

Article

On the Inter-relatedness of Theory and Measurement in the Study of Unconscious Processes

EYAL M. REINGOLD AND PHILIP M. MERIKLE

Overview

The idea that cognitive processes can be meaningfully classified as conscious or unconscious has a long history in philosophy and psychology (see Ellenberger 1970; Erdelyi 1985; Perry and Laurence 1984, for reviews). However, even though many experimental reports during the past 100 years claim to demonstrate perception, learning, or memory without conscious awareness, the distinction between conscious and unconscious processes remains highly controversial. For example, the same empirical findings that Holender 1986 concludes provide little or no evidence for unconscious perception are considered by other reviewers (e.g. Dixon 1981) as conclusive and overwhelming documentation of the validity of perception without awareness.

In an attempt to explain this puzzling state of affairs, Dixon 1981 states that '... research on closed mindedness and related traits suggests the possibility that those people with rigid belief systems, who feel threatened by the loss of control implied by subliminal perception, might be just the sort to create a milieu in which it fails to occur' (p. 200). Dixon's critical evaluation of his theoretical rivals' personalities instead of their arguments represents a dangerous trend because it promotes a futile debate between 'believers' and 'non-believers' that has very little to do with empirical evidence. We do not deny that belief systems and private epistemological and existential theories held by investigators contribute both to the controversy and to the fascination surrounding this area of research (see Crowder 1986 for candid and humorous autobiographical comments). However, while such issues may constitute an intriguing case study in the sociology

of science, they should not be used as weapons in a meaningful scientific exchange. Indeed, the highly personal and emotional aspect of the study of the unconscious only highlights the need for conceptual and methodological clarity.

The purpose of the present paper is to identify the *a priori* assumptions underlying the major experimental approaches employed by researchers of the unconscious. These assumptions are rarely made explicit. We argue that much of the long-standing controversy in this area revolves around differences in the implicit assumptions adopted by different investigators. More specifically, there is no general consensus as to what constitutes an adequate operational definition of conscious awareness. Accordingly, we begin by discussing the general issues that have obscured the relationship between the theoretical construct of conscious awareness and the behavioral indicators used to measure this construct. In the second part of the paper, we review two major approaches to the measurement of consciousness adopted in studies of perception without awareness. We conclude that the assumptions logically required by these approaches cannot be justified on an *a priori* basis. Consequently, in the third and final part of this paper, we discuss two alternative approaches: one approach requires a considerably less stringent *a priori* assumption, while the second approach requires converging evidence to support the adequacy of the behavioral measures used to index conscious awareness.

Conscious Awareness: Theoretical Constructs versus Empirical Measures

The nonscientific nature of current conceptions of the unconscious is attested by the vagueness of definitions of what constitutes conscious and unconscious behavior. Not only are the definitions vague and operationally inadequate but there are several different terms that are used, sometimes to designate the same phenomena, other times in a partially overlapping way. (Eriksen 1960, p. 279)

The basic definitional problems identified by Eriksen almost 30 years ago are still surprisingly relevant. In this section, we focus on two major factors that contribute to the lack of definitional and conceptual clarity in the study of the unconscious. The first problem, which becomes immediately apparent to anyone attempting to review the relevant psychological literature, is the proliferation of terminology associated with the conscious/unconscious distinction. Terms such as conscious, aware, intentional, explicit, controlled, and attentional are not sufficiently differentiated and are sometimes used as synonyms. The same can be said for the terms unconscious, unaware, incidental, implicit, subliminal, pre-attentive, inaccessible, and covert (see Erdelyi 1985). The second, and even more serious,

problem is the confusion between the underlying theoretical constructs and the empirical behavioral measures of these constructs.

These general issues can be illustrated through an examination of the definitional criteria currently used in the study of unconscious memory. Until recently, questions regarding the relationship between memory and consciousness attracted very little attention in mainstream cognitive psychology. Tulving 1985 went so far as to state that 'nowhere is the benign neglect of consciousness more conspicuous than in the study of human memory' (p. 1). However, during the past several years, a growing number of studies have been directed at demonstrating memory without awareness in both amnesic patients and normal adults. This recent trend has also been accompanied by a change in terminology. In an important review, Schacter 1987 advocates a distinction between explicit and implicit memory as opposed to possible distinctions between either conscious and unconscious memory or aware and unaware memory. He states that 'the main reason for adopting implicit memory in favour of either unconscious memory or unaware memory has to do with the conceptual ambiguity of the latter two terms' (pp. 501-502). However, even though Schacter attempts to avoid using ambiguous terms such as consciousness and awareness, he defines explicit and implicit memory in terms of subjective phenomenal awareness at the time of retrieval. According to Schacter 1987, 'implicit memory is revealed when previous experiences facilitate performance on a task that does not require conscious or intentional recollection of those experiences; explicit memory is revealed when performance on a task requires conscious recollection of previous experiences' (p. 501).

If the distinction between explicit and implicit memory is defined with reference 'to the key feature of implicit memory phenomena: the absence of conscious recollection of a prior experience at the time of test' (Schacter 1987, p. 512), then nothing is gained by this new terminology. Indeed, explicit memory can be considered a synonym for conscious memory, and implicit memory can be considered a synonym for unconscious memory. The substantial difficulty introduced by the implicit/explicit terminology is that it acquires different meanings in different contexts (see Richardson-Klavehn and Bjork 1988). More specifically, the terms explicit and implicit are employed as predicates in at least two different meanings:

- (1) As described above, explicit and implicit memory are used to refer to conscious and unconscious memory, respectively.
- (2) In addition, the terms explicit and implicit memory are used to refer to experimental tasks. Schacter 1987 defines memory tasks in which subjects are instructed to refer to a specific processing episode as explicit memory tasks or tests. For example, subjects may be instructed to recall or recognize words from a list that was presented in an earlier part of the experiment. In contrast, a variety of tasks that do not require reference to a prior study episode but

which nevertheless document memory for that episode are defined as implicit memory tasks. A prototypic example of an implicit memory task is word-stem completion. In this task, subjects are given word stems (e.g. TRA_ for TRAVEL) and are instructed to complete them with the first word that comes to mind. Memory for previously presented words is reflected by an increased tendency to produce these words as responses to the stems.

Using the implicit/explicit terminology to refer both to subject characteristics (i.e. phenomenal awareness) and to task characteristics (i.e. reference to a previous study episode) illustrates the blurring of the distinction between theoretical constructs and empirical measures. A short allegory from *Alice's Adventures in Wonderland* might help demonstrate what is at stake here. After Alice and the creatures swam in the pool of Alice's tears, the problem was how to get dry, and they had a consultation:

... said the Dodo ... 'the best thing to get us dry would be a Caucus-race.' 'What is a Caucus-race?' said Alice. ... the Dodo had paused as if it thought that somebody ought to speak, and no one else seemed inclined to say anything. 'Why,' said the Dodo, 'the best way to explain it is to do it.' ... First it marked out a race-course, in a sort of circle ('the exact shape doesn't matter,' it said), and then all the party were placed along the course, here and there. There was no 'One, two, three, and away!' but they began running when they liked, and left off when they liked, so that it was not easy to know when the race was over. However, when they had been running half an hour or so, and were quite dry again, the Dodo suddenly called out 'The race is over!' and they all crowded round it, panting, and asking, 'but who has won?' This question the Dodo could not answer without a great deal of thought ... At last he said 'Everybody has won, and all must have prizes.' ... and the whole party at once crowded around, calling out in a confused way, 'Prizes! Prizes!'

The amusing, but rather chaotic, consequences of the caucus-race illustrate that without clear definitions of the rules of the game (i.e. the best way to explain it is to do it), deciding the outcome (i.e. winners or losers) is quite an arbitrary process. Note also, that in the midst of the confusion, the original goal which the caucus-race 'task' was designed to achieve (i.e. getting dry) was quickly forgotten. Likewise, the lack of definitional and conceptual clarity in the study of the unconscious often results in arbitrary and contradictory interpretations of empirical findings. In addition, theoretical goals are often confused with the tasks designed to achieve them. For example, as noted by Erdelyi 1985 the general consensus in the late 1950s was that 'the failure of experimental methodology to corroborate the existence of unconscious processes was taken, as a matter

of course, to reflect a failure of the concept rather than a failure of the extant methodology' (pp. 58-59).

To date, the most extensive treatments of definitional issues related to the distinction between conscious and unconscious processes have evolved within the context of the study of perception without awareness. Consequently, in the next section, we examine in some detail several of the major approaches to the measurement of consciousness employed in studies of unconscious perception.

Indicators of Conscious Awareness in the Study of Unconscious Perception

The vast majority of studies directed at demonstrating perception without awareness have relied on the dissociation paradigm (see Erdelyi 1985, 1986). The basic logic underlying this paradigm is that perception without awareness can be demonstrated by a dissociation between two indices of perceptual processing: one index is assumed to indicate the availability of stimulus information to awareness or consciousness, while the second index is assumed to indicate the availability of stimulus information, independent of whether or not this information is available to consciousness. In the frequently employed version of the dissociation paradigm, such as the one advocated by Holender 1986, a demonstration of perception without awareness requires unequivocal evidence that stimulus information which is completely unavailable to awareness is nevertheless perceived and capable of influencing higher-level decision processes.

This version of the dissociation paradigm has three requirements or criteria that must be satisfied before perception without awareness is demonstrated. First, an adequate measure of the perceptual information available to consciousness or awareness must be selected. Second, this measure of conscious perceptual experience must be shown to indicate null sensitivity. Finally, given that the measure of conscious awareness indicates null sensitivity, the second measure of perceptual processing must be shown to have greater than zero sensitivity.

Obviously, the success of any approach based on this experimental strategy depends critically upon the adequacy of the behavioral measure used to index conscious awareness. If the measure is inadequate, then any dissociation between this measure and another measure of perceptual experience provides no definitive evidence either for or against unconscious perception. Thus, before any approach based on this version of the dissociation paradigm can be evaluated, it is necessary to have a clearly articulated definition of exactly what is meant by an adequate measure of conscious awareness.

Reingold and Merikle 1988 have argued that the implicit assumption underlying most of the applications of the dissociation paradigm to the study of unconscious perception is that a particular behavioral measure

exhaustively and/or exclusively indexes conscious perceptual information. The exhaustiveness and the exclusiveness assumptions define possible relations between the empirical finding of greater than zero perceptual sensitivity indexed by a particular behavioral measure and the occurrence of conscious perceptual processing. If conscious perception is assumed necessarily to result in better than zero perceptual sensitivity on a given measure, then this measure is defined as an exhaustive measure of conscious awareness. Conversely, if an exhaustive measure indicates null sensitivity, then no stimulus information is available to conscious awareness. It is important to note that an exhaustive measure of awareness is potentially sensitive to conscious, unconscious, or both conscious and unconscious information. Thus, although greater than zero sensitivity on an exhaustive measure is a necessary condition for conscious perception, it is not a sufficient condition for demonstrating perception with awareness. In contrast to an exhaustive measure, an exclusive measure of consciousness awareness is defined as any measure that is influenced only by conscious perceptual experience. However, an exclusive measure is not necessarily an exhaustive measure of consciousness. For this reason, with an exclusive measure of awareness, greater than zero sensitivity is a sufficient but not a necessary condition for demonstrating perception with awareness.

To illustrate the exhaustiveness and the exclusiveness assumptions, consider the five hypothetical measures shown in Figure 1. The shaded area inside each circle represents the perceptual information resulting in above zero sensitivity on each measure. In contrast, the unshaded areas represent the perceptual information leading to zero sensitivity on the measures. As can be seen in Figure 1, exclusiveness and exhaustiveness are independent assumptions; a measure can be exclusive, but not exhaustive (Measure A), exhaustive, but not exclusive (Measures D and E), both exclusive and exhaustive (Measure C), or neither exclusive nor exhaustive (Measure B).

Investigators applying the dissociation paradigm have assumed, either implicitly or explicitly, that null awareness is demonstrated whenever the behavioral measure used as an indicator of awareness shows null sensitivity. However, this assumption can only be true if this behavioral measure is an exhaustive measure of conscious perceptual processes. If the exhaustiveness assumption is not made, then it is entirely possible that stimulus information is available to consciousness despite the finding of zero sensitivity on the designated measure of awareness. Consequently, evidence for perceptual sensitivity indexed by a different perceptual measure (i.e. dissociation) may simply reflect the fact that the two measures are sensitive to different aspects of consciously available information (see Duncan 1985; Navon 1986). For example, consider Measure A in Figure 1. This measure is not sensitive to all consciously available information. Consequently, it is not an exhaustive measure of conscious perception. If Measure A is designated as the measure of awareness and null sensitivity is established, then a dissociation between Measure A and another meas-

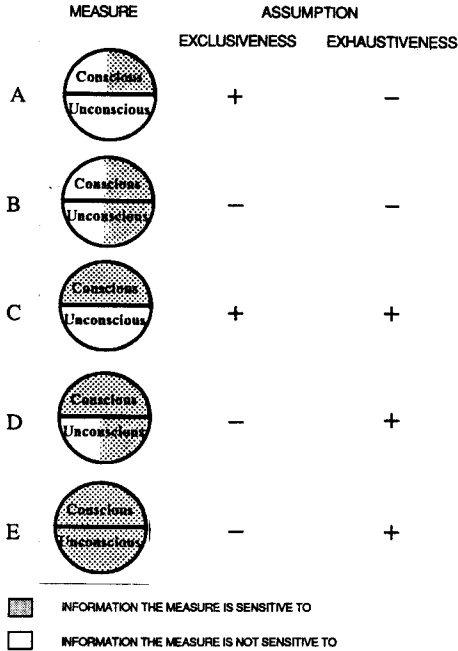


Figure 1. Illustration of the exhaustiveness and the exclusiveness assumptions.

ure, such as Measure C in Figure 1 (i.e. $A=0$ and $C>0$), would be interpreted erroneously as evidence for unconscious perception. However, this interpretation would be incorrect because neither Measure A nor Measure C index unconscious perceptual information. Indeed, according to the logic of the dissociation paradigm, an adequate indicator of awareness must be an exhaustive measure of conscious perceptual processing.

The importance of the exclusiveness assumption is critical if one attempts to reject the validity of perception without awareness on the basis of experimental evidence. When a designated measure of awareness indicates null sensitivity and all other measures of perception also indicate null sensitivity (i.e. no dissociation), one possible conclusion is that perception without awareness does not exist. Such a conclusion is only warranted, however, if the behavioral measure is an exclusive measure of conscious perceptual processing. If the exclusiveness assumption is not made, then it is entirely possible that the absence of a dissociation between measures reflects the fact that these measures index conscious, unconscious, or both conscious and unconscious perceptual experiences. For example, selecting Measure E in Figure 1 as the measure of awareness would inevitably lead to finding no dissociations between this measure

and all the other perceptual measures irrespective of whether or not these measures index unconscious perception.

In summary, both the exhaustiveness and the exclusiveness assumptions are relevant to interpretations of findings obtained within the framework of the dissociation paradigm. When one perceptual measure is shown to be dissociable from another perceptual measure, perception without awareness is indicated only if the first measure is assumed to be an exhaustive indicator of conscious perception. At the same time, the absence of dissociations between measures can only be used as an argument against perception without awareness if it can be assumed that the behavioral measure designated as an indicator of awareness is an exclusive measure of conscious perception. In attempting to satisfy the exhaustiveness assumption, it is tempting to select the most sensitive measure of perception as an indicator of awareness (i.e. Measure E in Figure 1). However, unless this measure is also an exclusive measure of consciousness, such a research strategy may preclude the demonstration of perception without awareness.

The controversy and polarization concerning the validity of unconscious perception is a direct consequence of the relative emphasis assigned to the exhaustiveness and the exclusiveness assumptions by different investigators. Unfortunately, such differences in the theoretical starting points are rarely made explicit. The resulting interpretive problems are illustrated by reviews of two major experimental approaches to the measurement of conscious awareness. Neither approach has provided definitive evidence for or against perception without awareness. The problematic aspect of the first approach is related primarily to a failure to satisfy the exhaustiveness assumption, while a failure to satisfy the exclusiveness assumption underlies the interpretive problems associated with the second approach.

Studies Based on Subjective Confidence

In the earliest studies of unconscious perception, the behavioral measure used to index conscious awareness was based simply on an individual's subjective confidence that the perceived stimulus information was useful for the experimental task. Many of these early studies were reviewed by Adams 1957, and the experiments reported by Sidis 1898 provide an excellent illustration of this general approach. Sidis showed observers cards containing a single printed digit or letter. The interesting aspect of these experiments is that 'the subject was placed at such a distance from the card that the character shown was far out of his range of vision. He saw nothing but a dim, blurred spot or dot' (p. 170). In fact, 'the subjects often complained that they could not see anything at all; that even the black, blurred, dim spot often disappeared from their field of vision . . . (p. 171). However, when Sidis asked the subjects to name the character on a card, their responses were correct considerably more often than would be expected on the basis of pure random guessing, even though many subjects

expressed the belief '... that they might as well shut their eyes and guess' (p. 171). On the basis of these and similar findings, Sidis concluded that his experiments indicated '... the presence within us of a secondary subwaking self that perceives things which the primary waking self is unable to get at' (p. 171).

Many other investigators (e.g. Miller 1939; Stroh, Shaw and Washburn 1908; Williams 1938) have reported findings quite similar to those originally reported by Sidis. In fact, perception in the absence of subjective confidence is a relatively easy phenomenon to demonstrate, and the phenomenon is so robust that Adams 1957 suggested its use as a classroom demonstration. Thus, the experimental evidence clearly indicates that subjects can make accurate perceptual discriminations even when they believe that their perceptual experiences are inadequate to guide their choices.

Even more dramatic demonstrations of perception, learning and memory without subjective confidence are based on observations of cortically blind and amnesic patients (see Young and De Haan, this volume). Blindsight patients who exhibit absolutely no confidence as to the presence of objects in their blind field nevertheless demonstrate knowledge of the size, shape, and orientation of such objects when required to guess (See Campion, Latto and Smith 1983; Weiskrantz 1986, for reviews). Similarly, amnesic patients demonstrate robust learning of skills such as reading mirror-inverted script and puzzle solving despite their claims that they cannot remember ever performing these tasks before (see Schacter 1987; Shimamura 1986, for reviews).

Many investigators, however, feel uncomfortable measuring conscious awareness solely in terms of subjective reports. A major reason for caution is that it is difficult to know what criteria individuals use to decide they are guessing (Merikle 1984). Statements expressing no subjective confidence may simply reflect biases introduced by either the experimental instructions (i.e. demand characteristics, in psychological jargon) or an individual's preconceived ideas concerning the value of particular types of perceptual experiences for making decisions. For example, from the subjects' statements in Sidis' experiments, it is clear that, on at least some occasions, they saw both the cards and also 'dim, blurred spots or dots' on these cards. Thus, statements indicating an absence of subjective confidence may only reflect an individual's own theories of how perceptual experience guides behavior rather than a true absence of conscious perceptual experience. As pointed out by Merikle 1984 the fundamental problem with the subjective confidence approach 'is that it transfers the responsibility for operationally defining awareness from the investigator to the observer' (p. 450).

The above considerations raise serious doubts as to whether subjective reports constitute an adequate exhaustive indicator of conscious awareness. The primary problem with this approach is that a lack of subjective confidence does not necessarily indicate an absence of conscious perceptual experience. For this reason, most investigators, with a few notable excep-

tions (e.g. Dixon 1981; Henley 1984), reject any approach for distinguishing conscious from unconscious perceptual processes that is based solely on subjective reports indicating whether or not sufficient information was perceived to perform the required task.

Studies Based on Perceptual Discriminations

Given the problems associated with subjective confidence as an exhaustive measure of awareness, many investigators prefer to define awareness on the basis of tasks that measure perceptual discriminative capacity. Typical measures used in recent studies are forced-choice, present-absent decisions, which require subjects to distinguish between the presence of a stimulus and a null stimulus condition, and forced-choice discriminations among a small, known, set of stimulus alternatives. Methodologically, measures of discriminative responding have an important advantage over measures based on subjective reports; measures of discriminative capacity allow the assessment of perceptual sensitivity with considerable precision, and independent of any possible influence of preconceived biases. Thus, the methodological rigor offered by an approach based on measures of discriminative responding is superior to any approach based on measures of subjective confidence. For this reason, operational definitions of awareness based on measures of perceptual discriminative capacity are preferred by many investigators. Implicitly, these measures seem more likely to satisfy the exhaustiveness assumption than measures based on subjective reports.

However, in early studies, this definitional change appeared to have completely eliminated the phenomenon! In retrospect, this consequence is perhaps the most plausible outcome. By defining awareness in terms of discriminative responding, the very same measures that investigators such as Sidis 1898 used to indicate the availability of perceptual information independent of consciousness were now used as indicators of awareness. For example, Sidis used forced-choice discriminations to demonstrate perception in the absence of subjective confidence. If, as implicitly assumed by Sidis, forced-choice discriminations are influenced by both conscious and unconscious processes, then using forced-choice discriminations to measure perceptual awareness violates the exclusiveness assumption. As a consequence, null sensitivity on a measure of discriminative responding may indicate an absence of both conscious and unconscious perceptual processes. In other words, discriminative responding may be an exhaustive measure of unconscious as well as conscious processes. Given these considerations, it is not surprising that Eriksen 1960, in his classic critique of research using this approach, reached the following conclusion:

At present there is no convincing evidence that the human organism can discriminate or differentially respond to external stimuli that are at an intensity level too low to elicit a discriminated verbal

report. In other words, a verbal report is as sensitive an indicator of perception as any other response that has been studied (p. 298).

Eriksen's conclusions were accepted for many years by the majority of psychologists. However, they were seriously challenged in 1974 when Marcel presented a preliminary report describing a series of studies which appeared to demonstrate that visual stimuli are perceived even when observers cannot detect their presence. Although Marcel used a somewhat different methodology than had been used in previous experiments (see Marcel 1983), for present purposes the exact details of his methodology are unimportant. Rather, the critically important aspect of Marcel's experiments is that they appeared to demonstrate that a stimulus can be perceived even when subjects cannot discriminate between its presence or absence. Additional support for Marcel's findings came from subsequent experiments by other investigators who used similar methodologies and found comparable results (e.g. Balota 1983; Fowler, Wolford, Slade and Tassinari 1981). These findings, taken as a whole, led to considerable excitement. They convinced many former skeptics that perception without awareness was indeed a valid phenomenon. If stimulus detection does provide an adequate exhaustive measure of perceptual awareness, then perception in the absence of stimulus detection would provide strong support for unconscious perception.

Given the potential importance of these findings reported by Marcel and subsequent investigators, these studies were carefully scrutinized by a number of critics (e.g. Cheesman and Merikle 1985; Merikle 1982; Nolan and Caramazza 1982). It is interesting to note that these critics did not question the adequacy of stimulus detection as a measure of awareness. Instead, they directed their attention solely to the methodology used to establish null stimulus detection. On the basis of these critiques, it now appears that the methodology used in these experiments was probably inadequate for establishing null stimulus detection. Consequently, these studies are inconclusive as to the validity of perception without awareness. For this reason, Holender 1986, following a detailed review of these studies, concluded that there is little or no evidence for the concept of perception without awareness.

We seem to have come full circle from Eriksen 1960 to Marcel 1974 to Holender 1986 as opinion has swung from skepticism to enthusiasm and back to skepticism. If the absence of an ability to respond discriminatively to a stimulus is adequately established, then at the present time, there is no evidence for any other perceptual processing. However, this absence of positive findings is only relevant to the study of perception without awareness if discriminative responding is assumed to provide an adequate exclusive measure of awareness. If discriminative responding does not measure conscious processes exclusively and actually measures the influence of both conscious and unconscious processes, then equating awareness with the capacity for discriminative responding may be tantamount

to defining unconscious perception out of existence (see Bowers 1984).

Some investigators implicitly assume that measures of discriminative responding are exclusive indicators of awareness. For these investigators, the failure to demonstrate perception in the absence of discriminative responding provides evidence against the existence of perception without awareness. For example, Holender 1986 reviewed a number of measures of discriminative responding used in studies of perception without awareness and emphasized that 'one property common to all these indicators of awareness is that subjects make their responses intentionally. It is fundamental that an indicator of awareness must be intentional' (p. 51). Thus, Holender's position implies that whenever subjects are required by task demands to discriminate between alternative stimulus states, their responses are intentional and therefore, by definition reflect conscious processes. However, as pointed out by Marcel 1983, it is entirely possible that:

In attempting to make deliberate judgements based on information of whose external source one is unaware, it would seem that one makes use of the relevant nonconscious information, if it is available, by relying passively on its effects (e.g. upon attention) rather than being able selectively to retrieve it or be sensitive to it such that it can be the basis of an intentional choice (p. 211).

The obvious fact emphasized by Marcel is that subjects' attempts to comply with task demands and to provide discriminative responses do not necessarily imply that their responses are informed and influenced by conscious processing exclusively. The real problem with Holender's 1986 position is that the intentions of a subject cannot be directly observed or measured. Intentionality, like awareness, is a theoretical construct that should not be confused with the characteristics of empirical tasks.

To summarize, the logic of the dissociation paradigm requires an adequate measure of awareness. To interpret any dissociation between two measures of perception as evidence for perception without awareness, one measure must be assumed to provide an exhaustive measure of awareness. In addition, to interpret the absence of a dissociation as evidence against perception without awareness, one measure must be assumed to provide an exclusive measure of awareness. Unfortunately, neither assumption can be justified on an *a priori* basis when awareness is measured in terms of either discriminative responding or reports of subjective confidence.

Alternative Approaches to the Measurement of Conscious Awareness

The lack of definitional and conceptual clarity in the study of the unconscious stems from the implicit or explicit association of certain tasks

with characteristics of observers or rememberers such as intentionality or phenomenal awareness. Given that the assumed associations between tasks and observer characteristics are difficult to justify, the empirical findings have led primarily to controversy rather than to clarification. In this section, we describe two alternative approaches which appear to have some promise for resolving the conceptual/empirical confusions that characterize the study of the unconscious.

Relative Sensitivity of Direct and Indirect Measures

In the absence of a valid measure of awareness, Reingold and Merikle 1988 suggested that comparisons of the relative sensitivity of different types of tasks used to assess perception and memory have the potential to provide considerable information concerning the relation between consciousness and cognition. They proposed that an important distinction between tasks concerns whether a task provides a direct or an indirect index of a particular stimulus discrimination (see also Richardson-Klavehn and Bjork 1988). Tasks in which subjects are explicitly instructed to perform the memory or perceptual discrimination of interest are defined as direct measures of memory or perception. In contrast, if the instructions given to subjects do not make any reference to the discrimination of interest, then such tasks are defined as indirect measures.

Examples of direct memory tasks are stimulus recognition and recall. In these tasks, subjects are explicitly instructed to discriminate old or previously presented stimuli from new stimuli that have not been presented within the experimental context. In contrast, a task such as word-stem completion constitutes indirect measure of memory in that no explicit reference is made in the task instructions to the distinction between old and new stimuli. For this reason, if the word stems are completed more often with old than with new words, then this task provides a sensitive indirect measure of memory.

As an illustration of direct and indirect measures of perception, consider the following variant of the Stroop color-word interference task (e.g. Cheesman and Merikle 1984). In this task, the presentation of a color patch is immediately preceded by a brief presentation of a word naming either a congruent or an incongruent color. Instructing subjects to report the identity of the word constitutes a direct measure of word identification. In contrast, if the subjects are instructed to name the color patch, any influence of the preceding word on their color naming performance constitutes an indirect measure of word identification. Typically, incongruence between a word and a color patch inhibits color naming performance, while congruence between a word and a color patch facilitates performance. Thus, color naming performance can provide a sensitive indirect measure of word recognition.

A critically important aspect of this distinction between direct and indirect measures of memory and perception is that it is based solely on a

consideration of the instructions given to subjects. As such, it is completely neutral with respect to the nature of processing which may underlie performance on these two types of tasks. Thus, direct and indirect tasks may reflect conscious, unconscious or both conscious and unconscious processing. In other words, neither direct nor indirect measures are assumed to provide either exhaustive or exclusive indicators of conscious processing.

Reingold and Merikle 1988 suggested that comparisons of the relative sensitivity of comparable direct and indirect measure have the potential to provide definitive evidence for unconscious perception and memory. This approach is based on the following minimal *a priori* working assumption: 'The sensitivity of a direct discrimination is assumed to be greater than or equal to the sensitivity of a comparable indirect discrimination to conscious, task relevant information.' (Reingold and Merikle 1988, p. 556) The rationale underlying this assumption is that relevant conscious information, if it exists, would be used equally or more efficiently when subjects are instructed to make a particular discrimination (i.e. a direct task) than when subjects are not so instructed (i.e. an indirect task). Conversely, it is difficult to imagine circumstances in which conscious, task relevant information would enhance performance more when subjects are not instructed to make the discrimination, than when subjects are explicitly instructed to make the discrimination. Although any *a priori* assumption can be criticised, the proposed working assumption has two advantages. First, it is explicitly stated and thus open to evaluation. Second, it is a much more minimal assumption than either the exhaustiveness or the exclusiveness assumptions which are often made implicitly and which may in fact be impossible to ever justify.

The important consequence of the very minimal assumption proposed by Reingold and Merikle 1988 is that unconscious processes are implicated whenever an indirect measure shows greater absolute sensitivity than a comparable direct measure to a particular stimulus discrimination. This is the case because the assumption rules out the possibility that superior performance on the indirect task is attributable to conscious task relevant information. Therefore, by default, whenever an indirect measure indicates greater sensitivity than a comparable direct measure, it must reflect a greater sensitivity of the indirect measure to unconscious, task relevant information. It is important to emphasize that this interpretation is warranted only if the direct and the indirect measures are truly comparable except for the instructions given to the subjects (see Reingold and Merikle 1988). Otherwise, the greater sensitivity of an indirect measure may reflect a methodological artifact rather than unconscious processes.

Empirical support for the possible value of this approach to the study of unconscious processes comes from studies of unconscious memory. The results of a number of studies indicate that, at least under certain conditions, indirect measures do in fact exhibit greater sensitivity than comparable direct measures. In an important study, Kunst-Wilson and Zajonc

1980 initially showed subjects ten irregular geometric shapes, with each shape being presented five times for a very brief, 1-msec duration. Following these initial exposures, the subjects were shown 10 pairs of shapes, one old and one new, and they were instructed either to indicate which member of each pair had been presented previously (a direct measure) or to choose the shape they preferred (an indirect measure). With the indirect measure based on preference, the subjects chose the old stimulus in 60% of the pairs. However, with the direct recognition test, old stimuli were selected in only 48% of the pairs, which approximates a chance level of performance in this task. These basic results have been replicated by other investigators (e.g. Bonnano and Stilling 1986; Seamon, Marsh and Brody 1984). In addition, Mandler, Nakamura and Van Zandt 1987 used a similar procedure and found that a variety of tasks requiring indirect discriminations (preference, brightness, darkness) were more sensitive to the old/new discrimination than comparable direct measures of stimulus recognition. According to the logic underlying comparisons between comparable direct and indirect measures, these findings constitute strong evidence for unconscious memory.

An approach to the study of unconscious processes based on comparisons of the relative sensitivity of comparable direct and indirect measures has distinct conceptual and methodological advantages relative to many previous approaches. Conceptually, the approach bypasses much of the controversy over the measurement of awareness. No strong *a priori* assumptions are required concerning the possible exhaustiveness or exclusiveness of any particular behavioral indicator as a measure of awareness. Rather, given that all behavioral measures are potentially sensitive to both conscious and unconscious processes, the approach only requires the much more minimal *a priori* assumption that the sensitivity of direct measures to conscious, task-relevant information is equal to or greater than the sensitivity of comparable indirect measures to the same information. This emphasis on the relative sensitivity of different measures also leads to an important methodological advantage. The extremely difficult methodological requirement of establishing null absolute sensitivity for an assumed measure of awareness (see Macmillan 1986) is no longer a prerequisite for demonstrating unconscious processing. Given these advantages and the suggestive findings indicating that certain indirect measures of memory are more sensitive than comparable direct measures, approaches based on the relative sensitivity of direct and indirect measures may be instrumental in documenting unconscious processes.

Converging Evidence for Measures of Awareness

I suggest that consciousness is no clearer a construct than, say, intelligence and that any given indicator of awareness is no more incontrovertible than a particular IQ index of intelligence. (Erdelyi 1986, p. 31)

facilitation on both congruent and incongruent trials. Marcel suggested that these results indicate that conscious perception involves selection of the one meaning consistent with the context (i.e. the first word), whereas unconscious perception is not constrained by context. Interestingly, Marcel's findings are reminiscent of Freud's conceptualization of the primary processing which characterizes the unconscious id. According to Freud, primary processing allows mutually exclusive or contradictory thoughts and impulses to coexist (see Erdelyi 1985).

Although the importance of demonstrating qualitative differences between conscious and unconscious processes has been emphasized previously (e.g. Cheesman and Merikle 1985, 1986; Dixon 1971, 1981; Jacoby and Whitehouse 1989; Jacoby, Woloshyn and Kelley 1989; Shevrin and Dickman 1980), this criterion has received surprisingly little empirical or theoretical attention. If it can be shown that qualitative differences can be predicted consistently on the basis of a particular behavioral measure, then this measure may constitute a valid indicator of awareness. Potentially, such measures could be based on either subjective reports or objective indicators of discriminative capacity. Thus, identification of a large number of qualitative differences provides a method for defining and, perhaps, even for discovering non-arbitrary measures of awareness. Furthermore, discovering predictable qualitative differences may constitute the ultimate empirical criteria for evaluating the value of the conceptual distinction between conscious and unconscious processes.

Summary

In the present paper, we identify some of the issues that underlie the controversial status of the concept of the unconscious in psychology. In addition, possible directions for resolving this controversy are outlined. We argue that the confusion of constructs with tasks and the confusion of theoretical goals with methodological tools represent major obstacles in the study of the unconscious. What appears on the surface to be a debate over empirical findings is more often a reflection of differences in implicit theoretical starting points or assumptions. Thus, key players are actually playing in different courts, according to different rules, very much like the creatures in the caucus-race described in *Alice's Adventures in Wonderland*. Previous approaches based on attempts to provide indicators of awareness cannot be justified on an *a priori* basis. In the absence of a valid measure of awareness, the approach proposed by Reingold and Merikle 1988 represents a conservative methodological framework, with a minimal *a priori* assumption, for studying unconscious processing. In addition, identifying qualitative differences between conscious and unconscious processing may prove invaluable both in converging on a non-arbitrary indicator of awareness and in establishing the importance of the conscious-unconscious distinction. Given the complexity of this area of research, it is likely that different paradigms will be necessary if true progress is to be made. At

the same time, the need for definitional and conceptual clarity should not be forgotten.¹

Department of Psychology
University of Waterloo
Waterloo
Ontario N2L 3G1
Canada

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