Unconscious perception and the classic dissociation paradigm: A new angle?

EYAL M. REINGOLD

University of Toronto, Toronto, Ontario, Canada

Reingold and Merikle's (1988, 1990) critique of the classic dissociation paradigm identified the exhaustiveness, exclusiveness, null sensitivity, and task comparability issues as inherent problems that severely undermine the utility of this paradigm. Snodgrass, Bernat, and Shevrin (2004) attempt to provide solutions to these problems and claim to propose a novel conceptual and methodological framework for the study of unconscious perception. Unfortunately, the present analysis indicates that the approach proposed by Snodgrass et al. involves the same problems as do previous implementations of the classic dissociation paradigm.

An important aspect of the study of the relation between consciousness and perception concerns the development and implementation of experimental methods that will more conclusively document the separate existence, as well as the unique aspects, of conscious and unconscious processes. Equal emphasis on methodological rigor, as well as conceptual clarity, is imperative if progress is to be made toward the attainment of this goal. On the methodological front, the study of the unconscious is infamous for illusive and fragile phenomena, the difficulty of replicating findings, and inconsistent, indeed sometimes inadequate, implementation of basic measurement criteria (see Eriksen, 1960; Holender, 1986; Merikle, 1982; Merikle & Reingold, 1990, 1991, 1998; Reingold, 2003, 2004; Reingold & Merikle, 1988, 1990; Reingold & Toth, 1996). On the conceptual front, definitional and terminological chaos, and implicit assumptions that are rarely acknowledged, fuel the often futile controversy between "believers" and "nonbelievers" in the unconscious (see Dunn & Kirsner, 1988, 1989; Erdelyi, 1985, 1986, 2004; Reingold, 2003, 2004; Reingold & Merikle, 1988, 1990; Reingold & Ray, 2002; Reingold & Toth, 1996).

Snodgrass, Bernat, and Shevrin (2004) claim to provide a novel conceptual and methodological framework for the study of unconscious perception. Unfortunately, the present examination indicates that the approach proposed by Snodgrass et al. (2004) involves the same problems as those implicated in previous implementations of the classic dissociation paradigm. Given that Snodgrass et al. set

their paradigm in contrast to the analysis provided by Reingold and Merikle (1988, 1990), it will be appropriate to begin with a brief overview of that analysis.

The starting point of Reingold and Merikle's analysis is a formal description of the classic dissociation paradigm (see also Erdelyi, 1985; Reingold & Ray, 2002). This paradigm establishes three prerequisites for demonstrating unconscious perception:

1. A valid measure of perceptual information available to consciousness must be selected (C) and compared with another measure of perceptual processing (X).

2. $C = 0$. The measure of conscious awareness indicates null sensitivity, or null awareness.

3. $X > 0$. The second measure of perceptual processing must be shown to have greater than zero sensitivity.

Reingold and Merikle (1988, 1990) pointed out that much of the long-standing controversial status of the study of unconscious perception revolves around the lack of a general consensus as to what constitutes a valid measure of conscious awareness. In the absence of an agreed upon operational definition of consciousness, a variety of measures have been, often arbitrarily, used as indicators of conscious awareness. Two general approaches to the measurement of conscious awareness were identified: the subjective approach employing a subjective report or "claimed awareness" measure, and the objective approach that defines awareness in terms of performance on tasks that measure perceptual discriminations. Indeed, it was noted that whether evidence of perception without awareness is obtained depends crucially upon how awareness is operationally defined. Specifically, although perception in the absence of subjective confidence is a very robust phenomenon (see Adams, 1957, for a review), convincing evidence of perception under conditions that establish chance discrimination has not been forthcoming. Reingold and Merikle argued that in the context of the classic dissociation paradigm, a valid measure must index *all* of the perceptual information available to consciousness (the exhaustiveness assumption) and *only* conscious, but not unconscious, information (the exclusiveness assumption). Even if it could be established that a particular measure constituted an exclusive and exhaustive indicator of conscious perceptual information, the classic dissociation paradigm also requires a convincing empirical demonstration of null sensitivity on such a measure (i.e., $C = 0$). As highlighted by Reingold and Merikle (1988, 1990) a conclusive demonstration of null sensitivity is not trivial (the null sensitivity problem; cf. Macmillan, 1986). In fact, claimed demonstrations of null sensitivity (e.g., Balota, 1983; Fowler, Wolford, Slade, & Tassinari, 1981; Marcel, 1983) were subsequently criticized as failing to truly establish chance discrimination (see Cheesman & Merikle, 1984; Holender, 1986; Merikle, 1982; Nolan & Caramazza, 1982).

On the basis of the analysis above, Reingold and Merikle (1988, 1990) argued that *no* proposed measure of con-

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scious awareness, be it objective or subjective, should be considered valid on an *a priori* basis (i.e., on the basis of assuming exclusiveness and exhaustiveness). Instead, Reingold and Merikle proposed that an important research goal is to identify qualitative differences between conscious and unconscious processing in an attempt to converge on a nonarbitrary indicator of awareness, and to establish the importance of the conscious-unconscious distinction. If it can be shown that theoretically predictable qualitative differences are correlated with a particular behavioral measure, this measure may constitute a valid indicator of awareness. Furthermore, discovering predictable qualitative differences may constitute a critical test for determining the value of the conceptual distinction between conscious and unconscious processes. More specifically, if the difference between conscious and unconscious processing is quantitative, rather than qualitative, in nature, the merit of agonizing over this distinction becomes highly questionable.

In the absence of a valid indicator of consciousness, Reingold and Merikle (1988, 1990) proposed the relative sensitivity paradigm (RSP), an approach based on the most minimal *a priori* assumption that still permits the implementation of the logic of the dissociation paradigm. Specifically, the RSP assumes that the sensitivity of a direct discrimination is greater than, or equal to, the sensitivity of a *comparable* indirect discrimination to conscious task-relevant information. Thus, if empirically we find an indirect measure that is more sensitive than a comparable direct measure, then because the superiority of the indirect measure cannot be attributed to conscious information (by assumption), it must by default indicate that performance on the indirect task is informed, at least in part, by unconscious information. In contrast to previous approaches, the RSP does not assume that direct or indirect measures exclusively and/or exhaustively index conscious or unconscious processing. Thus, direct and indirect measures may reflect conscious, unconscious, or both conscious and unconscious information. Direct versus indirect measures are defined respectively by the presence versus absence of reference to the discrimination of interest in the task instructions. In addition, comparable direct and indirect measures of a particular discrimination should be as similar as possible, with the exception of this difference in task instructions. To the extent that dissociated direct and indirect measures are truly comparable, such a dissociation may be theoretically more meaningful (i.e., potentially reflect unconscious processing). Conversely, we should not really be surprised if dissimilar measures are dissociable. Conceptually, the advantage of the RSP is that it is based on a very minimal *a priori* working assumption that is stated explicitly, and it is thus open to evaluation. Methodologically, the advantage of the RSP is that the difficult requirement of establishing the null sensitivity of the direct measure is no longer a prerequisite for demonstrating unconscious processing. Rather, it is sufficient to demonstrate that the sensitivity of an indirect measure is

greater than the sensitivity of a comparable direct measure, even if the sensitivity of the direct measure is greater than zero (i.e., indirect sensitivity $>$ direct sensitivity $\geq$ zero).

Empirical support for the possible value of the RSP approach to the study of unconscious processes comes from the results of a number of studies, which indicate that at least under certain conditions, indirect measures do in fact exhibit greater sensitivity than do *comparable* direct measures. In one important study, Kunst-Wilson and Zajonc (1980) initially showed participants 10 irregular geometric shapes; each shape was presented five times for a very brief, 1-msec duration. Following these initial exposures, the participants were shown 10 pairs of shapes, and they were instructed either to indicate which member of each pair had been presented (a direct measure) or to choose the shape they preferred (an indirect measure). Kunst-Wilson and Zajonc reported that the indirect preference measure was more sensitive than the comparable direct recognition measure (for similar findings, see Mandler, Nakamura, & Van Zandt, 1987). According to the logic underlying comparisons between comparable direct and indirect measures, these findings constitute strong evidence for unconscious processing (see also Merikle & Reingold, 1991, for another illustration of a successful application of the RSP paradigm).

Within the framework of the RSP approach, other patterns of results are certainly possible. However, given the logic behind comparing the relative sensitivity of direct and indirect measures, these other possible patterns of results do not provide any definitive evidence. For example, if an indirect index is less sensitive to a particular stimulus dimension than a comparable direct index is (see Dulaney & Eriksen, 1959, and Reingold & Merikle, 1988, for such findings), this pattern of results provides no evidence either for or against unconscious perception. This is the case since one cannot deduce whether the sensitivity of either the direct or the indirect index reflects conscious, unconscious, or both conscious and unconscious perceptual processes.

Furthermore, Reingold and Merikle (1988, 1990) were careful to note that the RSP cannot resolve the fundamental quest for a valid measure of consciousness or awareness. Being a conservative approach (i.e., employing a minimal *a priori* assumption), the RSP may not be optimally effective in distinguishing between conscious and unconscious processing. In other words, the RSP is more likely to err in not identifying unconscious processing (i.e., a miss), than to mistake conscious processing as being unconscious (false alarm). In the final analysis, the RSP may be useful to the extent that it enables us to document unconscious processing via dissociations between tasks in a state of considerable ignorance, or uncertainty, as to the nature, and the composition of the processes that mediate performance on these tasks. It is important to emphasize that the RSP was always intended to be implemented in conjunction with other methods such as the qualitative

difference approach in order to converge on a valid procedure for distinguishing between conscious and unconscious processing.

As described above, Reingold and Merikle’s (1988, 1990) critique of the classic dissociation paradigm highlighted the exhaustiveness, exclusiveness, null sensitivity, and task comparability problems. Reingold and Merikle argued that these issues severely undermine the utility of this paradigm. In marked contrast, Snodgrass et al. (2004) argue for the use of objective detection thresholds (ODTs) in conjunction with the classic dissociation paradigm logic as the only promising methodology for conclusively demonstrating unconscious perception. Simplifying the arguments advanced by these authors, the core of their approach can be summarized by two basic assertions:

1. The signal detection theory (SDT) detection task provides a valid measure of conscious perceptual awareness.
2. The validity of SDT detection as an indicator of conscious perceptual awareness is critically supported by the purported finding that as stimulus intensity is varied, a nonmonotonic U-shaped relationship between direct and indirect measures of perception emerges, establishing a powerful qualitative difference.

Table 1 further summarizes the model proposed by Snodgrass et al. (2004), its predictions of performance on direct (detection and identification) and indirect (e.g., semantic priming) measures of perception, and the hypothesized underlying processes (Table 1 is based on Snodgrass et al.’s [2004] Figure 3 and related discussion). Snodgrass et al.’s (2004) assertion that SDT detection provides a valid measure of conscious perceptual awareness appears to be based on a very strong assumption that above chance detection occurs *if and only if* the stimulus is consciously detected (see Table 1). In other words, SDT detection is assumed to exhaustively and exclusively measure conscious perceptual information. However, whereas these authors were quite clear about assuming that detection constitutes an exhaustive measure of conscious perceptual awareness, their exclusiveness assumption with regard to

this measure is a logically required, but unacknowledged, prerequisite of their approach.

The necessity for assuming detection exclusiveness within the framework proposed by Snodgrass et al. (2004) becomes clear once the implications of different aspects of their approach are considered together. Before I address this issue, it is important to draw the reader’s attention to an important distinction between two terms used in the literature that might be easily confusable: exclusiveness and exclusivity. As explained above, Reingold and Merikle (1988, 1990) coined the term *exclusiveness* to refer to the assumption that the performance on a proposed measure of conscious awareness solely reflects conscious perceptual influences. In contrast, following Jones (1987), Snodgrass et al. (2004) use the term *exclusivity* to refer to the assumption that conscious and unconscious influences never co-occur (i.e., are mutually exclusive). In addition, they use the term *functional exclusivity* to refer to the assumption that when conscious and unconscious influences co-occur, the former always overrides the latter.

Keeping in mind the distinction between exclusiveness and exclusivity, consider the argument by Snodgrass et al. (2004) that “conscious and unconscious perceptual influences are *functionally exclusive* (cf. Jones’s, 1987, typology), and the former override the latter when (1) both are present, and (2) participants regard their conscious perceptions as relevant given the task context. The latter occurs by definition with direct tasks and may occur frequently even with ostensibly indirect tasks” (p. 855). Accordingly, in the context of the direct SDT detection task, even though conscious and unconscious influences co-occur (seemingly contradicting the exclusiveness assumption), the former overrides the latter, and consequently task performance is exclusively driven by conscious detection (consistent with the exclusiveness assumption).

Most importantly, Snodgrass et al. (2004) argue that “if some form of exclusivity holds, approaching null sensitivity would actually potentiate rather than eliminate unconscious perceptual influences, dissolving the exclusiveness problem” (p. 863). In other words, Snodgrass

Table 1
Summary of the Predictions Made by the Model Proposed by Snodgrass, Bernat, and Shevrin (2004)
Concerning Performance on Direct (Detection and Identification) and Indirect (e.g., Semantic Priming)
Measures of Perception, and the Hypothesized Underlying Processes

Condition	Performance Measures and Underlying Processes		
	Detection	Identification	Indirect (e.g., Semantic Priming)
Objective detection threshold	Chance performance: No conscious detection	Chance performance: No conscious identification	Above chance performance: Unconscious semantic activation
Objective identification threshold	Above chance performance: Conscious detection	Chance performance: No conscious identification	Chance performance: Conscious detection overriding unconscious semantic activation
Subjective identification threshold	Above chance performance: Conscious detection	Above chance performance: Conscious identification	Above chance performance: driven exclusively by conscious perceptual inputs
Supraliminal	Above chance performance: Conscious detection	Above chance performance: Conscious identification	Above chance performance: driven exclusively by conscious perceptual inputs

et al. assume that detection null sensitivity (i.e., the ODT) is tantamount to no conscious influences (i.e., the exhaustiveness assumption), and under exclusivity or functional exclusivity, unconscious perceptual influences manifest behaviorally only in the absence of conscious influences. Consequently, they argue that detection null sensitivity should maximize rather than attenuate unconscious perceptual influences. However, this argument works only if one also assumes that above zero detection sensitivity necessarily implies that performance is mediated by conscious perceptual influences (i.e., the exclusiveness assumption). In fact, it is clear that Snodgrass et al. (2004) assume that greater than chance detection at or below the objective identification threshold (OIT) necessarily implies that performance is mediated by conscious detection of stimuli. Precisely this conscious detection in the absence of conscious identification at the OIT is hypothesized by Snodgrass et al. to suppress higher level unconscious semantic activation, as indexed, for example, by a semantic priming measure (see Table 1). In their own words, higher level unconscious influences "should be maximal at the ODT and *decline*, not increase, as stimulus intensity increases to the OIT, because the overriding low-level conscious perception is not yet sufficient to support higher level effects. . . . Finally, as stimulus intensity surpasses the OIT, higher level effects also increase, now driven exclusively by conscious perceptual inputs" (Snodgrass et al., 2004, p. 855). Thus, it is clear that the predicted U-shaped function that is so central to the model proposed by Snodgrass et al. is implicitly predicated on assuming the exclusiveness of the SDT detection measure.

From the preceding discussion, it should be evident that Snodgrass et al. (2004) assume that establishing the objective detection threshold selectively removes conscious influences without affecting unconscious influences. In contrast, consider the possibility that above chance detection under extremely degraded stimulus display conditions may be predominantly mediated by unconscious perceptual influences and that at the objective detection threshold both conscious and unconscious perceptual influences are largely absent. Under these circumstances, even if exclusivity holds, establishing detection null sensitivity would result in severely attenuating or even eliminating any observable unconscious perceptual influences. Thus, rather than dissolving the exclusiveness problem by adopting the functional exclusivity assumption, Snodgrass et al. (2004) appear to attempt to camouflage it or to merely assume it away.

As Reingold and Merikle (1988, 1990) argue, the exclusiveness assumption is more troublesome for the objective approach to the measurement of awareness, and the exhaustiveness assumption is more troublesome for the subjective approach. Given that Snodgrass et al. (2004) advocate the use of objective detection thresholds for the purpose of establishing null awareness, it is vitally important that they provide an adequate solution for the exclu-

siveness problem. However, as has been discussed above, they have failed to do so.

What about the assumption of Snodgrass et al. (2004) that detection constitutes an exhaustive measure of conscious perceptual awareness? In general, rigorously established objective detection thresholds are commonly accepted as convincing demonstrations of null awareness, thereby satisfying the exhaustiveness criterion. However, it is important to note that claimed demonstrations of null detection sensitivity often fail to truly establish chance discrimination (see Cheesman & Merikle, 1984; Holender, 1986; Macmillan, 1986; Merikle, 1982; Nolan & Caramazza, 1982). Mindful of this problem, Snodgrass et al. (2004) highlight 20 experiments in nine investigations of unconscious perception in the last 15 years that they claim employed carefully determined ODTs and yielded positive findings. Snodgrass et al. argue that these "rigorous studies have provided stronger and more consistent evidence for ODT effects than did the earlier studies criticized by Holender (1986), Reingold and Merikle (1988, 1990), and others" (p. 859).

Although a review of these studies is beyond the scope of the present article, it is instructive to consider the procedure used for establishing null detection in a study by Snodgrass, Shevrin, and Kopka (1993), which is listed by Snodgrass et al. (2004) as one of these rigorous experiments. In the study by Snodgrass et al. (1993, Experiment 3), detection performance was assessed by using 24 presence/absence detection trials (12 word and 12 blank trials). Importantly, these trials were postexperimental trials that followed a pseudoexperiment in which no actual stimuli were presented during 240 forced choice identification trials and in which participants received dummy feedback concerning their performance. Could it be that after being subjected to the pseudoexperiment, participants simply gave up? One is reminded of the point made by Eriksen (1959) in the following caricature:

A psychophysicist in setting about to determine the absolute threshold for light would not use an experimental situation where the subject was to press a button directly in front of him to indicate that he did not see the light and to get up and walk across the room to press a button on the wall if he did. Few would expect such an arrangement would yield as low an absolute threshold as would be obtained if the subject had the two buttons directly in front of him. (p. 205)

Eriksen's clever illustration reminds us that only by looking beyond the title or characterization of a task and scrutinizing the details of its implementation will we be in a position to evaluate the scientific rigor or merit involved. What, then, is the appropriate benchmark for establishing null detection sensitivity? Indeed, distinguishing residual detection from null detection is one of the most serious methodological and practical hurdles inherent in the classic dissociation paradigm. This is nicely illustrated by Macmillan's (1986) computation that a minimum of 140 trials would be required to empirically distinguish be-

tween $d' = 0$ and $d' = .5$. Furthermore, the number of required trials is truly prohibitive if one attempts to distinguish null detection from even lower levels of residual detection.

The vast majority of studies employing the classic dissociation paradigm, including many of the studies touted by Snodgrass et al. (2004) as using rigorous procedures for establishing null detection, can be criticized on similar grounds as failing to do so. In addition, a careful examination of the nine studies identified by Snodgrass et al. as providing reliable evidence for unconscious perception indicates that most of these effects are extremely small in magnitude and have not been independently replicated. This is a very meager yield for 15 years of research. It is important to note that two separate types of problems can lead to erroneous positive ODT results: (1) inadequate threshold setting procedures that establish subjective rather than, as claimed, objective thresholds (e.g., Balota, 1983; Fowler et al., 1981; Marcel, 1983), and (2) random variation leading to Type I error. Furthermore, given the difficulty of publishing null results, the file drawer problem is particularly problematic in the area of unconscious perception. Thus, methodological flaws or chance leading to false findings are therefore occasionally rewarded with a publication in this field, resulting in further confusion and controversy.

The preceding discussion reveals that the framework proposed by Snodgrass et al. (2004) involves the same problems as have previous attempts to implement the classic dissociation paradigm in conjunction with the objective approach to the measurement of awareness. Thus, it is important to evaluate any new arguments offered by Snodgrass et al. to mitigate such problems. Their arguments rely heavily on their claim that empirical evidence reveals that as stimulus intensity is varied, a nonmonotonic U-shaped relationship between direct and indirect measures of perception emerges. This purported finding of a U-shaped function is in turn touted as a powerful qualitative difference that provides strong support for the validity of SDT detection as an indicator of conscious perceptual awareness. Given that Snodgrass et al. (2004) base their approach on a critique of the analysis provided by Reingold and Merikle (1988, 1990), it is ironic to note that they appear to be simply following Reingold and Merikle's prescription of employing the qualitative difference approach to establish the validity of their proposed measure of conscious awareness (i.e., detection). Furthermore, Snodgrass et al., having criticized the validity of attempts to use the qualitative differences approach in the context of the subjective approach to the measurement of awareness, are in the curious position of needing to explain why the qualitative difference that they are arguing for is convincing or decisive while other qualitative differences are inconclusive.

Notwithstanding the latter issue, a conclusive and robust demonstration of such qualitative differences in the form of U-shaped functions would be theoretically very important. Unfortunately, it appears that in arguing for such qualitative differences, Snodgrass et al. (2004) make

extremely strong claims on the basis of less than convincing empirical evidence. As is shown in Table 1 (see also Snodgrass et al., 2004, Figure 3A), it is clear that the so-called U-shaped function is critically dependent on a single data point (i.e., at the ODT). Specifically, an indirect measure of semantic activation produces performance above chance at the ODT (constituting the sought after classic dissociation). In other words, findings of indirect measure >0 at ODT are key to establishing the U-shaped function, and the U-shaped function is used to allay concerns related to the reliability and interpretation of such findings. Most importantly, Snodgrass et al. attempt to construct their support for the U-shaped function by aggregating data across different studies. Before the authors' claims can be taken seriously, it would be necessary to systematically manipulate stimulus intensity and demonstrate the U-shaped function within a single study. Critically, if the authors are correct, U-shaped functions relating performance on indirect measures of perception and stimulus intensity should be routinely obtained, but this is not the case. The bottom line is that the support offered by Snodgrass et al. for their intriguing proposal of U-shaped functions is very weak indeed and as such could not be legitimately used to validate SDT detection as a measure of conscious perceptual awareness.

More generally, according to Snodgrass et al. (2004), although conscious and unconscious perception can co-occur, unconscious perception has an impact only and therefore can be observed only in the absence of conscious perception. If they are correct, the phenomenon of unconscious perception may be of very limited theoretical and practical significance. In contrast, if they are wrong, and if detection performance is sensitive to both conscious and unconscious information, then equating awareness with detection above chance may result in severe underestimation of the magnitude and importance of unconscious perception effects.

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