QUALITATIVE DIFFERENCES BETWEEN CONSCIOUS AND UNCONSCIOUS PROCESSES VS. DISSOCIATED MEASURES

LEVEL OF ANALYSIS IN UNCONSCIOUS PROCESSING

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ABSTRACT

In psychoanalytic theory, it is often claimed that people have a well-developed unconscious, which is capable of complex operations. Research into unconscious processing done by experimental psychologists seems to contradict this view. This paper investigates the extent to which unconscious processing reaches the level of complexity that is seen for conscious processing. In the past, this question has been addressed by looking into research that used the method of direct and indirect measures. The main conclusion from these investigations is that it is not possible to process multi-word strings or complex patterns unconsciously. The studies described in this paper do not make use of the direct-indirect research method. Instead, they look for qualitative differences between conscious and unconscious processes. Although there are few studies showing such an effect, it seems that the insights that can be gained are worthwhile. Based on this research it is suggested that unconscious processing is unspecific in comparison to conscious processing. This might be the reason that other studies indicate that complex stimuli cannot be processed outside awareness.

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1. INTRODUCTION

Recent decades have seen a major increase in research into the domain of unconscious perception. Many studies have addressed specific questions on the matter of unconscious processing of stimuli. Greenwald (1992), for instance, posed the general question to what extent unconscious processing is complex. Based on a large body of research, he argues unconscious processing is analytically unsophisticated. However, as Greenwald himself points out, many of the findings he discusses have regularly met with criticism (e.g. Holender, 1986). The apparent need to prove the existence of an indirect effect of unconscious cognition in the absence of a direct effect of conscious cognition has been particularly problematic. Reingold and Merikle (1988) note that this is only possible as long as the (direct) measure for conscious perceptual experience is assumed to exhaustively measure (and thus rule out) all conscious perception. This exhaustiveness-assumption is very difficult to justify. Therefore, Merikle (1992) proposes a different research strategy, in which the aim is to find qualitative differences between conscious and unconscious processes. The question addressed in this paper is whether the currently available research findings containing these qualitative differences support Greenwald's (1992) argument that unconscious processes are unsophisticated. It will be argued that unconscious processes indeed seem to be limited in their level of analysis, although the argument will be inherently different from Greenwald's line of reasoning.

First, a summary is given of Greenwald's (1992) argument pertaining to relative simplicity of unconscious processes. General criticisms issued against the methods used in the research he discusses will be clarified (Holender, 1986; Reingold & Merikle, 1988). Then an explanation is given of what Merikle's (1992) strategy of finding qualitative differences encompasses. Five studies that seem to have found qualitative differences between conscious and unconscious processes will be discussed in the light of their repercussions for the position that unconscious processes are unsophisticated compared to conscious processes. Taken together, these studies suggest that unconscious processes are limited in their level of specificity. This position is based on the finding that this type of processing seems to take place on the basis of non-specific semantic or affective characteristics of these stimuli as opposed to specific semantic or structural characteristics. It is suggested that as a result the level of analysis seen for consciously perceived stimuli is not achieved.

2. LEVEL OF ANALYSIS IN UNCONSCIOUS COGNITION: GREENWALD (1992)

Level of analysis in unconscious processing

In cognitive theory, level of analysis refers to the extent to which perception rises above the ability to identify physical features of stimuli, such as color and spatial location. In discussions of speech perception, for example, low levels of analysis identify physical features such as sound frequency and intensity. Conversely, higher levels of analysis identify words, propositions and more complex structures such as multiproposition syllogisms (Greenwald, 1992).

Greenwald (1992) evaluates a substantial body of research about the level of analysis that can be found in unconscious cognition. Differentiating between levels of analysis, he distinguishes research based on three kinds of stimulus material: physical features, single words and multi-word

strings. He identifies each kind of stimulus material with a higher level of analysis, multi-word strings being the highest.

He also differentiates between three theoretical research domains concerning research into unconscious cognition: *cognitive activation*, *establishment of memory* and *retrieval of memory*. The following section is dedicated to giving a summary of Greenwald's findings insofar they are of interest for this paper. The research is classified along roughly the same domains Greenwald (1992) adheres to.

Unconscious Cognitive Activation

Selective attention and subliminal activation are the two main paradigms used in trying to establish unconscious cognitive activation. In the following section some research using these paradigms will be discussed.

In subliminal activation research, target stimuli are presented for very short durations, often accompanied by masking stimuli that render them less perceptible. The majority of subliminal activation research is aimed at finding "indirect evidence for analysis of semantic content of target word stimuli under conditions that limit or prevent awareness of these words" (Greenwald, 1992), also known as *Subliminal Semantic Activation*. In analyzing subliminal semantic activation research, a distinction can be made between *objective* and *subjective* stimulus presentation thresholds. Objective thresholds are obtained when stimuli are presented at a level at which forced-choice responding indicates that a stimulus is *undetectable*. Subjective thresholds are acquired when stimuli are presented for longer durations, but subjects still do not report *phenomenological awareness* (Cheesman & Merikle, 1986).

Although evidence is limited that undetectable stimuli result in unconscious processing, Greenwald concludes in his 1992 paper that it is well established that analysis of single words presented somewhere in the region between objective and subjective threshold can extract at

least some semantic content. However, it is still controversial whether analysis of higher-level multi-word strings such as the "Mommy and I are One" string (Silverman & Weinberger, 1985 as cited by Greenwald, 1992) can take place. This is mostly due to the fact that effects could supposedly also have been caused by the positive affect of single words in such strings and because the proposed psychodynamic interpretation of such effects is often not taken seriously. Results in the field of subliminal semantic activation research seem to indicate limited analysis for suboptimally presented stimuli and offer yet unconvincing evidence that this analysis occurs with undetectable stimuli (Greenwald, 1992).

In selective attention research, the reduction of conscious awareness of stimuli is accomplished by diverting the subjects' attention away from the critical stimulus, thus rendering it less perceptible. Subjects are required to closely monitor one source of information (the primary channel) while being tested indirectly for effects from another (secondary) channel. This can be done either through dichotic listening procedures in which different messages are presented to the two ears, or through dichoptic viewing in which differing visual stimuli are presented to the two eyes. An important strategy for assessing the level of unconscious analysis is to establish what stimuli can cause spontaneous switching of attention.

Greenwald (1992) argues that it is an established fact that primitive (for instance, physical) features of stimuli can be analyzed even though they are presented to the secondary channel. At an intermediate level of analysis, evidence indicates that word meaning is processed at least partially in the secondary channel. There seems to be no established evidence, however, that multi-word strings or other complex patterns are analyzed in the secondary channel (although he proposes that this could partly be due to a lack of good experiments using selective attention to test for complex analysis). Greenwald summarizes the selective attention and subliminal activation research as indicating that the level of analysis found in the domain of unconscious cognitive activation is fairly low.

Unconscious Establishment of Memory

The *subliminal mere exposure* effect can be shown after a graphic stimulus is presented several times under conditions that do not allow subsequent recognition. Although subjects are not able to recognize these previously exposed stimuli, they do prefer them above new stimuli in a two-alternative forced-choice test of preference on about 60% of choices. This effect has been replicated by several investigators in various laboratories, although these experiments have generally not followed extensive procedures to establish the detectability characteristics of the exposure conditions (Greenwald, 1992).

Some researchers have also been aiming to find a visual *subliminal affective conditioning* result. Such a result is shown when the affect of a suboptimally presented affectively charged prime (a positive or negative word, a smiling or frowning face) is transferred to a fully visible neutral target stimulus. Though several positive results had been reported, Greenwald (1992) considered the evidence for such an effect insufficient at the time of writing his appraisal. Later on in this paper, research into subliminal affective conditioning by Murphy and Zajonc (1993, published after Greenwald's 1992 review), will be discussed.

Unconscious Retrieval of Memory

In the past two decades, a large number of systematic observations in both clinical and healthy populations have been made of what has been termed *implicit memory*. Implicit memory is generally revealed when no reference is made to the presentation episode and the subject is not aware of the memory character of a test. Amnesiacs often show an ability to perform certain tasks based on experience they are not aware of ever having had. A similar effect can also be observed in normal populations when tests for memory show implicit recognition of stimuli comparable to implicit memory of forgotten prior experience in amnesiacs. Jacoby and Witherspoon (1982, as cited by Greenwald, 1992) showed a close similarity between data

obtained from Korsakoff amnesiacs and from a student population on a spelling task that indirectly tapped memory for words that were presented earlier in the experiment. Jacoby's further work has identified a number of *memory illusions* that derive from implicit memory effects. One of his experiments showing such an illusion will be discussed later in this paper. However, implicit memory for complex stimuli, such as digit sequences, has so far not been found (Greenwald, 1992).

Greenwald's Conclusion: Limitations of Unconscious Processing

Greenwald (1992) concludes his paper by claiming that studies indicate that the level of processing involved in unconscious cognition does not go beyond physical features and some aspects of word meaning. Although memory traces of objects or words are established for unattended stimuli, as yet no evidence has been presented that can confidently be interpreted as indicating unconscious analysis at the level of multi-word strings. Object representations are apparently learned very efficiently without attention, as indicated by the mere exposure effect, but more abstract object representations (digit sequences) seem to require attention.

It is important to note at this point that Greenwald equates sophistication of unconscious processing with the level of processing that is achieved, i.e. with the ability to process multi-proposition strings. As is argued later on in this paper, this is not necessarily the most informative way of analyzing levels of complexity in unconscious processing. One could, for instance, also look at the level of specificity that is achieved in unconscious processing versus conscious processing. Groeger (1986, 1988), for example, shows that both meanings of an ambiguous word are activated in unconscious conditions (Palm-Wrist *and* Palm-Tree), whereas only one meaning is activated in conscious conditions (Palm-Wrist *or* Palm-Tree). Clearly then, the unconscious conditions show a lower level of specificity than the conscious conditions.

3. SSA AND THE DISSOCIATION PARADIGM: GENERAL CRITICISM

A large part of the research Greenwald (1992) discusses is aimed at finding evidence for Subliminal Semantic Activation (SSA). Because SSA research has endured much criticism (e.g. the appraisals by Greenwald, 1992, and Holender, 1986), the following section is devoted to explaining measures common to subliminal activation research and summing up the most pungent criticism that has emerged.

Direct and Indirect Measures of Consciousness

A corner of the veil was lifted during the discussion of Greenwald's (1992) findings, but at this point a more explicit description of the measures used in SSA research is necessary in order to explain why a different approach is taken in this paper. An important distinction that is made is between *direct* and *indirect* measures. "A *direct effect* of a stimulus is its effect on an instructed response, typically assessed by a measure of accuracy at the instructed task. By contrast, an *indirect effect* is an *un*instructed effect of the task stimulus on behavior, and is often assessed by including an irrelevant or distracting component in the task stimulus" (Greenwald & Draine, 1997).

A clear example of an indirect effect can be found in the Stroop task (Stroop, 1935). In a Stroop task, subjects are instructed to name the color ink that words are written in. However, when these words are color names themselves, incongruity between word meaning and ink color interferes with the speed with which a color is named. This uninstructed effect is termed an indirect effect.

In typical SSA research, the direct measure (usually a discrimination task of some sort) is taken as a measure of conscious processing. This is intuitively appealing: when someone responds at chance level on a detection task, it seems logical that this person has no conscious awareness of the stimuli he is responding to. Consequently, the indirect (uninstructed) effect can confidently be taken as a measure of *unconscious* cognition.

Many investigators have sought evidence for unconscious cognition in terms of an *indirect-without-direct* effect. The contention is that no conscious awareness is taking place as can be seen from the direct measure, while there is still some unconscious processing as can be inferred from the indirect effect. Because looking for an indirect-without-direct effect is *de facto* the same as looking for a (single) dissociation of direct and indirect effects, it is also commonly referred to as the *dissociation paradigm* (Reingold & Merikle, 1988). Hence the term *dissociated measures* in the title of this paper refers to employing direct and indirect measures within the dissociation paradigm.

Exhaustiveness and Exclusiveness of the Direct Measure

Although many researchers in the field of unconscious cognition would agree that theoretical advance can be gained from combining both direct and indirect measures, conclusions to be drawn on the basis of data obtained in such a way have often been subject of debate. Holender (1986) asserts in a lengthy and influential appraisal of the research into SSA, that unconscious cognition cannot be proven unless research findings satisfy at least two stringent criteria. These criteria were subsequently named and made more explicit by Reingold and Merikle (1988):

- *Exhaustiveness:* direct measures of consciousness must be sensitive to *all* conscious effects of task stimuli, otherwise indirect measures representing unconscious cognition can be said to have been caused by conscious effects that were not adequately picked up by the direct measure. In this case, the results can all be explained in terms of conscious cognition.
- *Exclusiveness:* one is to assume that direct measures of consciousness are sensitive to conscious effects and *only* conscious effects of task stimuli. Holender (1986) concludes that it is by definition proof of intentional (and thus conscious) discrimination if a direct measure exhibits a sensitivity greater than zero.

What these criteria actually encompass is a rather rigid version of the dissociation paradigm. As a matter of fact, Holender's conception of the dissociation paradigm is more of a separation

than of a dissociation of direct and indirect measures. On the ground of these stringent stipulations, Holender (1986) argued that the research up to that time did not stand the test of providing evidence for an indirect in the absence of a direct effect, and thus did not show unconscious cognition convincingly. Particularly, he argued that it was questionable whether the direct measures used in the research he reviewed were exhaustive. Although his conclusions and assumptions have received quite a bit of criticism in their own right (e.g. Cheesman & Merikle, 1986; Greenwald, Klinger & Schuh, 1995; peer commentary to Holender, 1986; Merikle, 1992; Reingold & Merikle, 1988), at least some of his arguments are valid, as is acknowledged by most of his critics.

Acceptance of the Null-Hypothesis

Another important difficulty that emerges when trying to find an indirect-without-direct effect is of a statistical nature. It is statistically problematic when an effect is non-significant to accept a *null-hypothesis*. Unfortunately, as Reingold and Merikle (1988) noted, this is exactly what needs to be done in the search for an indirect-without-direct effect. If one wants to show that a direct effect does *not* occur, one has to effectively *accept* that the absence of significance corresponds to the absence of an effect. Although recent efforts have been made to repair this shortcoming without giving up the search for an indirect-without-direct data pattern (e.g. Greenwald, Klinger & Schuh, 1995; Greenwald & Draine, 1997), Reingold and Merikle actually discouraged the prolonged search for such a pattern for this and other reasons.

4. QUALITATIVE DIFFERENCES: AN ALTERNATIVE APPROACH BY MERIKLE (1992)

Subjective measures and qualitative differences

As was already suggested by Holender (1986) and agreed upon by Greenwald (1992), no unequivocal evidence for unconscious processing on the basis of an indirect-without-direct effect seems to have been found so far, partly because of the aforementioned problems. Although the search for an indirect-without-direct effect has methodological and intuitive advantages, Merikle (1992) argues that it will be impossible to find a direct measure which everyone agrees upon that it measures all relevant conscious experience exhaustively. In fact the difficulties in justifying the exhaustiveness and exclusiveness assumptions are intrinsic to consciousness research itself. How can one know for sure that a certain measure measures *all* conscious cognition? And if one discards all findings containing above chance discrimination on account of the exclusiveness claim, does one not throw away the baby with the bath water, as it seems impossible to find a process-pure measure of conscious processing altogether?

Because of the controversies surrounding the search for indirect-without-direct effects, Merikle (1992) proposes a new research strategy in which the aim is to find *qualitatively* different consequences of conscious and unconscious processes. Instead of using only objective (detection) measures to establish lack of consciousness, subjective (purely phenomenological) measures can then also be used. Merikle argues that the conceptual distinction between conscious and unconscious processes is much more important then trying to find some objective direct measure that works for everyone.

If qualitative differences can be found, the knife cuts both ways. The conceptual difference between conscious and unconscious processes, together with qualitatively differing consequences of these processes, support both the justification of the conscious-unconscious distinction and the validity of whichever measures were used. As Jacoby and Whitehouse (1989) put it: "We

circumvented those issues by arranging the situation so that awareness of a presented item would produce a pattern of results opposite to that produced by presentation of the item without awareness". This kind of converging research strategy, in which theoretical and empirical findings support each other reciprocally, has been termed 'converging operationalization'[1] in the past (Beyk, 1977). In short, while theoretical insights can be gained particularly from qualitative differences, a lot of the difficulties associated with looking for indirect-without-direct effects become obsolete.

Are unconscious processes indeed unsophisticated?

Merikle (1992) proposes that this research strategy could offer the key to Greenwald's (1992) question whether unconscious processes are 'smart' or 'dumb'. Even though Greenwald (1992) had already answered this question in favor of relative simplicity of unconscious processing, Merikle (1992) contends that the research he discusses is overshadowed by the search for proof of unconscious processing. He goes on to say that the extent to which unconscious processes are sophisticated is unknown due to lack of research of the kind he proposes. Merikle himself, however, gives examples of at least three qualitative differences that were found in recent experiments. Additional research findings indicate that other qualitative differences have been found (Carroll, & Shanahan, 1997; Jacoby & Whitehouse, 1989; Murphy & Zajonc, 1993). In the following section, five experiments by Merikle and other researchers showing qualitative differences will be discussed. An attempt is made to link the findings of these experiments to the position that unconscious processes are unsophisticated. Particularly, it is suggested that the lack of sophistication might be caused by a lack of specificity.

[1] Free translation of the Dutch term 'convergerend operationalisme'

5. UNCONSCIOUS COGNITIVE ACTIVATION

Predominant Code

Groeger (1984) obtained evidence that subjects are more likely to code words based on semantic features when these words are presented outside of awareness, whereas subjects are more likely to code structural characteristics when they are aware of these stimuli.

Subjects were presented with a matrix of words in which each word could either be structurally or semantically similar to a preceding target word. Structural similarity was defined as correspondence between the first, the middle or the last letter of the matrix word with the same letter in the target word. The target word was either presented at a duration that allowed detection but not recognition (the aware condition), or was presented at suboptimal durations that did not allow for either detection or recognition (the unaware condition). Both presentation times, and similarity between target words and matrix words had been determined in advance through preliminary experiments. Subjects were instructed to identify the preceding target word from among the words in the matrix following it. In fact, the target word would never be presented in the matrix. The hypothesis was that subjects in their attempt to identify target words might use different similarity features, depending on whether the target word had been presented in the aware or unaware condition. This could then be taken as evidence that processing of unconsciously perceived stimuli is based on other coding features than consciously perceived stimuli.

An unambiguous data pattern emerged in which subjects were much more likely to select words that were semantically related to the target word in the unaware condition, whereas they tended to select structurally related foils in the aware condition. In a control group, using blanks as targets, the data showed no pattern of this kind.

Other experiments by Groeger (1986, 1988) revealed similar results for auditorily presented stimuli. In these experiments subjects heard a sentence in which a target word would be

presented at an acoustic level or signal-to-noise ratio that made it either undetectable (unaware), or unidentifiable (aware). After hearing the sentence, subjects were given a choice between two words that could complete the sentence, effectively filling in the 'gap'. These alternatives would either be semantically or phonologically related to the target word. Again, subjects tended to choose words that were semantically related to the target word in the unaware condition, while phonologically similar words would be selected in the aware condition.

These experiments may indicate that semantic rather than structural or syntactic characteristics guide analysis when stimuli are presented at suboptimal levels that do not allow for conscious detection. Merikle (1992) coined this finding predominant coding because the coding of the words is apparently dependent on the level of awareness of these stimuli during perception. The predominance of either structural or semantic analysis depending on the level of awareness seems to show that unconscious processing is non-specific in nature, whereas an increase in the level of consciousness results in more specific structural coding.

In order to clarify these classifications, it is illustrative to consider this from the perspective of neural network theory. Semantic activation can be seen as non-specific, general and extensive as it seems to be caused by spreading activation. Imagine for instance the number of objects that are semantically related to any particular object you can think of. A chair is not only semantically related to a table, but in effect to any other type of furniture. This includes beds, cupboards, couches and any particular instance of these classes of objects. If one would imagine each of these objects to be represented by a node, the number of nodes that is activated through semantic activation of the concept chair is initially quite big already, but rapidly spreads to massive numbers of nodes.

Structural coding can be seen as much more specific, at least from a neural network perspective. If one, for instance, takes the same chair to be made up of four legs, a seat and a back, the nodes that are activated in order to represent a chair structurally are (1) smaller in number and (2) much more specific in nature than is the case for semantic activation. In order to

represent a chair satisfactorily, a specific number of items needs to be activated in a specific constellation (four legs, vertically and parallel to each other, one seat on top of the legs and a back on top of that). The kind of spreading activation that is seen in semantic activation could not account for such a specific structure.

Unconscious processing might not be detailed and sophisticated enough to allow for specific structural coding. Semantic coding on the other hand would not need the sophistication to target specific nodes in order to represent and analyze a stimulus. If a node representing a concept is activated, it requires less complexity to activate all related nodes in the vicinity, as opposed to the precision that is needed to build up a specific structural image.

Selection

An experiment by Marcel (1980) indicated that polysemous words can only be biased towards a particular meaning when context words are perceived consciously. When these context words are presented suboptimally, both meanings of the polysemous word seem to become activated simultaneously.

In a lexical decision task, subjects were presented with a sequence of three words. The first word was a context word, the second a polysemous[2] word and the third was a target word on the basis of which lexical decisions were to be made. The context word was presented in order to bias the meaning of the polysemous word towards a particular meaning. The three words could either be unrelated (e.g., Tree-Race-Wrist), partially related through the use of both meanings of the polysemous word (e.g., Tree-Palm-Wrist) or completely related through only one meaning of the polysemous word (e.g., Hand-Palm-Wrist). Polysemous words were either presented optimally (the aware condition), or suboptimally through the use of backward masking (the

[2] Polysemantic = word with more than one meaning

unaware condition). The goal of this experiment was to find out which meanings of the polysemous word could facilitate lexical decision, dependent on the level of awareness.

In the aware condition, complete relatedness resulted in shorter decision times than unrelatedness or partial relatedness. Partial relatedness gave rise to the longest reaction times. However, in the unaware condition both partial and complete relatedness resulted in shorter response times than unrelated sequences. This result indicates that both meanings of a polysemous word are processed when it is perceived subconsciously, whereas only one meaning of a polysemous word is processed when it is perceived consciously.

This view is consistent with the idea that unconscious perception results in more general semantic activation, whereas conscious perception results in more specific activation. Again, stated in terms of a neural network framework, it is likely to require more sophistication and time to select a specific meaning of a word on the basis of additional information than to just activate all cells that carry the same meaning. This experiment seems to support the view that unconscious processes are non-specific and thus relatively unsophisticated in nature.

Prediction

In a number of experiments, Cheesman and Merikle (1986) found that subjects only use a predictive strategy on a Stroop task when a strategy-inducing cue was perceived consciously as opposed to unconsciously.

As explained earlier, in a Stroop task, subjects are quicker to name a word when the color the word represents is the same as the color ink it is written in (facilitative effect) and slower when the word and the color of the word are incongruent (inhibitory effect). A predictive strategy can be induced in subjects when the proportion of congruent trials to incongruent trials is varied. Both facilitative and inhibitory effects grow stronger conform this proportion.

Cheesman and Merikle investigated whether this effect still occurs when target words are presented suboptimally. In a variant on the traditional Stroop task, subjects had to name color

patches. The color patches were preceded by optimally or suboptimally presented color words that were either congruent or incongruent with the color patches. The proportion of congruent pairs was varied in order to test strategy-inducing effects during conscious and unconscious perception. Prior to the experimental session, the detection characteristics of the suboptimal color words were determined either by a lexical decision task or by a four alternative, forced-choice recognition task. If subjects could either not subjectively discriminate between words and non-words (Experiment 2), or could not recognize the four color words (Experiment 3), this was taken as the level of suboptimal presentation at which no phenomenological awareness on the relevant dimension occured. It is important to note that subjects were only *subjectively* unaware of the cues, objective thresholds yielded above chance performance. Suboptimal and optimal presentations of the cue were randomized. This was done in order to make sure that any observed strategy difference was induced on a trial-by-trial basis, and did not result from a general strategy applicable only to a particular threshold condition.

The results of this experiment showed that Stroop effects were observed in both the suboptimal and the optimal presentations, as indicated by subjects' performance on congruent and incongruent trials. However, influence of the proportion of congruent and incongruent trials on predictive strategy could only be observed on trials in which subjects were aware of cue presentation. In other words, on stimulus-blocks when the number of congruent trials was high relative to incongruent trials, subjects showed facilitation in incongruent optimal trials and inhibition in congruent optimal trials. When subjects were subjectively unaware of cue presentation, the classical Stroop effect of facilitation in congruent conditions and inhibition in incongruent conditions returned despite the uneven proportion.

These results seem to indicate that awareness is a necessary condition for the adoption of a predictive strategy. Although some processing does take place as can be seen from the enduring presence of Stroop effects in unaware conditions, this processing does not seem to be complex

enough to allow for the adoption of a higher order predictive strategy. This is in concordance with the idea that unconscious processing is unsophisticated.

6. UNCONSCIOUS ESTABLISHMENT OF AFFECT

Transfer of Affect

In a series of experiments, Murphy and Zajonc (1993) showed that unfamiliar Chinese ideographs ('characters') can be judged on affective measures in accordance with an unconsciously perceived 'emotional' prime, but not with a consciously perceived prime. When characters are to be judged on 'cognitive' measures, an opposite data-pattern seems to emerge.

In five experiments, subjects were asked to rate Chinese ideographs on a variety of affective and cognitive dimensions. In the 'affective' experiments, the ideographs would be primed by photographs of either frowning (negative) or smiling (positive) faces, or with polygons which served as control primes. Primes would be presented either suboptimally at what Cheesman & Merikle (1986) call objective thresholds (the unaware condition) or optimally (the aware condition). Subjects had to rate the ideographs on whether they 'liked' them (Study 1) and on a good-bad dimension (Study 2).

In the *unaware* condition subjects judged the ideographs more positively when they were preceded by a positive prime and more negatively when preceded by a negative prime. In contrast, no significant differences between negatively charged and positively charged primes were found in the *aware* condition.

In the 'cognitive' experiments the procedure was much the same as in the 'affective' experiments. This time, however, subjects had to judge the ideographs on a number of 'cognitive' dimensions: Size (Study 3), Symmetry (Study 4) and Gender (Study 5). The primes of ideographs serving as targets were relevant to the dimensions that were used: large and small polygons (Study 3), symmetric and non-symmetric polygons (Study 4) and affectively neutral male and female

faces (Study 5), respectively. In study 3 and 4 the control trials contained neutral faces as primes, in study 5 the primes of control trials consisted of polygons.

In these 'cognitive' studies, judgements of the Chinese ideographs did not deviate from judgements on control trials in the *unaware* condition. However, in the *aware* condition, judgements deviated significantly in the direction corresponding to the position on the relevant dimension of the prime. Ideographs with larger primes were more likely to be judged to represent something large (Study 3), symmetric primes caused ideographs to be judged more often as symmetric (Study 4) and primes of female faces increased the likelihood of ideographs being judged as representing something female (Study 5).

Murphy and Zajonc (1993) read these results as support for the *affective primacy* hypothesis. The affective primacy hypothesis asserts that positive and negative affect reactions can be evoked with minimal stimulus input and virtually no cognitive processing. The question posed in this paper, however, is to what extent these results answer the question whether unconscious processes are unsophisticated. Although quite different, the results are in some ways reminiscent of Groeger's (1984) results. Groeger reported that words are more likely to be coded on the basis of semantic features when presented outside awareness, while more structural characteristics are only picked up on in the aware condition. This experiment by Murphy and Zajonc seems to show that affective information can be transferred through unconscious processing while transfer of cognitive 'structural' characteristics only takes place in aware conditions.

The parallel lies in the degree of specificity that can be conveyed through unconscious processing. Apparently, affective and non-specific semantic information can be conveyed under some conditions through unconscious processing, whereas under similar conditions specific structural or cognitive information is conveyed only when it is processed consciously. The important thing to note here is that unconscious processing only seems to take place based on non-specific semantic information or on affective information, which has often been claimed to be non-specific. Öhman (1992), for example, convincingly argues that it is advantageous from an

evolutionary perspective to show instantaneous fear reactions to affective stimuli *before* the identity of the affective stimulus has been resolved.

7. UNCONSCIOUS RETRIEVAL OF MEMORY

Illusions of Memory

An experiment by Jacoby and Whitehouse (1989) indicates that subjects are more likely to falsely recognize a word as belonging to a previously learned list when it is preceded by the suboptimal presentation of a matching word than when it is preceded by the optimal presentation of a matching word.

Subjects were first given a list of words, which they had to study for later retrieval. After the study phase, subjects were presented with a series of test words on a monitor. A test word could be preceded by the same word (Match condition), a different word (Non-match condition), or no word at all (control condition). The preceding context words could either be presented optimally (the aware condition) or suboptimally (the unaware condition), and either belonged or did not belong to the previously studied list. For each test word, subjects had to decide whether it was part of this list by indicating on a control panel whether it was an 'old' or a 'new' word.

In the unaware condition, subjects were more likely to falsely recognize a test word as 'old' when it was preceded by a suboptimally presented *matching* word than when it was preceded by a *non-matching* word or no word at all. This pattern of results is reversed in the aware condition: when the preceding word matches the test word it is more likely to be classified as 'new', whereas it is classified as 'old' when they are non-matching.

Jacoby and Whitehouse (1989) interpreted these results in terms of an attribution process that is influenced by unconscious processes by proposing the *fluency of processing account*. This account asserts that concordance of the unconsciously perceived context word with a subsequent test word influences the fluency with which that test word is processed. Such ease of processing

supposedly triggers a feeling of familiarity, which causes subjects to perceive new test words as 'old'. Conversely, non-matching words reduce fluency of processing. This causes a feeling of strangeness resulting in 'new' responses. The pattern of responses was different for the consciously perceived context words. Supposedly, the feeling of familiarity in the Match condition can - because it was consciously perceived - be actively attributed to the fact that the test word was preceded by a matching context word. This then, suppresses incorrect 'old' responses.

How does the sophistication question fit into this pattern of results? Arguably, unconscious perception is not sophisticated or specific enough to allow for a clear separation of cause and effect in an attribution process. It seems that only a vague feeling of familiarity carries over from the context words into the memory judgements of test words. Clearly, subjects are not able to attribute their feeling of familiarity to unconsciously perceived context words, whereas they are much more able to do so in the case of consciously perceived context words. When context words are perceived consciously, subjects seem to be so aware of possible judgement errors, they tend to overcompensate for this bias, which results in an opposite data pattern. The 'aware' attribution error requires a much higher degree of sophistication than the 'unaware' attribution error, as can be concluded from the fact that it seems to be able to overrule the feeling of familiarity that is induced by a context word.

8. DISCUSSION

In the following discussion, differences and commonalities between Greenwald's research and the research discussed above will be considered. Benefits of the qualitative differences approach are also discussed. Finally, a section will be devoted to legitimizing the use of the five experiments as constituting qualitative differences.

Differences

As has become clear from the description of the five experiments, the nature of the conclusions drawn in this paper with respect to complexity in unconscious processing are quite different from the conclusions drawn by Greenwald (1992). In Greenwald's paper, level of complexity was defined in terms of level of analysis. Level of analysis was operationalized by the ability to analyze complex stimuli. A multi-word string or proposition, for instance, constituted a complex stimulus, whereas stimuli consisting of merely physical features were defined as simple stimuli. In most of the experiments he described, it was taken as self-evident that conscious processes allow us to analyze complex stimuli. Consequently, there is often no necessity to compare 'unaware' conditions with 'aware' conditions. Only an unaware condition is investigated by looking for an indirect-without-direct effect. Therefore, Greenwald's conclusions are mainly concerned with the amount of proof available for complex analysis in *unconscious cognition*, as opposed to making direct comparisons with conscious cognition.

The experiments described in this paper, however, include an aware condition by their very nature: otherwise one could not look for qualitative *differences*. This has two implications for the way in which the sophistication question can be answered with the results of these experiments:

1. Because all experiments show qualitative differences between conscious and non-conscious processing one can actually say something about the *differences* in level of complexity between conscious and non-conscious processes.
2. Level of complexity can take on a different meanings. It does not necessarily have to be defined in terms of level of analysis. Alternatively, level of complexity can be defined in terms of other relevant dimensions, such as level of specificity or the ability to engage in a predictive strategy. This is only possible by virtue of the first implication, namely that results can be interpreted through comparison between 'aware' and 'unaware' conditions. If this were not the case, one can only define level of complexity in a manner of which its presence

in conscious processing is implicitly taken for granted, as was done in the research Greenwald (1992) cites.

Commonality

So what can be said about the level of complexity reached in unconscious processing, as opposed to conscious processing, on the basis of these five experiments? To gain a general picture of the results it is helpful to look at the following overview:

Table overview of the five experiments showing qualitative differences

Experiment	Relevant	Unaware	Aware
Predominant code Groeger (1984)	Semantic features*)	Yes	No
	Structural features	No	Yes
Selection Marcel (1980)	Polysemantic*)	Yes	No
	Monosemantic	No	Yes
Prediction Cheesman & Merikle (1986)	Stroop	Yes	Yes
	Predictive strategies	No	Yes
Transfer Murphy & Zajonc (1993)	Affective measures*)	Yes	No
	Cognition based measures	No	Yes
Illusion of memory Jacoby & Whitehouse (1989)	Increased p of memory illusion*)	Yes	No
	Decreased p of memory illusion	No	Yes

*) Constitutes a dimension that is non-specific compared to its counterpart

In the first place, this table shows that very different measures and operationalizations can produce qualitative differences between conscious and unconscious processes. The second important point is that there seems to be a common denominator to these different experiments, namely that unconscious processes seem to be non-specific in comparison to conscious processes. In other words, taking into account the fact that very different aspects of unconscious and conscious processing have been measured, there is a general tendency for unconscious processes to be non-specific and general in nature.

This finding is in harmony with Greenwald's conclusions, which can possibly be attributed to this effect of non-specificity. After all, Greenwald (1992) proposed that people are unable to unconsciously process complex stimuli such as multi-word strings or complex patterns. A requirement would be a certain amount of specificity in processing these stimuli. The experiment

by Marcel (1980), for example, indicated that more than one meaning could become activated when ambiguous words are presented outside of awareness. This degree of non-specificity could not lead to successful processing of a complex stimulus because the successful integration of a multi-word string requires at least monosemantic activation of the individual words.

Although the experiments in this paper do not explicitly answer Greenwald's question whether, for instance, multi-word strings can be processed outside of awareness, they do provide a more abstract insight, particularly about the level of specificity reached in unconscious processing. This information helps in explaining why the complex analysis Greenwald talks about does not seem to take place.

Objections to calling these experiments qualitative

There are some points of concern, however. It must be noted that there is considerable disagreement over what constitutes a qualitative difference. Holender (1986) goes as far as to dismiss experiments claiming to have found qualitative differences as showing quantitative differences. The following section discusses objections to calling some of the studies in this paper qualitative. When appropriate, recommendations will be given for future research.

Some critics have proposed that the Stroop experiment by Merikle and Cheesman (1986) should be construed as quantitative rather than qualitative (Holender, 1986; Groeger, 1988). Stroop effects were present in *both* aware and non-aware conditions, whereas predictive strategy as a function of the percentage of congruent trials only occurred in the aware condition. Because there was merely an *absence* of a predictive strategy in the unaware condition, the critics reason, it is more appropriate to call this a quantitative difference.

Although this is one of the strongest arguments one can put forward against a study claiming to have found a qualitative effect, there is counter-argument. The design of the study was such that 'aware' and 'unaware' trials were mixed. This was done to prevent effects from being the

result of a general strategy, but rather being caused on a trial-by-trial basis. It seems unlikely that a Stroop effect occurs *on a trial-by-trial basis* in both aware and unaware conditions, but that a predictive strategy measured through the *very same* Stroop effect is *so* weak in the unaware condition as to appear absent. Because both are ultimately based on the same measure, this gives a strong impression of absence, not of weakness. However, in order to truly determine the nature of the effect it would be advisable to replicate this study using multiple lengths of stimulus presentation in both the aware and unaware conditions. If predictive strategy does not correlate with presentation length in the aware conditions, and it is absent in all unaware conditions, one could say with more confidence that this is truly a qualitative difference.

The study by Marcel (1980) showed that both meanings of a polysemous word facilitated decision time on a test word in the unaware condition, whereas only one meaning of a word could facilitate decision time in the aware condition. Groeger (1988) objected to calling this a qualitative difference because he deemed it conceivable that both meanings of the word were activated in the aware condition, the second meaning's activation being too low for it to influence decision time. Therefore, Groeger would rather call this difference quantitative.

This line of reasoning is somewhat strange, however. If both meanings were activated, it is unclear why the one with the 'low' level of activation would not influence decision time. After all, in the unaware condition both meanings influenced decision time. The level of activation achieved in the unaware condition cannot possibly be higher then in the aware condition. Therefore, if both meanings are activated in the aware condition, both should influence decision time. As this is not the case, Groeger's (1988) argument seems to be invalid. It is proposed that Marcel's (1980) finding can best be characterized as constituting a qualitative difference.

Murphy & Zajonc's (1993) experiment is the last to be discussed. They did a number of studies. In the first two, affective information influenced the judgment of Chinese 'nonsense' characters in the unaware condition, but not in the aware condition. Conversely, the other studies showed that cognitive information influenced the judgement of Chinese characters in the aware

condition, but not in the unaware condition. However, there is a problem with calling this difference qualitative because the priming stimuli were different for 'affective' and 'cognitive' studies. Therefore, affective and cognitive judgments were influenced by different primes. In the 'affective' studies these consisted of faces, in 'cognitive' studies polygons served as primes. Consequently one could argue that 'affective' and 'cognitive' studies are independent quantitative differences.

To counter this objection, one would need to use the same primes for all studies. These primes would need to have both strong affective and strong cognitive valence to see if the effects in question remain. However, even if one considers this criticism to be enough for dismissal of the total results as constituting a qualitative difference, there is another argument in favor of calling this experiment qualitative. The 'affective' studies only showed significant effects in the *unaware* condition. This is remarkable because one would expect effects to be larger in the *aware* condition. If one wanted to ascribe a quantitative effect to the results of these studies, this could logically only be done because the effect would be so weak in the *unaware* condition that it cannot be seen. As the effect is in the opposite direction, this is a strong argument for calling the differences qualitative.

Final conclusion: support for Greenwald (1992)

The criticism that was discussed in the last subsection is not complete. There are probably a lot more objections that could be raised to calling these experimental differences qualitative. However, the point neither of this section nor of this paper is to describe and counter every conceivable objection to these experiments. Rather, the point is that these experiments can give some valuable insights because they are in many ways remarkable, even if there are still many problems. Obviously, the five experiments that were described are too few in number to draw any major conclusions. Replications of and modifications to the presented research is needed.

However, on a more abstract level there seems to be some agreement between them. *They all seem to show a lesser degree of specificity in their 'unaware' conditions and more specificity in their 'aware' conditions.* This is the form of converging operationalization that was talked about in the introduction: both the outcomes of the experiments and the conclusion that was drawn from them reciprocally support each other. Finally, this conclusion fits in with Greenwald's proposal that unconscious processes are unsophisticated: *sophistication requires specification.*

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