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Commentary

Ceiling effects make Hughes and Nicholson's data analyses and conclusions inconclusive[☆]Bob Uttl^{*}, Alain Morin

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ABSTRACT

Hughes and Nicholson (2010) suggest that recognizing oneself is easier from face vs. voice stimuli, that a combined presentation of face and voice actually inhibits self-recognition relative to presentation of face or voice alone, that the left hemisphere is superior in self-recognition to the right hemisphere, and that recognizing self requires more effort than recognizing others. A re-examination of their method, data, and analyses unfortunately shows important ceiling effects that cast doubts on these conclusions.

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Hughes and Nicholson (2010) present a new study supposedly demonstrating that recognizing oneself is easier from face vs. voice stimuli, that a combined presentation of face and voice actually inhibits self-recognition relative to presentation of face or voice alone, that the left hemisphere is superior in self-recognition to the right hemisphere, and that recognizing self requires more effort than recognizing others. We re-examined Hughes and Nicholson's method, data, and analyses and were forced to conclude that severe ceiling effects, inappropriate analyses, and methodological confounds render Hughes and Nicholson's conclusions unwarranted.

Hughes and Nicholson (2010) devote several pages to reviewing the background literature but the review appears superficial. For example, the authors discuss an eclectic collection of studies on self-recognition, conclude that the right hemisphere is dominant for self-recognition of one's face, and propose that the right hemisphere may also be dominant for self-recognition of one's voice. The authors, however, did not consider much of the evidence showing no such right hemisphere dominance in self-recognition (see Morin, in press) as well as in other forms of self-awareness such as autobiographical memory and emotion awareness (Gillihan & Farah, 2005; Northoff et al., 2006; Phan, Wager, Taylor & Liberzon; 2004; Svoboda, McKinnon, & Levine, 2006). Even more critically, the authors appear to have missed Rosa, Lassonde, Pinard, Keenan, and Belin's (2008) conclusion that the ceiling effects in their first experiment were responsible for their null findings, and in turn, required them to design a new experiment that would avoid ceiling effects by using a more difficult recognition task. As we demonstrate below, by missing the lesson learned by Rosa et al., Hughes and Nicholson set themselves up for the same predicament: the ceiling effects in their first experiment render their data non-interpretable and their conclusions unwarranted.

Hughes and Nicholson's (2010) key data are shown in Figs. 1 and 2. The figures show participants' accuracy in deciding whether stimuli depict or do not depict themselves when faces and voices are presented separately (Fig. 1) and when they

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are presented simultaneously (Fig. 2). Our own Figs. 1 and 2 present the exact same data as shown in Hughes and Nicholson's Figs. 1 and 2, respectively, but with y-axis ranging from 0% to 100% and the bars depicting one SDs (directly reported in the text or calculated from SEs reported by Hughes and Nicholson).

The replotted figures highlight the severe ceiling effects in all but one condition (Fig. 1, Self Voice/Right Hand) using one SD criteria for detecting ceiling effects, and in all conditions using 1.5 SD criteria (Uttl, 2005). Accordingly, the means do not reflect participants' ability to decide whether stimuli do or do not represent them but primarily ceiling effects, and, similarly, the SDs do not reflect true individual variability in recognition abilities but are merely an artifact of ceiling effects (see Uttl, 2005).

Second, due to ceiling effects, the ratios between the largest and the smallest SD within each figure's data are huge and the corresponding ratio between the smallest and the largest variances is 285 for the data in Fig. 1 and 625 for the data in

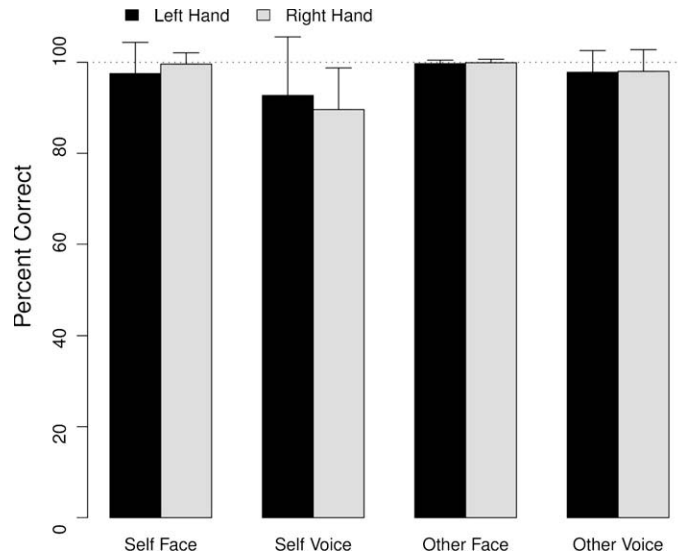


Fig. 1. Participants accuracy (means with bars indicating one standard deviation) in deciding whether stimuli depict or do not depict themselves when faces and voices were presented separately.

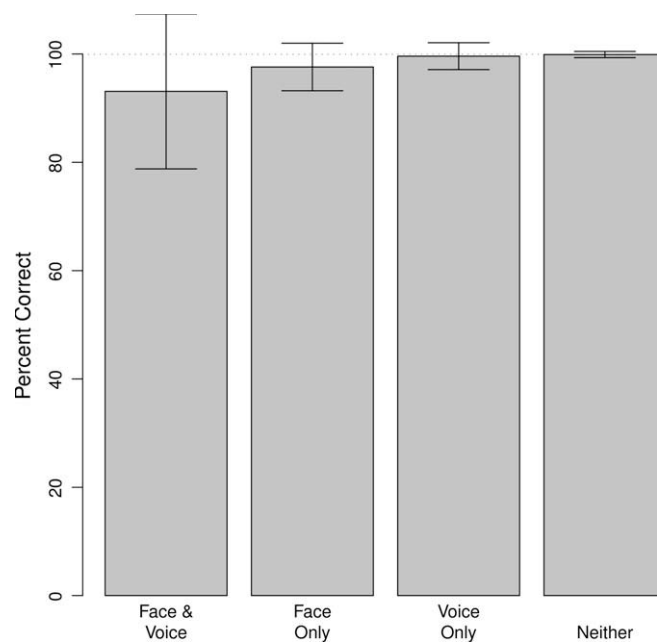


Fig. 2. Participants accuracy (means with bars indicating one standard deviation) in deciding whether stimuli depict or do not depict themselves when faces and voices were presented simultaneously.

Fig. 2. Moreover, correlations between condition means and condition standard deviations highlight that the high means are associated with low standard deviation ($r = -.85$ for the data in Fig. 1 and $r = -.99$ for the data in Fig. 2). In turn, these important differences in variability of scores across the experimental conditions and the strong association between the condition means and their standard deviations invalidate the parametric analyses (i.e., ANOVAs) reported by Hughes and Nicholson (see, for example, Howell, 2007, for a comprehensive discussion of assumptions that need to be satisfied to analyze the data using ANOVA).

In combination, the ceiling effects and invalid parametric analyses of the ceiling limited data render Hughes and Nicholson's key conclusions unwarranted. Hughes and Nicholson's data tell us nothing about participants' abilities except that the task was so easy that many participants (in some conditions nearly all of them) obtained perfect scores in all or nearly all conditions. The data and the analyses provide no conclusive evidence that "visual self-recognition processing is superior to auditory self-recognition processing" that "a cross-modal exposure to self stimuli . . . inhibits self-recognition" that "there may be lateralization effects for vocal self-recognition alone and when combined with visual information" and that "self-information required more effort to process than information about others".

Although Hughes and Nicholson (2010) acknowledged that participants' voice recognition accuracy was very high relative to the previous studies, they noted that their very high means were "consistent" with the very high means recently reported by Rosa et al. (2008). If they read Rosa et al.'s article, however, they learned that Rosa et al. (2008) concluded that "this [their] task was too easy and that the results were confounded by a ceiling effect." and "decided to design a second experiment" (p. 207). We think Hughes and Nicholson ought to have followed Rosa et al.'s example and also design a second experiment that would avoid the widespread ceiling effects that render their study difficult to interpret.

The ceiling effects problem aside, the authors make several puzzling claims. First, they claim that "participants were overall much more accurate at identifying stimuli presented that was not themselves versus when it was, suggesting it may take more effort to process self-information". However, the participants' task was to decide whether each stimuli was of self vs. not of self, and thus, participants never had to identify stimuli of others as those of specific people, for example, Joe or Jane. Arriving to a decision that a stimulus is vs. is not of a particular person is more difficult and requires more extensive cognitive processing. Even if the data were not limited by the ceiling effects and even if they were interpretable, the authors could only conclude that participants were more accurate in deciding that stimuli were not representing them than deciding that stimuli were representing them.

Second, the authors claim that "auditory-stimuli presented concomitantly with visual self-stimuli inhibited performance and reaction times on the self-recognition tasks". Again, arriving to a decision that *both* voice *and* face are of a particular person is much more difficult and requires more cognitive processing than a decision that a face *or* a voice is not of a particular person (e.g., the first feature that does not fit allows me to conclude it is not me). Thus, one task requires processing of more information than the other task and the inhibition/interference interpretation is unwarranted.

In conclusion, Hughes and Nicholson's claims are largely unwarranted due to the ceiling limited data, invalid parametric analyses of the ceiling limited data, and the failure to recognize that the participants' task did not at all require identification of specific others.

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