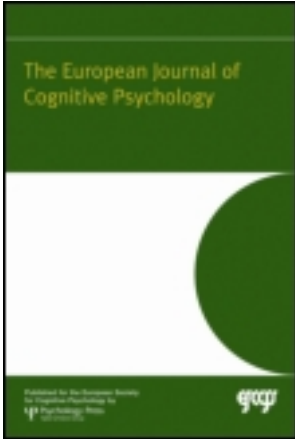


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Why do words hurt? Content, process, and criterion shift accounts of verbal overshadowing

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Verbal overshadowing describes the phenomenon in which verbalisation negatively affects performance on a task related to the verbalised material. Within the verbal overshadowing literature, three accounts exist which attempt to explain this phenomenon: content, processing, and criterion accounts. The content account refers to the notion that the specific contents of verbalisation interfere with later performance, processing refers to a proposed shift in processing caused by verbalisation, and criterion deals with the possibility that verbalisation leads to a reliance on more conservative choosing. The current manuscript reviews evidence for the existing accounts, while describing advantages and disadvantages of each account and attempting to reconcile these various accounts. The authors provide a framework for understanding verbal overshadowing as caused by one unified mechanism, or several. Finally, an outline for future research is suggested that should aid in reconciling the existing accounts for verbal overshadowing.

Theory, research, and general debate on the nature of the relationship between language and cognition has been in no short supply in past century (Hunt & Angoli, 1991; Watson, 1924; Whorf, 1956). Verbalisation—the simple act of translating one’s thoughts into words—speaks quite directly to this debate and although verbalisation seems straightforward enough, its impact on cognition is far from clear. A phenomenon known as verbal overshadowing typifies the tenuous relationship between language and cognition. As the term implies, verbal overshadowing occurs when verbalisation proves detrimental to the task at hand. Originally demonstrated in the context of face recognition, the phenomenon has been found to be quite general, applying to such disparate domains as decision making (Wilson & Schooler, 1991), problem solving (Schooler, Ohlsson, & Brooks, 1993), analogical reasoning (Lane & Schooler, 2004), and visual imagery (Brandimonte, Hitch, & Bishop, 1992a, 1992b, 1992c). Despite, or perhaps because

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of its pervasiveness, the sources of verbal overshadowing have remained in serious dispute.

In this paper we first review relevant existing evidence for verbal overshadowing and its generality to other domains. Next, we discuss three accounts for verbal overshadowing that have been proposed: a *content* account, which focuses on the content of verbalisation, a *processing* account, which focuses on a shift in processing orientation caused by verbalisation, and a *criterion shift* account, which focuses on the effect of verbalisation on recognition criteria. What we imply by the terms content, processing, and criterion will be explained in greater detail later. We will then propose a framework for understanding and integrating the three accounts, specifying situations in which one account is more applicable than another, as well as outline possible avenues for future research.

Verbal overshadowing was first documented by Schooler and Engstler-Schooler (1990) in a study of eyewitness memory. Participants viewed a video of a robbery perpetrated by a salient individual whom participants in the verbalisation condition subsequently described. The results indicated that participants who described the robber were poorer at picking him out of a lineup, as compared to control participants who read an unrelated text for the same amount of time. Since the initial series of studies by Schooler and Engstler-Schooler, verbal overshadowing of face recognition has been studied extensively, with many studies replicating the phenomenon (Dodson, Johnson, & Schooler, 1997; Fallshore & Schooler, 1995; Ryan & Schooler, 1998; Schooler, Ryan, & Reder, 1996; Sporer, 1989) and some failing to replicate the finding (Lovett, Small, & Engstrom, 1992; Yu & Geiselman, 1993). In a meta-analysis of verbal overshadowing studies, Meissner and Brigham (2001) found a small but statistically significant verbal overshadowing effect ($Zr = .12$). Within perceptual memory, verbal overshadowing has been shown to generalise to memory for colours (Schooler & Engstler-Schooler, 1990), music (Houser, Fiore, & Schooler, 1997), voices (Perfect, Hunt, & Harris, 2002), abstract figures (Brandimonte, Schooler, & Gabbino, 1997), wines (Melcher & Schooler, 1996), and mushrooms (Melcher & Schooler, 2004). In addition to being a reliable finding, verbal overshadowing effects have been shown to permeate several other areas of research.

With regards to visual imagery, several studies have demonstrated that verbalisation at the time of encoding can impair performance of such imagery tasks (Brandimonte & Gerbino, 1993; Brandimonte, Hitch, & Bishop, 1992a, 1992b, 1992c; Brandimonte et al., 1997; Hitch, Brandimonte, & Walker, 1995; Pelizzon, Brandimonte, & Favretto, 1999; Pelizzon, Brandimonte, & Luccio, 2002; Walker, Hitch, Dewhurst, Whiteley, & Brandimonte, 1997). In the prototypical experiment, participants are presented with visual stimuli and are either encouraged to covertly verbalise these stimuli or not, and then are asked to perform a mental rotation of the image to reveal underlying

characteristics of these images. Verbalisation is sometimes encouraged through the use of easily named stimuli (and difficult to name stimuli in the control condition), or through naming of the stimuli by the participant (Brandimonte & Collina, 2008 this issue). Results of such studies indicate that verbalisation impairs performance on visual imagery tasks, a finding that is attenuated by the presence of visual or verbal cues prior to the mental rotation task (Brandimonte et al., 1997; Brandimonte & Collina, 2008 this issue). A significant literature therefore suggests that verbalisation impairs mental imagery.

In the problem-solving arena, Schooler and colleagues (1993) found that insight problems—problems that do not lend themselves well to analytic reasoning—are susceptible to verbal overshadowing. These researchers asked participants to verbalise their thought processes concurrent to solving several insight and analytic problems. They found that insight problem solving was impaired for verbalising participants, as opposed to participants who engaged in a control task. Further, analytic problem solving was not impaired by verbalisation. A similar effect was found in the domain of affective decision making. Wilson and Schooler (1991) performed a study to test whether verbalisation impairs the quality of people's judgements. In a study veiled as an enquiry into consumer judgements of strawberry jams, they asked some participants (verbalisers) to taste the jams and then list their reasons for liking or not liking the jams, as well as analysing their reasons. Control participants tasted the jams but did not list or analyse their thoughts about the jams. Schooler and Wilson found that participants who did not list and analyse their reasons made judgements that were more similar to that of expert jam raters (from consumer report magazines) as compared to verbalisers.

Similarly, verbalisation appears to impair both analogical reasoning and retrieval. Sieck, Quinn, and Schooler (1999), for instance, tested the influence of verbalisation on people's ability to evaluate the soundness of analogies. Participants were presented with stories that were similar either superficially (various aspects of the stories, such as names or places, were the same) or analogically. Participants then rated how sound they felt the match between stories was, either listing the reasons for their judgement (verbalisers) or not (control). The researchers found that verbalisers rated all stories as better matches, and did not discriminate between superficial and analogical matches as well as control participants. Subsequent research showed that verbalisation also influences the retrieval of analogies in that verbalisers are more likely to retrieve superficial/surface matches as opposed to actual analogical matches (Lane & Schooler, 2004). In short, verbal overshadowing is not limited to memory.

Given that a healthy number of studies have documented verbal overshadowing across several different areas of study, it is noteworthy that a single theory has not been accepted to explain what causes verbal

overshadowing. Currently, three general accounts have been proposed to explain verbal overshadowing: a content account, a processing account, and a criterion shift account, which shall be explained next.

A CONTENT ACCOUNT

As the name suggests, the content account suggests that it is something about the specific contents of verbalisations that impairs memory. In other words, verbal overshadowing is caused by material within verbalisation interfering with the original memory, which in turn leads to poorer performance at recognition.

Schooler and Engstler-Schooler (1990) originally proposed a content-based account for verbal overshadowing in the form of a recoding interference explanation for the phenomenon. This original study dealt with visual stimuli that are not easily put to words: faces and colours. The recoding interference explanation suggests that memory for the original stimulus is impaired when subjects confuse the verbal memory created from the visual stimulus with the original visual memory. Moreover, recoding interference as a source of verbal overshadowing agrees well with standard theories of memory interference and misinformation effects (e.g., Schooler, Foster, & Loftus, 1988), in that the self-generated verbalisation may contain misinformation hampering future recognition. Recoding interference should not be a problem when the original stimulus is easily verbalised, or when the stimulus and distracters are qualitatively different, such that verbalisation aids in discrimination. In fact, recent research has demonstrated that under certain conditions, verbalisation does in indeed aid in discrimination (Brown & Lloyd-Jones, 2005). In line with the recoding interference explanation, research demonstrating that verbal overshadowing is especially likely when perceptual expertise exceeds verbal ability also provides evidence for the content account (Melcher & Schooler, 1996).

The recoding interference hypothesis predicts that individuals who possess a level of perceptual expertise that exceeds their verbal ability should be especially prone to verbal overshadowing. These individuals would be able to perceive and process various nuances of a stimulus, but would not be able to put these perceptions into words. Therefore, subsequent verbalisation would be especially unrepresentative of the perceptual experience. In a study testing the effect varying levels of perceptual and linguistic expertise has on verbal overshadowing, Melcher and Schooler (1996) asked participants to taste a wine and either verbalise it or perform a control task prior to identifying the tasted wine among distractors. Participants were either nonwine drinkers, untrained wine drinkers, or trained wine experts (professionals, or those who had taken wine seminars).

Melcher and Schooler's results align well with the content account as they found that verbalisation only impaired untrained wine drinkers, but not trained wine drinkers or nonwine drinkers. Trained wine drinkers have the verbal ability to describe the various aspects of wine detected by their palates, and do not experience verbal overshadowing, ostensibly because their experiences and verbalisations match up. Similarly, nonwine drinkers have neither the expertise to perceive wines in depth, nor the verbal tools to describe them and so their experiences and verbalisations do not interfere with each other. Untrained wine drinkers' perceptual expertise in wine tasting exceeds their verbal expertise in describing wine, and thus they do not have the verbal tools to describe all of the nuances their palates detected. Thus, they create verbalisations that do not match up with experience—in other words, verbal overshadowing due to a mismatch between the content of verbalisations and perception.

Although Melcher and Schooler's (1996) study on memory for wine provided helpful insight on the role of expertise on verbal overshadowing, the results are only correlational because participants were not assigned to various levels of expertise. In an effort to remedy this shortcoming and build on previous findings, Melcher and Schooler (2004) performed a study in which participants were assigned to be trained as either perceptual or conceptual experts in the domain of mushroom recognition. Much like the study on wine recognition, they hypothesised that perceptual training (expertise) in the absence of conceptual training would lead to verbal overshadowing, while conceptual training in the absence of perceptual training would not result in verbal overshadowing, and potentially lead to verbal enhancement. They reasoned that conceptual training would benefit memory in the verbalisation condition, because conceptual training would emphasise verbalisable knowledge. Melcher and Schooler's hypotheses were largely supported by the data, with perceptual training leading to verbal overshadowing and conceptual training leading to verbal enhancement.

Recoding interference can also be understood in the context of individual differences. Ryan and Schooler (1998) performed a study in which they measured individual differences in verbal ability (through use of high school or college grade point average), as well as perceptual ability (through score on an independent face recognition task). In accordance with the previously discussed literature, Ryan and Schooler documented the strongest verbal overshadowing effect among those who were measured as having high perceptual ability and low verbal ability.

From this review, it appears that verbalisation can affect memory through the content of verbalisations. Thus far, the influence of content has been analysed through the expertise and training of the verbaliser. Content, however, may also play a role through the demands of the verbalisation task

itself, specifically when participants are required to produce verbalisations that are beyond their abilities.

The influence of the verbalisation task falls under what Meissner, Brigham, and Kelley (2001) have termed, *retrieval-based effects*. In short, Meissner et al. find that the way in which verbalisation instructions are worded can influence the strength and even the existence of verbal overshadowing effects. They find strongest effects in what they call a *forced recall condition*, in which participants are asked to fill out 25 lines of descriptions, even if they feel they are guessing. Meissner et al. utilise a content-based explanation for their results, suggesting that forced recall participants are more apt to generate misinformation, which then interferes with recognition. Finger and Pezdek made a similar finding when they performed a verbal overshadowing study with a condition that involved a detailed and elaborate verbalisation task (a cognitive interview). They found that those in the elaborate verbalisation condition produced more incorrect details, which in turn predicted poorer recognition performance. Both Meissner et al. and Finger and Pezdek's research suggest that it is the content of verbalisations that overshadows memory for an original perceptual stimulus.

Research on the relationship between verbalisation and visual imagery is also in accord with the content account. In a recent study by Brandimonte and Collina (2008 this issue), they asked participants to generate a label for images they has just viewed. Brandimonte and Collina found that representing these labels prior to retrieval improved performance on the visual imagery task. These researchers also found a correlation between quality of the labels in describing the parts of the image (local elements) and performance on the imagery task. There was no statistically significant correlation between the quality of the labels in describing the whole of the image and imagery performance. Brandimonte and Collina conclude that these results provide evidence for recoding interference, noting that representation of the labels most likely aided participants by reactivating the visual code generated early in the study, which may well have been marked by focus on certain local characteristics of the image.

Despite a good deal of evidence implicating content effects as the cause of verbal overshadowing, there are situations in which it is an unlikely explanation.

Content account limitations

To be completely confident with a content account, a strong connection should exist between the quality of verbalisations and recognition accuracy. With face recognition, participants who create accurate and complete

verbalisations should be more likely to recognise the verbalised face later in the study. Many studies, however, have not shown this correlation between verbalisation quality and recognition accuracy (Brown & Lloyd-Jones, 2003; Kitagami, Sato, & Yoshikawa, 2002; Fallshore & Schooler, 1995; Schooler & Engstler-Schooler, 1990). Besides its failure to explain the lack of correlation between verbalisation quality and recognition accuracy, the content account fails to explain other findings emerging from verbal overshadowing studies.

A growing number of studies indicate that overshadowing is not limited to the verbalised stimulus. Dodson et al. (1997), for instance, presented participants with two dissimilar faces (a male and female). The researchers found that verbalising one face, either the male or female face, not only impaired memory for that face, but for the other face presented. Similarly, Westerman and Larsen (1997) found that when participants viewed a photograph of a car and of a face, describing the car impaired memory for both the car and the face. Considering that in both studies, content was not generated for the non-verbalised face, yet verbalisation impaired accuracy for the face, it is highly doubtful that the content effects can account for the findings of these studies.

Brown and Lloyd-Jones (2002, 2003) found a similar effect when they presented participants with 13 faces and only asked that they describe the 13th face presented. They found that recognition accuracy was impaired not only for the verbalised face, but for the 12 faces presented prior to the verbalised face. Seeing as the content account relies on the recoding of content into a suboptimal form, the finding that verbal overshadowing occurs for content that is not verbalised makes it unlikely that this account can fully explain verbal overshadowing. Further research with a related paradigm (Lloyd-Jones, Brown, & Clarke, 2006) has supported this finding, demonstrating that verbalisation following encoding impairs participants' ability to discriminate between faces seen at encoding and nonfaces. This effect generalises to faces participants had not seen, an effect that further supports the notion that verbalisation can impair memory for nonverbalised faces.

Finally, the design of Meissner et al.'s (2001) study demonstrating verbal overshadowing only under forced-recall conditions lends itself to multiple alternative interpretations. Meissner et al. did not take measures of confidence, and it seems likely that requiring participants to fill 25 lines with descriptions, quite a difficult task, might also force participants to question their ability to remember the target face. This psychological change may have also led to a shift in criterion, as participants' level of confidence decreased. The potential for such a shift is discussed later in more detail. Further, such a difficult task might have caused more interference simply because it was more difficult than the control or standard verbalisation task.

These findings do suggest that, at least in part, verbal overshadowing may not be due to the specific content of verbalisations, but the simple fact that verbalisation occurs.

A PROCESSING ACCOUNT

To deal with the lack of explanatory power provided by the content account in certain situations, researchers have proposed a processing based account for verbal overshadowing (see Schooler, 2002, for a review). Past research has shown that memory for faces, insight problem solving, and certain kinds of decision making rely on holistic/global processing, as opposed to item-by-item analytic/local processing. For example, there is strong consensus in the face recognition literature that such featural processing could deprive the perceiver of holistic information important for face recognition (Valentine, 1988). In other words, when it comes to face recognition it is the way the face looks as a whole that matters, and not as much what each individual feature looks like. Considering it is often the features of a face that are verbalisable, it has been suggested that verbalisation causes a shift from a holistic/global processing orientation towards a more analytic/local processing orientation that is detrimental to face recognition. Drawing upon transfer appropriate processing research, creation of an environment in which processing orientations differ in encoding and retrieval can impair memory. In this vein, memory may be impaired when, after encoding, verbalisation shifts processing towards analytic/local, which may carry over into retrieval.

Support for the processing account within face recognition

A transfer inappropriate processing shift explains several aspects of previous facial memory studies that the content account cannot explain. For instance, Macrae and Lewis (2001) found that effects similar to verbal overshadowing could be found through substituting verbalisation with a task designed to shift processing from global to local. These researchers performed a face recognition study using the robbery video initially utilised by Schooler and Engstler-Schooler (1990), but in lieu of a verbalisation condition, presented participants with Navon (1977) letters (i.e., small letters which comprise a larger composite letter, for instance, a large letter “s” made up of smaller “j”s) and asked them to report either the larger global letter or the smaller local letters. Participants in the control condition read from a text unrelated to the study. Macrae and Lewis found that globally oriented participants were better at identifying the robber than control participants, who were in turn more accurate than locally oriented participants. To summarise, these

researchers found that it is possible to create an effect similar to verbal overshadowing by inducing a processing shift from global to local.

Further evidence can be drawn from research on memory for same- and other-race faces. Fallshore and Schooler (1995) found that verbalisation interferes with memory for same-race faces, but not with memory for other-race faces. Given that researchers have found that other-race faces tend to be processed featurally (Rhodes, Tan, Brake, & Taylor, 1989), a processing shift towards local/featural processing should not have an effect on other-race faces, which are already being processed in such a manner.

The processing shift account is also applicable to some findings discussed as evidence for the content account. The Melcher and Schooler (2004) study on the effect of training on verbal overshadowing, for instance, is explained well by the processing account. Verbal overshadowing among perceptually trained participants is explained by how they may have learned to encode the stimulus mushroom in a more holistic manner, but were shifted away from this processing orientation by the verbalisation task, creating a mismatch between encoding and verbalisation. Conceptually trained participants, however, may have learned to process the stimulus in a more featural manner, which did not clash with the featural processing orientation potentially caused by verbalisation. Research on the effect of expertise and training, it seems, is also explainable through the lens of the processing account.

The fragility of verbal overshadowing

Numerous studies have shown the verbal overshadowing effect to be somewhat fragile, in that it may weaken, disappear, or even reverse across trials (Fallshore & Schooler, 1995; Melcher & Schooler, 1996; Schooler, Ryan, & Reder, 1996). This finding (or nonfinding), which was not easily reconcilable with the content account, fits well with the processing account. Generation of content that interferes with a memory does not seem as if it would necessarily be sensitive to time. However, seeing as the default processing orientation for humans appears to be more global than local (Kimchi, 1992; Navon, 1977), a processing shift accounts well for the fragility of verbal overshadowing. For instance, if verbalisation does indeed shift processing towards a more local orientation, time or other peripheral events may easily shift processing back to a more global orientation, thus eliminating the verbal overshadowing effect. Such an effect was demonstrated by Finger and Pezdek (1999) when they replicated the verbal overshadowing phenomenon, but found that when a significant delay is inserted between verbalisation and recognition, the verbal overshadowing effect is attenuated. They termed this finding, a “release” from verbal

overshadowing. Finger (2002) later replicated this release, replacing the delay by either having participants listen to music, or working on a maze. According the processing account, listening to music or working on a maze may have allowed participants to shift back towards global processing more quickly, thus explaining the absence of verbal overshadowing.

Support for the processing account outside of face recognition

A processing shift has also been implicated in several studies altogether unrelated to facial memory. Forster, Friedman, and Liberman (2004), for instance, found evidence for both transfer appropriate and inappropriate processing shifts in their investigation into the effect of temporal construal on creativity and insight problem solving. Temporal construal refers to the time distance perspective one takes when imagining an event, a variable Forster et al. manipulated by asking participants to either imagine their life tomorrow or a year from tomorrow. With regards to creativity, they hypothesised that imagining their life a year from tomorrow would cause a transfer appropriate processing shift, activating mental processes related to more abstract representations, which would carry over to creativity tasks later in the experiment (e.g., creating more abstract solutions to problems or better performance on insight problem-solving tasks). Indeed, participants taking a distant time perspective demonstrated more creativity and solved more insight problems than participants taking the near time perspective. Forster et al. also found evidence for a transfer inappropriate processing shift in that participants taking a distant time perspective showed impaired performance on logic puzzles from the analytic section of the GRE (i.e., Graduate Record Exam, an entrance examination for graduate school), as compared to participants taking a near time perspective and participants in the control condition. As a result of these findings, they postulate that taking a distant time perspective shifts processing away from concrete thinking that is beneficial for analytic logic problems, in other words a transfer inappropriate processing shift.

Forster et al.'s (2004) findings map well onto Schooler et al.'s (1993) research on the effects of verbalisation on insight problem solving. Much as Forster et al. found that a near time perspective was not beneficial for insight problems, Schooler et al. found that verbalisation impairs solving of insight problems. If verbalisation does indeed induce an analytic/local processing shift, such processing should interfere with solving of insight problems, which benefit from more creative and abstract thinking. Research on verbalisation and insight problem solving demonstrates this connection

well and provides more evidence in favour of the processing account (Schooler et al., 1993).

The processing account also helps explain the effects of verbalisation on cultural groups that have different levels of dependence on holistic or global information. That East Asians are both more dependent on and more prone to utilise holistic reasoning holds for the great preponderance of cross-cultural research findings (see Nisbett, Peng, Choi, & Norenzayan, 2001, for a review). For instance, Matsuda and Nisbett (described in Nisbett et al., 2001) asked Japanese and American participants to view an animated scene of fishes in an ocean environment and later recall what they had seen. Japanese participants made more statements about the environment, whereas Americans were more concerned with a focal fish. Further, Japanese participants were impaired on a later memory task when the focal fish was shown on a different background, but Americans were not, an effect that suggests that the Japanese were more dependent on background and contextual cues. Abel and Hsu (1949) performed a similar study in which they showed Rorschach cards to Chinese Americans and European Americans. European Americans based their responses more on part of the card, while Chinese Americans based their response more on the *gestalt* of the card. To apply these cross-cultural findings to the current discussion, it seems fair to say that compared to Europeans, East Asians are chronically globally oriented.

If East Asians are indeed more dependent on global information, a manipulation designed to shift their processing orientation towards a more local or analytic orientation should influence their performance more than Europeans who are more accustomed to such a processing orientation. Kim (2002) found such an effect while studying the effect of talking aloud while problem solving cross culturally. Specifically, Kim asked East Asian and European Americans (all native speakers) to either verbalise aloud their thought process or not while solving reasoning problems. Kim found that East Asian Americans participants were impaired by thinking aloud, while European Americans were not. Together with Schooler et al.'s (1993) finding that verbalisation impairs the performance of European Americans on insight problem-solving tasks, it seems likely that verbalisation shifted processing towards a more local/analytic processing orientation that East Asians were not accustomed to using, thus impairing their problem-solving performance. The research presented thus far is highly consistent with the notion that verbalisation causes a transfer inappropriate processing shift, which is at least partially responsible for verbal overshadowing effects.

To summarise, research has uncovered a general or related set of processes characterised by local, featural, and concrete thought, and another set of processes characterised by global, configural, and abstract thought. These two distinct sets of procedures have been shown to be predictably activated

by a focus on global or local characteristics of unrelated stimuli, time perspective, mood (Gasper & Clore, 2002), and possibly verbalisation. The processing account for verbal overshadowing helps explain several findings not accounted for by content effects, as well as generalising to areas of research beyond perceptual memory.

A CRITERION SHIFT ACCOUNT

More recently, Clare and Lewandowsky (2004) have proposed a verbal overshadowing account that draws on neither content nor processing. These researchers suggested that verbalisation causes a shift in criterion towards more conservative choosing, causing participants to be more likely to choose a target not present option if available. In other words, if a lineup provides the option of reporting that none of the options are correct, verbalisers will be more prone to choose this option than nonverbalisers. Verbalisation, therefore, raises participants' response criterion, making them less likely to pick anyone out of the lineup. If the target individual is indeed present in the lineup, verbalisers will exhibit impaired performance—the verbal overshadowing effect.

Clare and Lewandowsky (2004) present strong evidence for the criterion shift account through two major findings. In a face recognition experiment, they find that when using a target absent lineup, verbalisers actually show improved accuracy due to declining to choose one of the options. A target present lineup, however, replicated the standard verbal overshadowing finding, with verbalisers showing poorer performance. Further, Clare and Lewandowsky find that when using a forced-choice paradigm (i.e., the absence of a target not present choice), they find no verbal overshadowing effect. Forcing participants to choose a face out of a lineup eliminates a criterion shift towards more conservative decision making, and so no verbal overshadowing in this condition is predicted by the criterion shift account.

In terms of comparison to prior theories, the criterion account seems to share more similarities with the process account, as opposed to the content account. Both the criterion and processing accounts seem to represent a shift in thinking, with a processing account dealing with global to local processing and a criterion dealing with a shift from more liberal to conservative criteria. Both processing and criterion accounts deal with the *way* one is thinking, while content deals with precisely *what* one is thinking. Regardless, the criterion shift account represents a unique approach for studying verbal overshadowing.

Although the criterion shift account provides an interesting new explanation for verbal overshadowing, as well as due focus on the oft-ignored effects the intricacies of the recognition task, a criterion shift does

not readily account for several previous findings. For instance, despite Clare and Lewandowsky's (2004) demonstrated lack of verbal overshadowing with a forced-choice paradigm, other researchers have shown verbal overshadowing with this condition (e.g., Fallshore & Schooler, 1995; Ryan & Schooler, 1998). Furthermore, Brown and Lloyd-Jones' (2002, 2003) paradigm for studying verbal overshadowing allows for calculation of both signal detection and response criterion. Their results indicate that verbal overshadowing is caused by signal detection, and not response criterion. Still, criterion effects are quite important to a nuanced understanding of verbal overshadowing and they should certainly be considered in any sort of unified account.

RECONCILING THE ALTERNATIVE ACCOUNTS OF VERBAL OVERSHADOWING

As can be seen from the previous review, significant support exists for all three of the leading accounts of verbal overshadowing. The question thus arises as to how the three accounts can be reconciled. Ultimately it seems unlikely that a single account will be able to accommodate all of the extant verbal overshadowing findings. Indeed there are certain findings that seem inherently inexplicable with in the context of certain accounts. For example, the content account seems inherently incapable of explaining the finding that describing one face interferes with recognition of nonverbalised faces. Similarly, the criterion shift account has difficulty accounting for situations in which verbal overshadowing interferes with recognition performance even when a "not present" option is not included. And the transfer inappropriate processing account has difficulty explaining studies in which verbalisation during encoding impairs subsequent imagery performance (e.g., Brandimonte et al., 1992a, 1992b, 1992c) since images are initially encoded in a verbal manner, and thus verbalisation would not be expected to produce a conflict between the processing engaged in at encoding and test

Although there are some results which seem inherently challenging to account for with one or another perspective, there are a host of other findings which in principle might be accounted for by a single mechanism. As already noted, many key results that have been characterised as consistent with a content account can theoretically be accounted for by a processing account. The differential effects of verbalisation as a function of verbal expertise can be explained as occurring because a shift to verbal processing is not detrimental if verbal skills are sufficient (Schooler, Fiore, & Brandimonte, 1997). Similarly, the sometimes observed relationship between quality of verbal description and recognition performance can be accounted for by assuming that the impact of a shift to verbal processing will depend on

the quality of the verbal representation that participants possess. Finally, the fact that extensive verbalisation produces the largest verbal overshadowing effect (Meissner et al., 2001) can be accounted for by assuming that the more extensive the verbalisation the more likely a processing shift is to occur. A processing shift account might also be able accommodate the occurrence of criterion shift if, as seems quite plausible, one of the consequences of a shift from visual to verbal processing is a more conservative criterion in recognising visual stimuli.

While it remains to be determined just how many of the verbal overshadowing findings can be explained by a single account, ultimately we think it quite likely that when the dust settles, verbal overshadowing will be seen to be due to different mechanisms in different situations (see Sporer, Meissner, & Schooler, 2006, for a similar argument). Although it is premature to speculate about what precise conditions should determine when one account versus another account is most viable, we can outline a line of investigation that should ultimately resolve this question. Specifically, the following set of criteria may reasonably be used to determine when each of three accounts apply.

Evidence supporting a content account. There are a variety of sources of evidence that could provide additional support for a content account. For example, if disruptive effects of verbalisation result from a reliance on specific inaccurately verbalised details, then it stands to reason that verbalisation should influence verbalised items more than nonverbalised items. To our knowledge no study has yet demonstrated a unique impact of verbalisation on verbalised items relative to nonverbalised ones; however, the majority of verbal overshadowing studies have not directly compared the two types of items. If future verbal overshadowing studies were to routinely include both verbalised and nonverbalised recognition items, it would become much easier to determine the precise situations in which content account is particularly likely to apply.

Although demonstrations of unique effects of verbalisation on verbalised versus nonverbalised stimuli provide the most direct evidence for content accounts, other sources of evidence also can support content accounts. For example, while there are ways of accommodating a relationship between description quality and accuracy within a processing account, a consistent and strong relationships between verbal descriptions and memory performance is most parsimoniously accounted for by the view that memory is being influenced by the verbal content of the description.

Evidence supporting a processing account. Several sources of evidence help to support the existence of processing shifts. As already noted, the

demonstrations of the generalisability of verbalisation to nonverbalised stimuli implicate a processing shift. Processing shifts can also be assessed by examining the impact of processing manipulations. For example, if a nonverbal processing manipulation introduced at or immediately prior to retrieval attenuates the negative effects of verbalisation then this supports a role of processing shift (Finger & Pezdek, 1999). Alternatively, if the encouragement of verbal processing at test attenuates verbal overshadowing this argues against a processing shift account (Brandimonte & Collina, 2008 this issue)

Strikingly, although there is considerable evidence that is consistent with a processing account, surprisingly little research has attempted to directly establish the existence and nature of the hypothesised processing shift. If indeed verbalisation induces a processing shift, then this shift should be directly measurable by examining the concomitant impact of verbalisation on measures associated with the hypothesised shift. For example, if, as has been frequently speculated, verbalisation produces a shift from global to local processing, then it should be found that verbalisation shifts people's likelihood of focusing on the local versus global aspects of item arrays that can be viewed in either context (Chin & Schooler, 2006). For example, when given a Navon letter, verbalisation subjects should be more likely than controls to focus on the small letters relative to the large ones. Similarly, if verbalisation causes a shift in right versus left hemisphere processing (e.g., Schooler, 2002), this should be reflected by changes in hemispheric activation. By consistently including in verbal overshadowing studies measures that will assess hypothesised shifts in processing, it should be possible to establish both the extent of the processing shift account, as well as more precisely specify the nature of such a shift.

Evidence supportive of a criterion shift. Support for a criterion shift account would be revealed by conducting studies that either enable the separate determination of criterion and discrimination measures, and/or omitting not present options from experiments. If verbal overshadowing effects are found to be exclusively associated with criterion effects, this would (obviously) support criterion shift accounts. If verbal overshadowing effects are observed in contexts in which a not present option is omitted, then clearly criterion shift accounts are not tenable. Importantly, assessment of criterion shifts should be done concurrently with assessments of global processing shifts. This will enable us to establish whether criterion shifts, when observed, are a consequence of general global changes in processing, or some other yet to be established factor that could cause verbalisation to encourage participants to adopt a more stringent response criterion.

If the field is systematic in taking into account these considerations when conducting verbal overshadowing studies, it seems likely that we will soon become clearer about which mechanisms are operating under which conditions. And perhaps with time, we will be able to use this understanding to derive more general principles for predicting when verbalisation will cause a specific reliance on inaccurate verbalised details, a global shift in cognitive processing, or simply a criterion shift. We might even come to understand why verbal overshadowing, though observed on so many occasions and in so many contexts, continues to be such a fragile phenomenon.

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