's (1980, 1993) more theoretically focused discussions, although acknowledging that think-aloud procedures capture only the conscious elements of thought, have tended to deemphasize the conscious yet inherently nonverbal aspects of consciousness that border the transitions from one substantive (and verbalizable) thought to the next. As James (1890/1918) noted, underemphasizing the transitory elements of thought is a common pitfall:

> If to hold fast and observe the transitive parts of thought's stream be so hard, then the great blunder to which all schools are liable must be the failure to register them, and the undue emphasizing of the more substantive parts of the stream. (p. 244)

James (1890/1918) believed that as challenging as it may be to document the transitory states of consciousness, these states are nevertheless a critical element of the stream of thought. As a case in point, he considered the manner in which one experiences alternative preverbal thoughts before one actually articulates a thought in words, suggesting that "a good third of our psychic life consists in these rapid premonitory perspective views of schemes of thought not yet articulate" (p. 253).

James (1890/1918) also identified, in addition to transitory states between substantive thoughts, a variety of cognitions that he viewed as difficult to introspectively capture. For example, he was well aware of the limitations of language for capturing a host of nonverbal experiences, noting that "we find ourselves in continual error and uncertainty so soon as we are called on to name and class and not merely feel" (p. 195). In this regard, James lamented that we lack the vocabulary to characterize many experiences, observing that "this absence of a special vocabulary for subjective facts hinders the study of all but the very coarsest of them" (p. 195). James also recognized that many cognitive processes occurred entirely below the threshold of awareness: "The subconscious self is nowadays a well accredited psychological entity" (James, 1902/2002, p. 555).

Since the time of William James much research has substantiated his views regarding the elements of cognition that evade ready introspective characterization. Although the transitory states between substantive thoughts have yet to fully receive the attention that they deserve, their existence has been clearly demonstrated. Considerable research has documented tip-of-the-tongue states in which individuals experience a premonitory awareness of a desired word but temporarily fail to translate that awareness into a full-fledged retrieval of the word itself (see e.g., Brown & McNeill, 1966). Further evidence indicates that people can report that they will know the answer to a question before they actually access the answer (Reder & Ritter, 1992). Additional research has documented the numerous situations in which individuals' verbal abilities fail to adequately capture their experience (see e.g., Schooler & Fiore, 1997). And a massive amount of research has documented the marked degree to which the critical cognitive processes underlying performance on many tasks appear to take place below the threshold of awareness (see e.g., Wilson, 2002). The existence of these various forms of inchoate cognition identified by William James and substantiated by subsequent research puts important constraints on the ability of think-aloud protocols to illuminate

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mental states. Although think-aloud protocols certainly provide an important technique (arguably the best ever developed) for revealing the substantive aspects of thought, James would likely warn us to be cautious in overemphasizing their completeness.

It is important to point out that the primary empirical finding elucidated by Fox et al.'s (2011) meta-analysis is that think-aloud procedures are generally nonreactive: that is, amassed across studies, relatively few differences are observed between the objective performance of participants in think-aloud conditions relative to silent controls. However, this null finding does not necessarily speak to the degree to which the think-aloud protocols capture the critical conscious processes underlying thought. It might well be the case, as James (1890/1918) intimated, that many of the critical processes involved in conscious thought are not captured by the substantive verbal elements. In other words, just because think-aloud protocols are frequently nonreactive does not mean that they capture the essential elements of the thought process to which they correspond. Fox et al. suggested that the observation of nonreactivity of think-aloud protocols provides evidence for a close correspondence between the protocols and underlying cognitive states, noting:

> In the event of no significant differences due to thinking aloud compared with working silently, we would argue that the verbalized information is likely to reflect the cognitive states of the process generated under silent conditions. (Fox et al., 2011, p. XX)

Certainly, when verbal protocols are nonreactive there is likely to be an important correspondence between the cognitive states that individuals report and the cognitive states that take place when individuals are silent. Nevertheless, this does not mean that verbal protocols necessarily capture all or even most of the cognitive states that are generated under silent conditions. It seems likely that a large realm of mental life, including the transitory states between substantive thoughts and other nonverbalizable experiences that cannot be captured in words, will be lacking from such protocols.

On the Nonreactivity of Thinking Aloud

As noted, the striking empirical conclusion presented in Fox et al.'s (2011) meta-analysis is the general absence of a reliable difference between think-aloud conditions and silent controls. It is a bit surprising to me that no such reliable difference emerges, given the numerous studies in which I have been involved for which verbalization produced reactive effects. I and others have observed disruptive effects of verbalizing thoughts using both the think-aloud procedure, as in the case of insight problems (Schooler, Ohlsson, & Brooks, 1993) and analogical reasoning (Lane & Schooler, 2004; Sieck, Quinn, & Schooler, 1999), and written thoughts, as in the case of writing descriptions of faces (Schooler & Engstler-Schooler, 1990), colors (Schooler & Engstler-Schooler, 1990), tastes (Melcher & Schooler, 1996), maps (Fiore, 1994), affective judgments (Wilson & Schooler, 1991), forms (Brandimonte & Gerbino, 1993), and insight solution strategies (Schooler et al., 1993; for general reviews see Schooler, Fiore, & Brandimonte, 1997, and Chin & Schooler, 2008). My surprise in this regard stems not only from investigations that seem to contradict this conclusion but also from theoretical considerations of the reasons why verbalization, even simply thinking out loud, might be expected to be reactive (see e.g., Schooler, 2002; Schooler & Schreiber, 2004; Wilson, 1994). Specifically, I and others have theorized that when individuals attempt to put into words experiences that for any of a variety reasons are difficult to articulate, interference may ensue. Indeed, although it is a stretch to imagine what James might say about the nonreactivity of verbal protocols, I suspect he might have been surprised as well. As noted, James believed that many critical aspects of thought were inherently nonverbal, speculating that attempts to observe such thoughts could be disruptive. As James observed:

> Let anyone try to cut a thought across in the middle and get a look at its section, and he will see how difficult the introspective observation of the transitive tracts is. The rush of the thought is so headlong that it almost always brings us up at the conclusion before we can arrest it. Or if our purpose is nimble enough and we do arrest it, it ceases forthwith to be itself. (James, 1890/1918, p. 244)

In short, James, the veritable master of introspection, found that thoughts changed when they were observed. Although thinking aloud is not precisely the same thing as observing one's thoughts, it certainly has some distinct similarities to introspection. Speaking out loud naturally makes one self-aware of what one is thinking, and it is not possible to articulate the transitory elements of thought that bridge one substantive verbalizable thought and the next. Thus, I suspect James, like many others, would have shared the intuition that thinking aloud might under some circumstances be reactive.

One possible reason for the lack of an overall reactive effect of thinking aloud in Fox et al.'s (2011) meta-analysis stems from the fact that the vast majority of the studies on which the reactive effects of thinking aloud were evaluated were, as Fox et al. admitted, not specifically designed with the goal of identifying the specific conditions under which reactive effects might be expected to be observed. If, as I and others have hypothesized (see e.g., Brandimonte, Schooler, & Gabbino, 1997; Schooler et al., 1993; Wilson, 1994; Wilson & Schooler, 1991), the disruptive effects of verbalization are limited to certain specific situations in which particularly ineffable experiences are described, then it seems reasonable that those studies that explicitly set out to identify such conditions would be more likely to find effects than would those that were not purposely designed to explore this issue. In this regard it is worthwhile to consider the recent study by Gilhooly, Fioratou, and Henretty (2010), which was specifically designed to examine the impact of verbalization on the solving of spatial versus verbal insight problems. As Fox et al. noted, this study failed to find reactive effects of thinking aloud on insight solutions per se. Nevertheless, it did find "a greater (negative) effect of verbalizing on spatial as against verbal problems" (Gilhooly et al., 2010, p. 81). It may well be that it was Gilhooly et al.'s careful attention to isolating the distinct vulnerability of spatial versus verbal problems that enabled this study to find reactive effects of verbalization that were not found in the more course grained comparisons provided by Fox et al.'s meta-analysis.

It seems quite possible that in order to maximize the likelihood of finding disruptive effects of verbalization, researchers must focus on well-specified situations in which nonverbalizable processes are hypothesized to predominate and then directly compare the impact of verbalization in such cases with those in which more verbalizable processes are believed to be employed. This has been the strategy of a number of studies that have revealed differential effects of verbalization in various domains including the follow-

ing: insight versus logical problem solving (Schooler et al., 1993), eyewitness memory for faces versus statements (Schooler & Engstler-Schooler, 1990), configural versus featural face memory (Fallshore & Schooler, 1995), configural versus route spatial memory (Fiore & Schooler, 2002), visual–spatial versus verbal–analytic Ravens Matrices (DeShon, Chan, & Weissbein, 1995), and, as noted previously, spatial versus verbal problem solving (Gilhooly et al., 2010). In each of these cases, disruptive effects of verbalization were found in the domain entailing nonverbal processes but not in the one involving more verbal processes. Admittedly, some of the above studies involved written as opposed to spoken verbalizations, but a number used the spoken verbalization procedures specifically recommended by Fox et al. (2011). Moreover, although more research is required to directly compare written versus spoken verbalization, in our studies we have observed similar effects using both procedures (see e.g., Schooler et al., 1993). Thus it seems that the assertion that verbalization can interfere with nonverbal processes whereas it can be benign for more verbalizable tasks remains viable, despite Fox et al.'s failure to find support for this claim.

Although a reliance on studies that were not specifically designed to isolate the conditions under which reactive effects of verbalization are most likely to be observed may have contributed to Fox et al.'s (2011) failure to find negative effects of verbalization, other factors may also have contributed to the discrepancy between their conclusions and ours. For example, Fox et al. disregarded the domain of affective decision making, for which reactive effects of verbalization have frequently been observed (see e.g., Wilson & Schooler, 1991; Wilson et al., 1993). Although they defend this exclusion on the grounds that affective judgments have no objectifiable outcome, reactive effects of verbalization have been observed with measures such as postchoice satisfaction (Wilson et al., 1993), consensus with the judgments of experts (Halberstadt & Green, 2008; Wilson & Schooler, 1991), and sports teams' success (Halberstadt, & Levine, 1999), all of which represent metrics that can be reasonably characterized as entailing a normatively optimal response. Other studies that found large effects of verbalization were also omitted from Fox et al.'s meta-analysis on equivocal grounds. For example, the authors failed to include two studies in which we found large reactive effects of thinking aloud on analogical retrieval (Lane & Schooler, 2004, Experiments 1 and 2) because they concluded that participants had received inadequate instructions. However, participants' modest performance in this experiment can be reasonably attributed to the general difficulty of analogical retrieval (see e.g., Gentner, Rattermann, & Forbus, 1993; Gick & Holyoak, 1980) and not necessarily to a shortcoming of the instructions. Indeed, participants in this experiment were given extensive instructions on what constitutes a true analogy, including examples.[1] Fox et al.'s exclusion of this set of studies raises the possibility that they may have used particularly stringent criteria for studies that challenged their conclusions, thereby potentially leading them to underestimate the reactive effects of thinking aloud.

Fn1

On the Difficulty of Replicating the Effects of Verbalization

Issues entailing the specificity of design and possibly biased selection of studies may well have contributed to the discrepancy between our findings of disruptive effects of verbalization under certain specified conditions and Fox et al.'s (2011) conclusion that thinking aloud is nonreactive. Nevertheless, it must be acknowledged that even when experimental conditions have been set up to maximize the likelihood of finding reactive effects of verbalization, they are not always observed. In investigating the disruptive effects of verbalization (both spoken and written), we have consistently struggled with a peculiar observation: Whenever we examine a new domain we find marked negative effects of verbalization, but the more we attempt to replicate the finding, the harder it is to find. We have observed this increased difficulty finding verbalization effects with a host of different domains, including faces (Schooler & Engstler-Schooler, 1990), colors (Schooler & Engstler-Schooler, 1990), music (Houser, Fiore, & Schooler, 1997), insight problem solving (Schooler et al., 1993), and analogical retrieval (Lane & Schooler, 2004). In each of these cases our initial investigations revealed large effects that diminished with subsequent replications. Importantly, at least in the case of the original domain in which verbal overshadowing was observed—that is, the finding that writing an extensive description of a previously seen face impairs subsequent recognition—meta-analyses (Meissner & Brigham, 2001) have revealed that the effect is a genuine one, but the estimated effect size in later experiments was markedly smaller than what we originally observed in the early experiments (Schooler & Engstler-Schooler, 1990) that first revealed it.[2] It is beyond the scope of this commentary to account for the possible reasons why reactive effects of verbalization have proven so erratic, but it suggests that there may be factors that have yet to be understood that contribute to when reactive effects of verbalization are versus are not observed.

Fn2

Indeed, it is an intriguing fact that similar declines in effect sizes over time have been observed in a host of domains. Meta-analyses in parapsychology (Bierman, 2001), ecological and evolutionary biology (Jennions, & Møller, 2002) and medicine (Ioannidis, 2005; Kemp et al., 2010) have revealed striking declines in the magnitude of reported effect sizes as a function of the year in which the study was conducted. A formal process for registering and reporting scientific studies regardless of outcome (much as many clinical trials are already required to do; see http://clinicaltrials.gov/) would be a huge advance in the capacity to evaluate and interpret such decline effect as well as address a host of other ways in which the current scientific systems' propensity to exclusively publish statistically significant findings may bias scientific conclusions.

[1] A copy of the detailed instructions used in this experiment is available upon request.

[2] ~~It is an intriguing fact that similar declines in effect sizes over time have been observed in a host of domains. Meta-analyses in parapsychology (Bierman, 2001), ecological and evolutionary biology (Jennions, & Møller, 2002), and medicine (Ioannidis, 2005; Kemp et al., 2010) have revealed striking declines in the magnitude of reported effect sizes as a function of the year in which the study was conducted. A formal process for registering and reporting scientific studies regardless of outcome (much as drug companies are already required to do) would be a huge advance in our capacity to evaluate and interpret such a decline effect as well as to address a host of other ways in which the current scientific systems' propensity to exclusively publish statistically significant findings may bias scientific conclusions.~~

Conclusion

The field of psychology has come a long way since William James dismissed it as a "nasty little subject." Were James to revisit psychology's progress, it seems likely that he would be discouraged by the field's historical avoidance of introspection. Nevertheless, he would probably applaud the revitalization of introspective methods as exemplified by Fox et al.'s (2011) analysis of the use of think-aloud protocols. Although James might express some concerns regarding aspects of conscious thought that may be overlooked by this procedure, as well as some caution regarding the possible situations in which thinking aloud might still be reactive, he would surely be pleased that introspection has finally found a home in the field.

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