Social Psychological Procedures for Cognitive Response Assessment: The Thought-Listing Technique

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The various cognitive-behavior therapies share the notion that a person's idiosyncratic cognitions and ways of thinking are at the root of many emotional and behavioral disorders (Ellis, 1977; Meichenbaum, 1977). The goal of treatment, therefore, is often the modification of a client's self-statements. However, before a person's self-statements can be modified, one must determine what constitutes the internal dialogue.

As social psychologists, we have been interested in what people say to themselves when they are exposed to persuasive communications designed to change their attitudes on personally important issues. Previous investigators, beginning with Carl Hovland and his colleagues in the 1950s, believed that the primary determinant of whether or not attitude change would occur and endure was the extent to which the audience was able to comprehend and retain the arguments contained in the persuasive message (Hovland, Janis, & Kelley, 1953; Hovland, Lumsdaine, & Sheffield, 1949). This view of the persuasion process is analogous to therapies that emphasize the client's ability to understand and follow direct instructions from his or her therapist (cf. Shaffer & Galinsky, 1974, pp. 223–225).

More recently, it has been shown that the ability to learn the information (e.g., message arguments) espoused by the source is not as important in attitude change processes as how individuals cognitively respond to or elaborate upon that information (Cacioppo & Petty, 1980b; Greenwald,

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1968; Petty, Ostrom, & Brock, 1981). This cognitive response approach to persuasion emphasizes how people personally evaluate the information provided. Ultimately, it is the person's own self-statements that produce change or resistance. If the audience generates favorable thoughts about a message, persuasion results; if counterarguments are produced, resistance results. This emphasis on the importance of a person's self-statements (cognitive responses) in determining attitudes and behavior is analogous to the emphasis on self-talk and internal dialogues in the various cognitive-behavior modification therapies. The dilemma for both persuasion researchers and cognitive-behavior modifiers, then, is to assess what it is that a person says to himself or herself when various stimuli are presented (cf. Kendall & Korgeski, 1979).

**Measures of Cognitive Responses: An Overview**

The purpose of this chapter is to survey some of the procedures found in social psychology for assessing cognitive responses. By "cognitive responses," we mean those thoughts that pass through a person's mind as he or she anticipates, receives, or reflects upon a message designed to change beliefs, attitudes, or behaviors. Although we focus on procedures designed to measure thoughts elicited by persuasive messages, the techniques outlined would also be applicable for use in monitoring a person's thoughts when confronted with any personally significant stimulus or situation. We begin this survey of cognitive response assessment with a brief section on mechanical procedures. An overview of nonmechanical measurement procedures is then followed by a detailed discussion of a self-report technique that we have employed in our own research to tap what persons say to themselves.

**Mechanical Assessment Procedures**

In Hovland's pioneering work on attitudes, subjects were instructed to press buttons indicating their agreement or disagreement with an advocative message. (Hovland et al., 1949). A similar procedure, called the "signal stopping technique," has been used recently to measure the evaluative nature of a person's stream of thoughts (Carter, Ruggels, Jackson, & Heffner, 1973). Messages were delivered in print form by a computer to subjects at a console. Subjects were instructed (and encouraged) that, at any time they wanted to stop the incoming information, they were to press a slash (/) symbol on their console. In some experiments, subjects were also instructed to record in the margin their reason for stopping. In other studies, subjects used the following "stop" symbols: /A—stop to agree; /D—stop to disagree; /T—stop to think; and /?—stop to question.

Employing the latter procedure for monitoring cognitive responses, Carter and Simpson (1970, cited in Carter et al., 1973) presented messages containing either proattitudinal, neutral, or counterattitudinal information to subjects. The measure consisted of the number of times a subject disagreed with the message. A counterattitudinal message is one that one disagrees with the message's content. The measure suggested that subjects who have more proattitudinal cognitive responses were more likely to believe the message.

Unfortunately, no direct measure of this assessment is available in social psychology. In our own research, we have used a self-report technique in order to assess the cognitive responses of the subjects. In this procedure, subjects are asked to select one of the following words from a list: agree, disagree, think, question, or none. The words are printed on cards, and the subjects are asked to select one card for each message presented. The procedure has been found to be effective in assessing the cognitive responses of subjects to persuasive messages.
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...to subjects. They found that subjects stopped more to agree than to disagree with the message when the information contained in the message was proattitudinal and that the opposite was true when the information contained in the message was counterattitudinal. The average number of stops to agree and disagree did not differ when the information was neutral. These results suggest that the signal stopping technique may prove useful in future research on cognitive response, particularly if a computer (or sophisticated hardware) is used to provide minute-by-minute (or second-by-second, etc.) changes in responding to a stimulus.

Unfortunately, this technique has several disadvantages. Assessment must be done individually or at individual terminals, and the sensitivity of this assessment technique is unknown. Some individuals may enjoy playing with the computer, whereas others may be angered or intimidated by the impersonal interaction; these idiosyncratic responses to the contextual cues may obliterate subtle differences in cognitive response.

In marketing research, a person's cognitive responses to stimuli are sometimes tapped with a dial-turning technique (cf. Peterman, 1940). Subjects listen to the advocative message and turn a dial to designate their agreement with what is being said as it is being said. The turning of the dial denotes intensity as well as direction of agreement/disagreement. This and the preceding techniques could easily be adapted to suit the measurement needs of a researcher or practitioner. For instance, a dial could be turned to the right to indicate a positive self-statement and so on. Moreover, this latter procedure has the unique advantage of providing measures of intensity as well as of direction.

Electrophysiological Techniques. Nevertheless, a concern with procedures that require subjects to "do something" before, during, or after the presentation of a stimulus is that the request itself may elicit or alter the cognitive responses measured. That is, the measurement procedure may be reactive. Love (1972) attempted to avoid this problem by videotaping the shoulders and faces of subjects as they listened to an advocative message. Raters then scored the nonverbal cues (facial expressions) of subjects as denoting positive or negative affect. Following the early outlines of Darwin (1872/1904), Love sought to quantify distinctive facial expressions that characterized cognitive responses. Unfortunately, this videotape measure proved to be insensitive for detecting the fast and subtle changes of expression emitted by subjects (Haggard & Issacs, 1966). New hope for this theoretical approach, however, has been created by the work of Schwartz and his colleagues (Schwartz, 1975; Schwartz, Fair, Salt, Mandel, & Klerman, 1976). They found that facial electromyographic patterns reflect favorable and unfavorable imagery, even though neither judges nor subjects could visually distinguish the facial expressions.

We have found that this technique reflects the affective nature of one's thoughts as well (Cacioppo & Petty, 1979a). In our first experiment, subjects expected to hear discrepant communications (messages that take a position
elaborate a description of the task (Cacioppo describes one such task in upper-case letters). Lasting memory increases if the subject increases in the amount of effort spent on the task (Cacioppo et al., 1981).

Variations in subjects' attitudes about the type of task (e.g., a measurement task versus a pigeon-feeding task) can influence performance. For example, if the subject is a child, the task may be more motivating or less motivating depending on the subject's prior experiences with the task. The success of a task depends on the subject's ability to perform the task and to understand the instructions.

In a second experiment, subjects anticipated and heard either a proattitudinal, counterattitudinal, or neutral communication. They evaluated more positively and generated more favorable thoughts and fewer counterarguments to the proattitudinal than to the counterattitudinal advocate's message but rated similarly the neutral and proattitudinal messages. As in the first study, incipient oral muscle activity increased following the forewarning of an involving counterattitudinal message, and it increased for all messages during their presentation. Moreover, patterns of subtle facial muscle changes reflected the affective nature of the cognitive responding when subjects anticipated and heard the communication.

These results provide evidence that electrophysiological assessments offer objective, concurrent, and independent measures of cognitive response in persuasion and suggest that people actively elaborate upon personally important stimuli. The major disadvantages of electrophysiological techniques are that (1) they tend to require expensive equipment and specialized knowledge, (2) persons have to be tested individually, and (3) the information obtained is often sparse, if not ambiguous. These techniques seem most valuable, at this point, in providing convergent validation for simpler, more practical techniques (cf. Cacioppo & Sandman, 1980; McGuigan, Chapter 9, this volume).

Reaction-Time Procedures. Reaction-time procedures, employed commonly by experimental psychologists in the study of verbal learning and verbal behavior, have also been used in the study of cognitive responses in impression formation (Lingle, Geva, Ostrom, Leippe, & Baumgardner, 1979; Lingle & Ostrom, 1979, 1981) and in relation to the self (Cantor & Mischel, 1977; Markus, 1977; Rogers, Kuiper, & Kirker, 1977), with longer reaction times indicating more extensive (deeper) processing. For example, more

1Mean reaction time and mean speed (its reciprocal) have been used in studies of cognition as if the choice between these dependent measures mattered little. Surprisingly, however, these measures do not necessarily yield similar results; Wainer (1977) discussed an instance in which the conclusions to be drawn from the analyses of each of these measures were exactly opposite. Wainer (1977) suggests three solutions: (1) choose the measure for which a clear theoretical rationale exists; (2) employ an alternative measure of central tendency (e.g., the median) instead of the mean and then proceed with the appropriate order statistics; or (3) employ a trimmed mean in which a specified percentage of the distribution of data is eliminated from each end of the distribution (the justification for trimming comes from a heterogeneity-of-variance problem in the data). In any case, both the mean reaction time and the mean speed should be examined; if results are contradictory, one of the three suggestions of Wainer should be employed to remove the ambiguity of the results.
elaborate analyses of a word are involved when determining whether it describes oneself than when determining whether the letters are printed in upper-case letters. The former task takes longer to perform, produces a more lasting memory for the word that is analyzed, and is accompanied by greater increases in localized muscle activity over the speech muscles than the latter task (Cacioppo & Petty, 1979c, in press-a).

Variations of the reaction-time procedure may provide information about the type of cognitive responses elicited. One such technique involves measuring reaction times to the Stroop test. The Stroop test consists of rectangles (or X's) and words (typically, names of colors) printed in a variety of colors. Generally, the colors of rectangles are identified more quickly than are colors in which names of other colors are printed (Stroop, 1938). This difference presumably is due to a semantic interference effect. The subject viewing X's printed in some color has very little distracting information in the way of accessing the color name. The subject viewing a word printed in a color, however, has the tendency to allocate at least some of his or her attention to determining the meaning of the word, which hinders accessing the color name. The interference effect is especially noticeable when the printed word is highly accessible in memory, which occurs when the printed word represents the name of a different color or is associated with some word presented previously (Schiebe, Shaver, & Carrier, 1967; Warren, 1972, 1974).

For example, suppose that we want to determine whether a person relates the word "dog" more closely to "cat" (a normal response) or "man" (an abnormal response). We could do this by using reaction-time measures in the following manner: The person would be instructed that, each time a word was presented visually, he or she should quickly identify the name of the color in which the word was printed. A number of words (e.g., cat, man) would then be presented visually to the person, each printed in one of a variety of colors, and each preceded by a spoken word (e.g., "dog"). After a number of pairings of these words (and their synonyms), we should be able to secure a fairly stable estimate of the size of the interference effect that exists between dog-cat and between dog-man. The longer the average time it takes a person to identify the name of the color in which "cat" or "man" was printed (assuming the presentation of each was preceded by the word "dog"), the greater the interference effect. Because the interference effect is directly related to the strength of the association between words, we would judge the person as possessing an abnormal view of dogs and men only if the color-naming latencies for the dog-man pairings were significantly longer than those observed for the dog-cat pairings.

Geller and Shaver (1976) used this effect to identify whether or not people were generating self-relevant or self-evaluative thoughts. Some subjects were placed in a state of "objective self-awareness," which theoretically activates self-examination; this was accomplished by placing subjects in front of a mirror and camera. Other subjects served in a control group (no mirror or camera). As predicted by objective self-awareness theory, subjects who
had been placed in front of a mirror and camera responded more slowly to self-relevant words (but not other types of words) than subjects in the control condition.

A Limitation of Mechanical Techniques. It is apparent from this brief survey of mechanical techniques that there are several ingenious methods for assessing what a person is thinking. An important limitation of these techniques, however, is that individuals have more (and more types of) thoughts than can be placed in a scale or test; consequently, the dimensions (or types of words) composing the test may not be the most important ones to study. McGuire and Padawer-Singer (1976) echo this concern in their comments on the existing research on self-concepts:

This low yield (with respect to research on self-concepts) we attribute primarily to researchers having measured the self-concept almost exclusively by information-losing "reactive" methods, that is, by studying subjects' reactions to a dimension chosen a priori by the researcher. (p. 743)

To date, the profile of spontaneous cognitive responses has been ascertainable most easily by listing, reporting, and recalling procedures. These nonmechanical means of assessing cognitive responses are addressed next.

Spoken and Written Assessment Procedures

One of the most common means of obtaining cognitive responses in research has been to instruct subjects to either list (write) or report aloud their thoughts. Each of these techniques has its unique merits (cf. Meichenbaum, 1977; Wright, 1974a). Verbal measures are advantageous because they can be obtained quickly (it is easier to speak than to write), which minimizes the forgetting of one's actual responses to a stimulus. The written listing procedure, though slower, can be administered easily in group settings, is relatively private and nonthreatening, and requires only pencil and paper. Both have the advantage that they can be administered in a manner that does not restrict the dimensions obtained.

Some have suggested that persons be taught to monitor and record their thoughts and feelings in their daily lives, for instance, following an unexpected beep (Hurlburt & Sipprelle, 1978). We have found a related diary technique unsuitable for hypothesis testing in a study on migraine headaches (Quinatar, Cacioppo, Monyak, Alvarez, & Snyder, 1980). We found vast differences in our subjects' willingness and ability to record consistently and accurately their cognitive and emotional responses at the onset of a migraine headache. The vast differences in the situations and the people encountered also proved problematic. We found that the greatest potential of the technique was in its power to generate testable hypotheses by helping us to identify important dimensions of a person's reportable subjective reactions. The measure most helpful to us in testing hypotheses regarding cognitive response has been the thought-listing technique.
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A self-report device called the “thought-listing procedure” was developed by Brock and Greenwald at Ohio State University in the late 1960s (Brock, 1967; Greenwald, 1968). This procedure is suitable for obtaining either spoken (Cacioppo, 1979) or written (Pett, Wells, & Brock, 1976) listings, though the latter are more typical. In this section, we discuss the rationale for this procedure and the substantial data that now exist. We conclude the chapter with a discussion of the procedure’s reliability, validity, and sensitivity.

Thought-Listing Instructions

Three different types of instructions have been used to obtain thought listings. Subjects have been asked to list (1) thoughts elicited by the stimulus (e.g., Roberts & Maccoby, 1973), (2) general thoughts on the topic about the communication or problem (e.g., Greenwald, 1968; Peterman, 1940), and (3) all thoughts that occurred to them while they anticipated and/or attended to a stimulus (e.g., Cacioppo & Petty, 1979b; Goor & Sommerfeld, 1975; Petty & Cacioppo, 1977).

The request to list the thoughts elicited by the stimulus assumes that subjects are able to distinguish the thoughts that are elicited by the stimulus from those that are not. Thus it is assumed that subjects are able to determine the cognitive effects of the stimulus, an assumption that is quite dubious (Nisbett & Bellows, 1977; Nisbett & Wilson, 1977; Reese, 1971). In the second and third instructional procedures, subjects are not asked to identify the cognitive effects of the stimulus, and thus there is no assumption about the subject’s ability to identify the stimulus that elicited the cognitive responses. The instruction to list all thoughts that occurred to the individuals during the preceding moments is, of course, the least restrictive of the instructions.

The instructions given to subjects for listing thoughts are consequential. We have found that instructing them to report thoughts on a particular problem or issue versus instructing them to report all of the thoughts that occurred during a certain period produced different listings. In some of the conditions of a previous experiment, subjects anticipated a counterattitudinal communication on a highly involving topic (Pett & Cacioppo, 1977). Of these subjects, half were asked to list all of the thoughts that they were thinking prior to the discrepant message, and half were asked to write only those thoughts that were pertinent to the topic of the message.

We found that, when subjects were instructed to “try to record only those ideas that you were thinking during the last few minutes,” the demand to produce a particular type of cognitive response was minimal; the thoughts listed were predominantly unfavorable or unrelated to the counterattitudinal issue. When subjects were asked to list their thoughts on a particular topic or issue, however, significantly more favorable and fewer neutral/irrelevant
thoughts were reported. That is, the “topic instruction” produced an experimental demand for subjects to report responses relevant to the topic and apparently compelled them to show their “open-mindedness” and “intelligence” by generating thoughts on both sides of the issue. Because each of these profiles of thoughts may be of interest to an investigator, the instructions that provide the most useful results depend upon the aims of the particular research.

Thought-Listing Interval

Another factor that influences the profile of cognitive responses obtained is the amount of time given to subjects to report their responses (Miller & Baron, 1973; Osterhouse & Brock, 1970; Wright, 1974a). In the first part of this section, we report the rationale for, and the results of, imposing time limits for thought listings. In the second part, a distinction is made between the cognitive responses that are reported during the presentation of a communication and those that are reported following a communication.

Time Limits for Thought Listing. In general, investigators want to assess the cognitive responses elicited by a stimulus in order to study their role in the mediation of affective or behavioral change. The purpose of imposing a time limit to listing thoughts is to increase the likelihood that we measure only those responses that are elicited by the stimulus and those few responses that are readily accessible and could easily be elicited by the stimulus.

The time provided for listing cognitive responses has ranged from 45 seconds (Miller & Baron, 1973) to 10 minutes or longer (Cacioppo, Sandman, & Walker, 1978; Greenwald, 1968), but the time interval used most commonly has been 2 to 3 minutes (Brock, 1967; Cacioppo & Petty, 1979b; Petty & Cacioppo, 1979a, 1979b; Petty et al., 1976; Wright, 1973). Of course, the optimal interval depends on the purpose of the particular experiment and the nature of the experimental materials (e.g., the length of the message, situation, or interaction). As a rule of thumb, if only the most salient thoughts are desired, then a brief interval would be better than a long one. If the interval is too long, a subject would have time to reflect on, generate additions to, select among, and delete portions of his or her cognitive responses.

Time of Measurement. Another concern is whether the profile of cognitive responses differs as a function of when they are obtained. There is a paucity of evidence concerning this question, and the evidence that exists is conflicting: some research indicates that the responses measured during and after a stimulus presentation or situation are very similar (Greenwald, 1968), and other research suggests that the responses reported afterward are more unfavorable than responses reported during the presentation (Roberts & Maccoby, 1973). This entire question can be resolved by determining whether the responses reported during or after the situation or stimulus presentation more accurately reflect the cognitive responses elicited normally (i.e., when no measure of the topic).
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obtain cognitive responses immediately after a stimulus seems best.

Obtaining cognitive responses after the stimulus (e.g., a communication) can be accomplished without the subject's foreknowledge and does not require interruption of or distraction from the stimulus presentation. Obtaining responses during the stimulus presentation, however, requires that the subject know during the presentation that his or her cognitive reactions are being monitored; moreover, subjects must either interrupt the presentation or distract themselves from it to report their cognitive reactions to it. The primary disadvantage of measuring thoughts during the stimulus, then, is that the assessment may seriously distort the responses elicited naturally by the stimulus. On the other hand, the unexpected, immediate poststimulus measure of cognitive response suffers from loss of retention of cognitions, though this loss is minor (Wright, 1974a).

The usefulness of a cognitive response measure taken after the stimulus presentation would be enhanced greatly if it did not affect the reported emotion or behavior under investigation (i.e., if it were nonreactive) because separate groups of subjects would not be needed to measure the cognitive responses and the outcome variable. Evidence relevant to this issue is provided by several experiments in which subjects were asked to list their thoughts either before or after they rated their attitudes (Calder, Insko, & Yandell, 1974; Insko, Turnbull, & Yandell, 1974), by an experiment in which subjects were either asked or not asked to list thoughts while all subjects reported their attitudes (Petty & Cacioppo, 1977), and by an experiment in which electro-physiological procedures were used to trace cognitive responses (Cacioppo & Petty 1979a). In each experiment, the written thought-listing procedure was used to obtain cognitive responses. If the thought-listing method of obtaining cognitive responses is reactive, the first two variations would alter the reported attitude; in the case of the electrophysiological study, the cognitive and physiological responses would be unrelated to one another. These studies indicated that attitude (the outcome variable) was not affected by obtaining cognitive responses; further, a concordance between cognitive and physiological responses was evident. These results suggest that the thought-listing procedure is not reactive.

A note of caution is perhaps in order here. We found high correlations between cognitive response and attitudes when the stimulus (an advocative message) was personally relevant but much lower correlations between these variables when the stimulus was not personally relevant (Petty & Cacioppo, 1979a, 1979b). This latter instance suggests that the stimulus was of such low importance or personal relevance that it did not elicit much thought on the part of the individual. Under these conditions, an instruction to list cognitive responses about the issue before measurement of the outcome variable (e.g., attitude) may "force" cognitive consideration of the issue and alter the outcome observed. Instructions to list everything about which subjects thought,
or measurement of cognitive responses after the outcome variable should avoid this problem.

**Scoring Thought Listings**

To classify the cognitive responses, they must first be "unitized" (Meichenbaum, Henshaw, & Himel, 1980), which means that the protocols must be broken down into individual units of cognitive response. Three methods of unitizing cognitive response protocols seem most prevalent. In the first method, subjects are instructed prior to listing their thoughts to list one thought or idea per box. The exact instructions from Petty and Cacioppo (1977) are as follows:

We are now interested in what you were thinking about during the presentation of the message on the tape. You might have had ideas all favorable to the recommendation on the tape, all opposed, all irrelevant to the recommendation on the tape, or a mixture of the three. Any case is fine; simply list what it was that you were thinking during the tape-presentation. The next page contains the form we have prepared for you to use to record your thoughts and ideas. Simply write down the first idea you had in the first box, the second idea in the second box, etc. Please put only one idea or thought in a box. You should try to record only those ideas that you were thinking during the message. Please state your thoughts and ideas as concisely as possible... a phrase is sufficient. IGNORE SPELLING, GRAMMAR, AND PUNCTUATION. You will have 2½ minutes to write your thoughts. We have deliberately provided more space than we think most people will need to insure that everyone would have plenty of room to write the ideas they had during the message. So don’t worry if you don’t fill every space. Just write down whatever your thoughts were during the message. Please be completely honest and list all of the thoughts that you had. (p. 648)

Twelve 8-inch (20.32 cm) horizontal lines, each about 1 inch (2.54 cm) from the one above it, created the boxes in which subjects were to write their thoughts. This method is effective if cognitive responses are obtained using the thought-listing procedure but requires slight modification if spoken procedures are used (e.g., subjects must denote individual thoughts with a key word or pause—cf. Cacioppo, 1979).

The second method is similar to the first, except that judges, rather than subjects, determine what constitutes an idea or thought. Predetermined criteria are used by the judges. One common criterion is that a stated idea, whether grammatically correct or not, constitutes a unit. Other criteria might rely upon the use of semicolons, compound sentences, and so forth.

In the third method of unitizing cognitive responses, no search for a cogent idea is made. Rather, an arbitrary number of words (Miller & Baron, 1973) or unit of time (Goer & Sommerfeld, 1975; Meichenbaum et al., 1980) serves as the unit of cognitive response. Of course, a person’s thoughts and
ideas seldom, if ever, are generated in intervals of short duration and/or of equivalent length. Hence a highly contrived unitization of the protocol results; this makes it very difficult later to rate these unitized cognitive responses reliably along various dimensions.

Once the responses are unitized, their content can be analyzed, which involves classifying them along various dimensions. It is to that topic that we turn next.

**Dimensions of Cognitive Response**

Three dimensions that have characterized the classification of responses in research on attitude change (cf. Cacioppo, Harkins, & Petty, 1981) are: (1) "polarity"—the degree to which the response is in favor of or opposed to the referent; (2) "origin"—the primary source of the information contained in the person's response; and (3) "target"—at what the response is directed. These three orthogonal categories can serve generally as dimensions for systematically classifying the cognitive responses to any designated referent. In research and theory on persuasion, the referent has been the advocacy message; in theory and research on behavior deficits and on personality, the referent may be the person, or "self." Of course, the referent need not be restricted to these alternatives, and dimensions need not be restricted to the three that have been listed. For instance, a fourth dimension, the irrationality of the responses, has been called for in the literature and also is discussed briefly in this section.

**Polarity Dimension.** The most consistent finding in cognitive-response research has been that there is a relationship between the favorableness of the responses elicited by the referent and the evaluation of the referent, whether it be a communication (e.g., Brock, 1967; Greenwald, 1968; Wright, 1974a) or the self (Cacioppo, Glass, & Merluzzi, 1979; Glass, Gottman, & Schmurak, 1976; Lazarus, 1966; Meril & McPeek, 1977; Gergen & Gibbs, Note 1). The polarity dimension comprises (1) "favorable thoughts"—statements that are positive toward or supportive of a referent (e.g., the self or message); (2) "neutral/irrelevant thoughts"—statements that neither favor nor oppose the referent; and (3) "unfavorable thoughts"—statements that are negative toward or in opposition to the referent.

Scoring the reported thoughts along the polarity dimension is done as follows:

1. Statements involving the referent (e.g., self, advocated position) that mention specific undesirable attributes or negative associations, challenges to the validity of the situation or stimulus, and statements of negative affect about the referent are counted as unfavorable thoughts. Examples of unfavorable thoughts about the self or experimental setting generated by men waiting to interact with an un-
familiar woman (cf. Cacioppo, Glass, & Merluzzi, 1979) included “I’m a little nervous” and “I hope this experiment ends soon.”

2. Statements in favor of the referent that mention specific desirable attributes or positive associations, statements that support the validity or value of the situation or stimulus, and the statements of positive affect about the referent are scored as favorable thoughts. Examples of favorable thoughts included “I hope we start soon” and “This should be fun.”

3. All remaining statements should express no affect with regards to the referent and are scored as neutral/irrelevant thoughts. Examples of neutral/irrelevant thoughts included “I hope my math test won’t be too hard” and “I wonder what she looks like.”

Each statement is scored as one and only one of the preceding. Data reduction then involves simply summing the number of statements in each category. The three sums (e.g., three unfavorable, one favorable, and two neutral thoughts) serve as measures of polarity response.

As should be evident from these examples, the categorization of a cognitive response requires an interpretation of the responses. This can best be accomplished by reading all of the thoughts listed by a subject prior to scoring any of the listed thoughts. It is imperative, therefore, that the scorer be blind to the experimental conditions and, preferably, to the experimental hypothesis. (We have noticed, too, that trained, but psychologically unsophisticated, judges are sometimes better at scoring cognitive responses than psychology graduate students and faculty, who tend to see “subconscious motives” in many of the comments. The simpler, more naive perspective may be preferable.)

Origin Dimension. Classifying cognitive responses according to their origin was first proposed by Greenwald (1968). Three classifications of origin, which are modifications of those proposed by Greenwald (1968), are as follows: (1) “externally originated thoughts”—statements or paraphrases of information provided in the stimulus; (2) “modified externally originated thoughts”—statements that are reactions to the information provided in the stimulus; and (3) “internally originated thoughts”—statements not traceable directly to the materials constituting the stimulus.

Scoring the reported thoughts along the origin dimension has been done as follows:

1. Statements that are direct quotes, paraphrases, or restatements of the information given to subjects (e.g., instructions, message arguments)

Subjects in this study were instructed to list everything they were thinking about during the preceding several minutes. It is possible that instructions to list only their thoughts about themselves would provide more specific (i.e., fewer irrelevant) responses and hence might increase even more the sensitivity of this measure.
are counted as externally originated thoughts. Thus any statement that repeats an instruction or response made by an experimenter or confederate (e.g., recall) is scored as externally originated. Examples of externally originated thoughts are "I am to wait here until the experimenter returns" and "I am going to talk to some girl."

2. Statements that are elaborations, qualifications, or examples of materials constituting the stimulus (e.g., specific replies to instructions, message arguments) are counted as modified externally originated thoughts. Examples of such thoughts are "I hope I will like the girl" and "I wonder what questions she will ask me."

3. All remaining statements should be expressions not traceable directly to something heard or seen (e.g., responses pertinent to the stimulus or issue but not to a specific instance in the situation; responses irrelevant to the stimulus or issue) and are counted as internally originated thoughts. Examples of these statements include "I am always nervous when meeting a new girl" and "I didn't bring an umbrella and it looks like rain."

Each statement is scored along this dimension once and only once; data reduction requires summing separately the number of statements classified as externally originated, modified externally originated, and internally originated thoughts. The sums serve as measures of origin response.

Research employing basically this origin classification system has revealed that, in some cases, internally originated thoughts weighted by polarity are most highly related to affect (Greenwald, 1968; Roberts & Maccoby, 1973) and that, in other cases, externally originated thoughts weighted by polarity are related most highly to affect (Calder et al., 1974; Insko et al., 1974). Although various reasons may account for this discrepancy, one possibility is that the subjects’ prior knowledge of, and ability to generate responses to, the stimulus may affect whether internally, modified externally, or externally originated thoughts are most important in changing affective states and behavior. For instance, subjects may find it easy and adaptive to generate responses (i.e., internally and modified externally originated thoughts) to a situation about which they have some prior information (e.g., eliminating editorial comments in the news media—Roberts & Maccoby, 1973). In support of this analysis are the results of numerous experiments on role playing, which demonstrate that, so long as subjects have some prior familiarity with a topic, more attitude change results when arguments are actively self-generated than when arguments are received passively (e.g., Janis & King, 1954).

When subjects have little prior knowledge on an issue, as when judging a defendant’s guilt in a hypothetical case (Calder et al., 1974), they probably have to rely on the information contained in the situation rather than upon their preexisting cognitions about the case because no thoughts about the stimulus exist prior to exposure. For example, during jury selections, judges
attempt to select jurors who are characterized by just such a cognitive state. Experimental evidence for this notion is provided by McGuire’s (e.g., McGuire & Papageorgis, 1962) experiments on inoculation theory, which demonstrate that, when subjects have little familiarity with defending their positions on an issue, such as cultural truism, externally originated defenses (passive) are initially superior to self-generated defenses (active) in producing resistance to persuasion. Thus the discrepancy that exists concerning the relative importance of internally, modified externally, and externally originated thoughts may be attributable to differences in the amount of preexisting information that subjects have about the situation.

The clinical implications of this model are straightforward. Therapeutic techniques that require active involvement on the part of the client should be most effective when the problem is entrenched deeply in past experience and when the client views the advocated change as discrepant. On the other hand, therapeutic techniques that require relatively passive participation on the part of the client should be most effective when the client’s problem is due, in part, to a lack of experience or knowledge.

**Target Dimension.** The target of the cognitive response provides information about the effect of the stimulus on the recipient’s focus of attention. In the past, targets have been classified into the following categories: (1) “stimulus thoughts”—statements pertaining to the situation or issue, and (2) “source thoughts”—statements pertaining to the source of the stimuli. Lasswell’s (1948) and Abelson’s (1968) analyses of the persuasion process suggest additional targets that might be fruitful to study: (3) “recipient (or audience) thoughts”—statements pertaining to the recipient(s) of the stimulus, including the self, and (4) “channel thoughts”—statements pertaining to the medium through which the stimulus is transmitted.

Scoring the reported thoughts along the target dimension could be done as follows:

1. Statements whose object is the stimulus, or one or more informational items, stated or implied, concerning the stimulus, are counted as stimulus thoughts. Examples of stimulus thoughts would include “I wonder what the discussion will be like” and “What is this experiment really about?”

2. Statements whose object is the source of the stimuli are counted as source thoughts, examples of which include “I wonder what the experimenter wants me to do next” and “Why would he tell me that?”

3. Statements whose object is the expected, actual, or potential recipient(s) of the stimulus are counted as recipient thoughts. “I’m very nervous” and “If she’s as nervous as I am, I’m going to laugh” are examples of recipient thoughts.

4. Statements that have as their object the medium or modality through which the stimulus is presented are counted as channel thoughts. “I
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prefer talking face-to-face with a new girl” and “Are we going to have to talk into microphones?” are instances of channel thoughts.

5. Responses whose object is anything irrelevant to the targets designated are scored as irrelevant thoughts. Examples of irrelevant comments are “I was thinking about the upcoming Chicago Bears football game” and “I am going to be late for music practice if I don’t hurry.”

Each statement is scored as one and only one of the preceding; data reduction is accomplished by summing the number of statements in each category. The total number of each category of thought (stimulus, source, recipient, channel, and irrelevant thought) serves as the dependent measure.

Reality Dimension. There are, no doubt, a variety of other dimensions that might be important, including saliency (i.e., how often the response is emitted—Smith, Bruner, & White, 1956), emotionality (i.e., the degree to which a response is affect-laden, regardless of polarity—Janis & Mann, 1977; Miller & Baron, 1973), and reality (i.e., the extent to which the response is based on and reflects the acceptance of objective reality—Ellis, 1962, 1977; Maultsby, 1970, 1977). For instance, concerning the latter, cognitive responses could be classified as follows: (1) “objective-reality thoughts”—statements that exemplify a reasoned and objective commune with the environment; (2) “distorted thoughts”—statements that are based upon unrealistic desires or fears rather than upon actual states of being and affairs; and (3) “unclassifiable thoughts”—statements that are either too brief or too obtuse to categorize as either of the preceding thoughts.

Scoring the reported thoughts along the reality dimension might be done as follows:

1. Statements, assertions, or conclusions that are accepted as valid by objective observers, and statements that adhere to the rules of logic are scored as objective reality thoughts. Examples are “I will soon be discussing campus issues with some girl” and “The experimenter has been gone several minutes now” (when, in fact, the experimenter had been gone several minutes).

2. Statements that involve overgeneralization; statements that exaggerate the significance of an event; statements, assertions, or conclusions that would not be validated by objective observers; and statements based upon an inaccurate or illogical premise are counted as distorted thoughts. Examples of distorted thoughts include “I feel I should get the girl every time” and “I should have gotten a better grade on that test” (when, in fact, the test was graded fairly).

3. Statements that defy classification under one of the preceding categories are counted as unclassifiable thoughts. Examples include “Nothing” and “That woman.”
Again, each statement is scored as only one of the preceding; data reduction involves summing the number of statements scored for each category.

McGuire (1969, 1980) has conducted research employing a classification scheme similar to the one that is suggested here. He found that simply asking individuals to think about (attitudinal) conclusions of syllogisms led to increased logical consistency in the syllogisms. He also found evidence of added wishful (distorted) thinking by these instructions. Specifically, cognitive responses in McGuire’s research were assessed by asking individuals to supply probability estimates for various statements of belief. He found that subjects assigned higher probabilities to desirable outcomes and lower probabilities to undesirable outcomes than would be demanded by a strict probabilistic (logical) analysis. McGuire concluded that affective change over time is the result of both logical and wishful (distorted) thought processes.

Note that the method suggested here for scoring objective-reality and distorted thoughts is quite compatible with Maultsby’s (1970) and Ellis’s (1977) discussions of rational and irrational thoughts. The reader is also referred to the literature reviews of Di Giuseppe and Miller (1977) and Ellis (1977) for evidence of the utility of distinguishing between these types of cognitive responses.

Other Dimensions. A major disadvantage of employing predetermined dimensions for the classification of cognitive responses is that researchers may overlook important and recurrent themes present in a person’s responses. The dimensions described in this chapter have been discussed in the social psychological literature, but much can be gained in the hypothesis-generation phase of research by approaching the thought listings with no predetermined ideas about which dimensions are “relevant” (McGuire & Padawer-Singer, 1976).

Judging and Combining Thought Listings

Once cognitive responses have been obtained and classification schemes have been selected, there is the need to judge the responses (i.e., assign each response to a particular category along each dimension) and to combine the responses along each dimension to obtain an index of each individual’s responses. Quantitative analyses can then be performed.

With respect to the task of categorizing the responses, three methods have been employed:

1. “Judge rating.” Individuals that are familiar with the scoring categories, but not with the experimental hypotheses, assign each response to a particular category (within each dimension) on the basis of their understanding of the meaning of the response (Brock, 1967; Cook, 1969; Insko et al., 1974; Roberts & Maccoby, 1973).

2. “Subject rating.” After completing the dependent variable, subjects
are instructed how to categorize their responses (e.g., "Place a plus next to the thoughts that are favorable to yourself, a minus next to the thoughts that are unfavorable to yourself, and a zero next to the thoughts that are neutral or irrelevant to yourself"—Cacioppo, Glass, & Merluzzi, 1979; Calder et al., 1974; Cialdini, Levin, Herman, Kozlowski, & Petty, 1976; Greenwald, 1968).

3. "Judge and subject ratings." Both subjects and judges rate the responses. If there is disagreement between the independent judges' ratings, there are various reasonable means of resolution, including employing the subject's rating if it breaks the tie (e.g., Petty & Cacioppo, 1977; Petty et al., 1976), averaging the judges' ratings (e.g., Petty, Cacioppo, & Heesacker, 1981), obtaining a third judge's opinion to break the tie (e.g., Cacioppo & Petty, 1980a), or resolving any discrepancies in discussions between the judges (e.g., Cacioppo, Petty, & Snyder, 1979).

Independent judges have demonstrated a high degree of agreement in their classification of responses along the polarity dimension (e.g., Insko et al., 1974) but not along the origin dimension (e.g., Greenwald, 1968). Though ratings by subjects and judges are correlated highly (Petty et al., 1976), subjects rating their own responses circumvents both the problem of low intrarater reliability and the problem of judges' misinterpreting the meaning of responses. Subjects, of course, are not always willing and/or able to comply with the request to classify their thoughts (cf. Cacioppo, Petty, & Snyder, 1979), a problem that is exacerbated by the selection of several dimensions along which subjects must classify their thoughts. The procedure of using both judges' ratings and subjects' ratings represents a compromise method.

Some of the listed cognitive responses are more extreme than others (e.g., more favorable or unfavorable, more assuredly distorted or objective-reality thoughts). What are the effects of weighting the responses in accordance with their extremity? What happens if, instead of just counting the number of favorable thoughts generated, the thoughts were weighted such that "1" indicated slightly favorable, "2" indicated moderately favorable, and "3" indicated very favorable? The research results indicate that weighting the responses along the polarity dimension neither alters nor strengthens the effects found by using the simpler frequency counts. This null effect has been obtained when using subjects' ratings (Calder et al., 1974; Cullen, 1968; Greenwald, 1968) and when using judges' ratings (Roberts & Maccoby, 1973).

Alternatively, weighting inferential beliefs (responses) on the basis of the subjects' certainty that the responses were applicable and on the basis of their extremity appears to be an effective method of increasing the predictability of the attitude toward a person in an impression formation task (Jaccard & Fishbein, 1975). Similarly, Petty (1977) determined that subject
weightings of the "certainty" of belief in cognitive responses scored along the polarity dimension strengthened their covariation with attitude change. This latter procedure may prove especially useful in future research of cognitive responses, emotions, and behavior.

Finally, neither simple counts nor weightings of the responses by their extremity and certainty reduces individual differences in the total number of thoughts reported. One method of controlling for these differences in total thought production is to calculate a ratio score, with the difference score serving as the numerator and the total number of responses from the two categories as the denominator—for example, (favorable − unfavorable thoughts)/(favorable + unfavorable thoughts) (Cullen, 1968; Petty & Brock, 1979).

The Stream of Cognitive Responses

Development of techniques for assessing the sequence in which cognitive responses are generated has begun only recently (see Notarius, Chapter 11, this volume). Meichenbaum et al. (1980) investigated the probabilistic and temporal sequence of cognitive responses during the performance of creativity tests; the think-aloud procedure was employed to obtain the cognitive responses, which were unitized differently for each of the sequential analyses performed. For the probabilistic analysis, unitization of the verbal protocols was accomplished by having judges determine what constituted a cognitive response on the basis of content and paralinguistic cues (e.g., pauses). Comments by Meichenbaum et al. (1980) are informative regarding the use of stream analysis:

The results thus far have indicated that high versus low creative subjects differed significantly in the frequencies with which they emitted various categories of verbal behavior. These results, however, leave open the question of how high and low creative subjects might differ in their patterns of verbal behavior. One way of addressing this question is to compare high versus low creative subjects on the frequencies of the various categories of response which follow each specific category. This provides an opportunity to examine the patterning of thoughts over time.

Meichenbaum et al. (1980) compared the effects of the grouping variable (i.e., high- versus low-creative individuals) on the various conditional probabilities. The potential of this procedure manifested in identifying differing sequences of cognitive response attributable to the grouping variable. For instance, Meichenbaum et al. reported that low-creative individuals were more likely than high-creative individuals to follow an unfavorable thought with another unfavorable thought. High-creative individuals tended to generate task-relevant or favorable thoughts after they expressed an unfavorable thought. The exact method by which these comparisons are conducted depend on the types of data presented, each of which will be discussed.
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depends upon whether the grouping variable(s) affected the frequency and types of thoughts produced. Gottman and Notarius (1978) provide a cogent presentation of the statistical procedures for conducting these probabilistic analyses; the interested reader may wish to consult their work.

Meichenbaum et al. (1980) also conducted an analysis of the temporal sequence of cognitive response. Unitization of the verbal protocols for the temporal analysis was achieved by dividing each protocol at every 5-second interval; one 5-second interval constituted a unit of cognitive response. The number of cognitive responses within each category generated within various (equal-length) time intervals (e.g., the first half versus the last half of the protocol) was analyzed to obtain the temporal sequence of cognitive response. This temporal analysis has the following potential merits: (1) the cognitive responses elicited by components of the stimulus presentation (e.g., particular informational items) can be identified, (2) differences in the general sequence of cognitive response are discernible (e.g., by counterbalancing the ordering of the informational items composing a stimulus presentation), and (3) the effects of grouping variables on either of the preceding can be determined. For instance, Beaber (1975) used a similar procedure and found that individuals initially responded emotionally, but that in time responded rationally, to the contents of a discrepant message.

We recently have studied the sequence of cognitive and affective responses to repeated, rather than single, exposures to a stimulus (Cacioppo & Petty, 1979b, 1980a). Individuals heard a personally relevant, counterattitudinal communication either one, three, or five times. They then rated their agreement with the message, and listed their thoughts (unitizing them as they did so by placing one idea or thought in a box). Classification of the cognitive responses was done both by subjects and by judges, and analyses were performed using the frequency counts of each type of response along the polarity dimension. We found that only topic-relevant thoughts were related to attitude change. More important, the production of unfavorable thoughts decreased and then increased, whereas agreement and favorable-thought production increased and then decreased as the subjects heard the communicative stimulus again and again.

This example underscores the major benefit of this type of sequence analysis: The pattern of cognitive response can be examined as the information in (or motor response to) a stimulus becomes overlearned, more familiar, or the object of more thought. It is theoretically possible to employ a probabilistic or a temporal analysis in combination with a repeated-exposure analysis (e.g., by examining changes in conditional probabilities as a function of exposure frequency) to provide yet more specific temporal information about the person's stream of thought. The selection of the method of assessing cognitive-response sequence depends, of course, upon the purpose of the research.
In sum, cognitive responses can be assessed using mechanical, observational, or instructional techniques. Instructional techniques, used most frequently, involve either the spoken or written report of thoughts and feelings. The classification of the cognitive responses can be done by judges, subjects, or both. Frequency counts of the items within each category of cognitive response provide a satisfactory measure of the relative prominence or profile of the different cognitive response categories. Recent research suggests that the associations between cognitive responses and the outcome variable are strengthened by including ratings of certainty (saliency) and extremity for cognitive responses.

Assessing the Structural Bases of Cognitive Responses

Cognitive organizations or schemas provide the means by which persons organize objects and events in their environment. Obviously, then, cognitive organization affects the way people respond to their environment. One of the first social psychologists to measure cognitive structure was Zajonc (1960). He had subjects describe a stimulus person “by freely listing the qualities and attributes that characterized” a person about whom they had read a letter (Zajonc, 1960, p. 160). In other words, Zajonc obtained the cognitive responses (one per index card) elicited by a description of a fictitious person. He then calculated four measures of cognitive structure:

1. “Differentiation” is a measure of the extent to which a person is capable of identifying the discriminating objects and events. The simple total of characteristics listed is the measure of differentiation. For example, if one were interested in studying the structure of cognitive responses to a stimulus, the total number of stimulus-relevant thoughts listed could serve as the measure.

2. The extent to which different categories are used determines “complexity.” The cognitive responses that subjects list can come from a single category or multiple categories. Complexity is measured by asking the subjects to arrange the reported cognitive responses into their categories and subcategories and by counting the number of categories utilized.

3. “Unity” is a measure of the interdependence of the cognitive responses. It is assessed by having the subjects indicate which cognitive responses would change if one were changed or untrue. The greater the number of changes resulting from a change in each of the cognitive responses, the greater the unity.

4. “Organization” is the degree to which one cognitive response or a set of cognitive responses is central or dominates the relationship among all the cognitive responses. To the extent that changes in one cognitive response result in changes in other related cognitive responses, the initial cognitive response would be central.
Zajonc (1960) provides procedures for calculating each of these aspects of cognitive structure.

An alternate structural analysis has been suggested recently in research on personality. Some have argued that past experience and categorizations form structures (schemas) that affect perceptions and recollections of events and that function to process information efficiently (with a concomitant loss of actual detail; e.g., Abelson, 1976; Bartlett, 1932; Neisser, 1976). Markus (1977) provided evidence that self-schemata facilitate the processing of information about the self and that they contain behavioral examples and self-predictions. Cantor and Mischel (1977) demonstrated the prototypical character of schemata, which they found biased recognition of self-related, but unpresented, items.

Recently, we have explored the question of how self-schemata influence attitudinal processing (Cacioppo, Petty, & Sidera, Note 2). Sixty introductory psychology students were shown 30 slides of trait adjectives, 15 of which were rated as indicating a "religious" person, and 15 of which were rated as indicating a "legal" person. Classification of subjects to group (religious or legal) was done using their "me" (self-descriptive) and "not-me" (not-self-descriptive) decisions and response times to the 30 words (cf. Markus, 1977). One week later, subjects heard one of four counterattitudinal messages, which had been developed in pilot tests to represent either a legal or a religious perspective on the topics of capital punishment or abortion. These messages were equated across perspectives for persuasiveness and familiarity. After hearing one of the four messages, subjects rated its persuasiveness, listed their thoughts in the manner described, and completed a surprise recognition test.

We found that a persuasive message that was in accord with the subject's self-schema was rated as more persuasive than one that was not. In addition, a schema-consistent message elicited more total thoughts, more externally originated thoughts (e.g., quotes), and more thoughts with the message as target. These results suggest that a developed self-schema facilitates total thought production and, more specifically, increases topic-relevant thinking. In other words, the person's cognitive structure affected the attitudinal processing of a related issue. The study of the influence on affect and behavior of self-schemata seems to portend a fuller understanding of why individuals respond cognitively as they do.

Cognitive Response Stereotyip

Finally, neuropsychological studies of human information processing suggest the utility of one additional measure of cognitive response: the degree to which one particular type of cognitive response (e.g., favorable or unfavorable thoughts) dominates the entire profile of cognitive responses (cf. Cacioppo, Petty, & Quinatar, Note 3). Specifically, research on functional cerebral asymmetry indicates that the right (minor) compared to the left (ma-
jor) hemisphere processes information in a prosodic, thematic manner (Cacioppo & Petty, in press-b; Tucker, 1981). This suggests that the thoughts, associations, and elaborations that are produced when, for instance, listening to a communication, are especially likely to adhere to a common theme when the right hemisphere is relatively utilized. Conversely, relative utilization of the left, rather than the right, hemisphere should be associated with more divergent (piecemeal) analyses of the communication and hence less stereotypy in the cognitive responses.

To test this notion, we conducted several experiments in which subjects anticipated and heard either a proattitudinal or counterattitudinal message (Cacioppo & Petty, Note 4). Immediately following the message presentation, subjects listed everything they had been thinking about and, afterward, went back through their listed thoughts and scored them along the polarity dimension. Throughout the session, we monitored the electroencephalographic activity over the right and left associative (parietal) areas of the brain. Afterward, we calculated electroencephalographic ratio scores to determine which side of the brain of each subject was being relatively utilized; at the conclusion of the study, we conducted a median split between subjects, using these ratios to determine who displayed relative left versus right hemispheric involvement while anticipating and listening to the persuasive communication.

The next task was to derive the measure of cognitive response stereotypy. To do this, we used a nomothetic criterion to identify the predominant and the nonpredominant cognitive responses. In pilot testing, we had found that most people responded to our proattitudinal message by listing favorable thoughts, whereas most responded to our counterattitudinal message by listing unfavorable thoughts. Hence, by our nomothetic criterion, "favorable thoughts" was the predominant cognitive response, and "unfavorable thoughts" the nonpredominant cognitive response when the message was proattitudinal; the opposite was the case when the message was counterattitudinal. We calculated the degree of cognitive response stereotypy by subtracting the number of nonpredominant cognitive responses generated by each individual from the number of predominant cognitive responses produced by each. Thus we obtained a measure of cognitive response stereotypy for each subject in the study. We analyzed this measure in the same manner in which we analyzed the other measures obtained (e.g., attitudes).

As expected, we found that subjects who displayed relative right hemispheric involvement while anticipating and listening to the persuasive communication generated a more stereotyped profile of cognitive responses. Interestingly, median splits on the electroencephalographic ratios obtained during a prewarning basal interval did not portend this effect, which is consistent with the notion that there are predictable relationships between relative cerebral hemispheric involvement and the means by which attitudes are developed and changed. More important here, perhaps, is the utility of the
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measure of cognitive response stereotypy that is illustrated in this research. In sum, the research concerning the measurement of cognitive responses has focused on a variety of empirical means of obtaining and analyzing cognitive reactions to a stimulus. Most of this work has been conducted on the level of analyzing and classifying single responses. The work on the stream of cognitive response and on analyses of cognitive organization offers a potentially rich area of research in which the reciprocal organismic-environmental interactions can be studied.

Some Final Considerations

How useful is the thought-listing procedure for tapping a person’s self-statements? Can the procedure be employed successfully in an attempt to monitor the covert verbalizations or images that are produced as some task is anticipated or performed? Is the thought-listing procedure useful in psychological research and treatment?

Several important issues must be addressed in answering these questions, namely:

1. Is the measure reliable?
2. Is the measure sensitive to environmental interventions and individual differences?
3. Are the thoughts that are measured determinants or post hoc rationalizations of the observed outcome variable?
4. Can the thought-listing procedure serve as both an independent and a dependent variable?

Reliability

A perfectly reliable measure is internally consistent (split-half reliability) and yields the same result on repeated testings (test-retest reliability). In

Rather than using the nomothetic procedure for identifying predominant and nonpredominant cognitive responses that we have outlined, an idiographic criterion could be used. In this alternative method, the predominant cognitive response is considered to be whatever type of cognitive response is most abundant within each individual’s thought listing. This can be calculated simply by taking the absolute value of the difference between the number of favorable and unfavorable thoughts generated by each subject. When we calculated this index in the study described here, we obtained essentially the same results. This idiographic criterion is especially useful, however, when the goal of the study is to examine a particular individual’s thought processes and when thought listings by this individual in response to a variety of stimuli are available. The reader might recognize the parallels between our notions of nomothetic and idiographic stereotypy in cognitive response and psychophysicists’ notions of stimulus and individual response stereotypy in bodily reactions (cf. Engel, 1972).

Other important issues concern the reactivity and the validity of the thought-listing measure. Because we addressed these issues previously in this chapter, we have excluded discussion of them in this section.
1968, Cullen compared the reliability of the thought-listing procedure with that of several respected attitude assessments (the Likert and Thurstone scales). Subjects responded to messages on two topics (birth control and segregation) by completing attitude and thought-listing measures (the order of assessment was counterbalanced across subjects). Cullen found that both split-half and test-retest reliabilities were acceptably high for these measures and that order of measurement made no difference. Specifically, she found that the average split-half reliability was +.78 for thought-listings, +.83 for Likert scales, and +.55 for Thurstone scales. The average test-retest reliability was +.64 for thought listings, +.83 for Likert scales, and +.53 for Thurstone scales. These data suggest that the thought-listing procedure obtains reliable information from a subject.

Sensitivity

Is the thought-listing measure sensitive to interventions? To test this, we conducted some studies in which we attempted to disrupt the subjects' thought processes (e.g., Cacioppo et al., 1978; Petty et al., 1976) and other studies in which we attempted to facilitate thinking (e.g., Cacioppo & Petty, 1979b; Petty & Cacioppo, 1979b).

Disrupting Cognitive Elaboration. We constructed two communications for a study in which thought processes were disrupted (Petty et al., 1976). One contained rather weak arguments, and we expected that subjects would primarily counterargue this low-quality message while hearing it. We reasoned that, if we could impair cognitive elaboration while leaving comprehension relatively intact, then we could disrupt primarily counterarguments and make the person more susceptible to the speaker's appeal. The second message contained very strong arguments on the same topic. For this high-quality message, we expected subjects to be generating favorable thoughts to themselves regarding the advocacy as they listened to it. If we impaired cognitive elaboration in this instance, then we would expect to disrupt primarily favorable thoughts about the advocacy, thereby leading to less attitude change than if no disruption of thoughts occurred.

To test these hypotheses, Petty et al. presented a discrepant message (increasing tuition) to the subjects. Half heard the low-quality communication (weak arguments) for increasing tuition, whereas half heard the high-quality communication (strong arguments). In addition, half of the subjects engaged in a distracting task during the message, whereas half did not. The results confirmed the hypotheses: Distraction decreased counterargumentation and increased attitude change for the low-quality communication, but it decreased favorable thoughts and attitude change for the high-quality communication. This study has been replicated recently using different topics and distractors but yielding, in essence, the same effect (Lammars & Becker, 1980).
Enhancing Cognitive Elaboration. In other studies, we exposed subjects repeatedly to a persuasive communication. We reasoned that repeated presentations would provide subjects with additional opportunities to think about and elaborate upon the arguments given for adopting a discrepant position. Hence facilitated thought should increase attitude change if the arguments are strong (at least until repetition becomes tedious) and decrease attitude change if the arguments are weak. In our first studies, we tested and found support for the first notion, that it, that a moderate number of presentations of a high-quality communication increased attitude change (Cacioppo & Petty, 1979b, 1980a).

We recently completed a study in which subjects heard a high- or low-quality communication for instituting senior comprehensive exams (a discrepant message). Some subjects heard the message once, whereas others heard it three times. As expected, moderate repetition reduced counterarguing and increased attitude change when the arguments were strong, but it increased counterarguing and decreased attitude change when the arguments were weak. Together, these studies indicate that the thought-listing measure is sensitive to manipulations of information processing and illustrate the importance of self-statements in mediating affective responses to communications.

Reflecting Motivational Changes. Cognitive response processes operate at the service of two general factors: the motivation and the ability to think about and elaborate upon some stimulus or event. (Freud, for instance referred to repression in order to indicate motivated forgetting or nonthinking about some traumatic event.) The issue of the sensitivity of the thought-listing procedure can be extended to these two factors as well. Simply stated, does the thought-listing procedure reflect changes in cognitive response when a person's motivation or ability to think about some stimulus has been manipulated? Again, the answer seems to be a firm "yes."

One of the best known findings in social psychology is that the real or imagined presence of other people inhibits individuals from helping in emergencies (Latané & Darley, 1970). This social laziness is not limited to emergency (e.g., Ingham, Levinger, Graves, & Peckham, 1974; Petty, Williams, Harkins, & Latané, 1977) or even to physical tasks (Petty, Harkins, & Williams, 1980; Petty, Harkins, Williams, & Latané, 1977). The "social loafing" elicited by the presence of others who could also perform or assist in a task appears to be motivational in origin, as the effect is evident even when care is taken to ensure that participants are equally able to perform the task when alone and when with others.

Petty, Harkins, and Williams (1980) have shown that the implied or real presence of others working on the same cognitive task lessens the cognitive work an individual devotes to the task. More important here, this motivational effect was evident in thought listings. For instance, when evaluating a high-quality communication, individual evaluators generated more favorable thoughts and evaluated the stimulus more positively than group
evaluators; when evaluating a low-quality communication, however, individual evaluators generated more unfavorable thoughts and evaluated the stimulus more negatively than group evaluators.

We have also found the thought listing to reflect enhancements of a person’s motivation to think about a stimulus ( Petty & Cacioppo, 1979b). Again, we used two forms of communication advocating the same position, one constituted by weak message arguments (low-quality communication), and one by strong arguments (high-quality communication). This time, however, subjects were told that the advocacy (instituting senior comprehensive exams) would occur at some distant school (low personal involvement, low motivation) or at their university (high involvement, high motivation). Increasing involvement enhanced persuasion for the high-quality communication but reduced persuasion for the low-quality communication. Moreover, thought listings revealed that the production of favorable thoughts was enhanced by involvement for the high-quality communication, whereas unfavorable thought production was enhanced by the more involving low-quality communication.

Collectively, these studies suggest that the thought-listing procedure can be used to detect differences in cognitive response caused by environmental influences on a person’s motivation to think about a stimulus or event.

Reflecting Alterations of Ability. The thought listing has in several studies also proven quite sensitive to environmental influences on a person’s ability to think about a stimulus or event. The distraction studies we reviewed above (e.g., Petty et al., 1976) are based upon the logic that the person’s ability to elaborate upon the stimulus was impaired. The level of distraction in these studies was finely determined so that reception of the message arguments was left intact while disabling subjects from elaborating as completely as normal upon these arguments. As we noted, these conditions had a dampening effect on any cognitive and attitudinal changes normally caused by these stimuli—and these effects were evident in the thought listings.

Enhancing a person’s ability to process has been illustrated in the thought-listing technique by Cacioppo (1979). We found that under certain conditions an accelerated heart rate enhanced the performance on intellective tasks of people wearing pacemakers. In a second study, subjects wearing implanted cardiac pacemakers read counterattitudinal communications when their heart rate was either accelerated or not accelerated. These subjects were more resistant to these communications (which consisted of weak arguments) when their heart rate was accelerated than when it was not. This change in their ability to elaborate cognitively was evident on the thought-listing measures as well (cf. Cacioppo & Petty, in press-α).

Reflecting Individual Differences. It is often more important in clinical matters to assess dispositional, rather than situational, differences in thought processes. How does the thought-listing procedure fare in assessing individual differences? The data are sparse but encouraging.
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In one study, we pretested a large number of male undergraduates and selected for further examination (i.e., a second session) those who scored either high or low on Watson and Friend’s (1969) scale of social anxiety (Cacioppo, Glass, & Merluzzi, 1979). During the second session, subjects (who were tested individually) were told that they would be discussing campus issues with a female undergraduate. Each subject was asked to wait quietly for a few minutes while the experimenter retrieved a “prediscussion questionnaire.” When the experimenter returned 3 minutes later, the subject was asked to complete thought-listing and self-evaluation measures.

We found that anticipating a discussion with an unfamiliar woman led to the spontaneous generation of more negative self-statements and more negative self-evaluations by high, as opposed to low, socially anxious men. Moreover, the self-statements listed by high and low socially anxious men were clearly distinguishable and were highly related to self-evaluations.

The Role of Cognitive Responses

This finding brings us to an important theoretical as well as methodological question: Are the responses that are measured with the thought-listing technique determinants or post hoc rationalizations of the observed emotional responses? The logic of the distraction studies discussed previously argues that they are determinants. Similarly, studies in which thought has been facilitated suggest that they are determinants (cf. Petty & Cacioppo, 1981). For instance, slightly speeding up the heart beat of pacemaker patients improved their performance in intellective tasks—and increased their counterargumentation, total thought production, and resistance to discrepant communications (Cacioppo, 1979).

Besides these experimental means, we have employed path analytic procedures in an attempt to determine the most likely causal sequence of the cognitive and affective responses we observed. For example, if a manipulation influences cognitive and affective responses, then one of the following causal models is likely:

1. Manipulation \rightarrow Cognitive responses \rightarrow Affective responses
2. Manipulation \rightarrow Affective response \rightarrow Cognitive responses
3. Manipulation \leftrightarrow Cognitive responses \leftrightarrow Affective responses

Path analytic techniques provide a means of selecting from among these various models. The logic behind path analysis is fairly straightforward. If the effects on some “criterion” measure (e.g., affective response) are mediated by the effects of the manipulation on some other (“predictor”) variable (e.g., cognitive responses), then statically eliminating the predictor variable should eliminate the effects that the manipulation seemed to have on the criterion variable. Typically, path analyses have revealed that the person’s
cognitive responses to persuasive communication mediated the affective response (Cacioppo et al., 1981; Insko, et al., 1974; Osterhouse & Brock, 1970).

Finally, we discussed previously how personal involvement increases the cognitive elaboration of a communication as it is presented. If the thought-listing procedure taps post hoc rationalizations, then the correlation between these thoughts and affective responses should be about the same, regardless of issue involvement. On the other hand, if thought listings are tapping the actual (and accessible) cognitive responses to the communication, then the correlation between cognitive and affective responses should be higher when there is high, rather than low, issue involvement because the former elicits greater relevant cognitive elaboration. As mentioned previously, high-involvement issues produce stronger correlations among cognitive and affective responses than do low-involvement issues (Petty & Cacioppo, 1979a, 1979b).

**Thought Listing as an Independent Variable**

The thought-listing procedure has proven useful as a reliable and sensitive dependent variable; it has been employed successfully as an independent variable as well. One example of this is in research on the determinants of enduring attitude changes.

Most attitude changes that are produced in the laboratory are relatively short lived; there is little or no maintenance of the new attitude. Hovland (1959) and his colleagues originally believed that attitude change would persist if subjects could subsequently recall the arguments contained in the communication. Of course, from the cognitive response point of view, attitude change is not produced or maintained by argument learning but by the elicitation and retention of favorable thoughts about the advocacy. That is, attitude change may persist to the extent that subjects at some later time are able to recall the favorable cognitions that were elicited initially by the communication.

To test this, we asked subjects to read five arguments on an involving topic and to list five of their own thoughts on the topic (Petty, 1977). Subjects then memorized either their own five thoughts or the five message arguments. Attitudes on the topic were measured both immediately and one week later. The results supported the cognitive response view. Immediate attitude change was related more highly to the cognitive responses than to message learning. In addition, attitude change persisted more among those who memorized their own thoughts than among those who memorized message arguments.

The use of thought listing as an independent variable is important for other areas of psychology for at least two reasons. First, there is the obvious advantage for theory testing that we capitalized upon in the study described.

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For instance, recall that we found that highly socially anxious men were more likely to generate negative self-statements when awaiting their interaction with a woman than were less anxious men (Cacioppo, Glass, & Merluzzi, 1979). This study did not indicate whether or not these self-statements were instrumental in eliciting or heightening the anxiety and self-evaluations; the use of thought listing as an independent variable provides a means by which to test the causal role of a person’s self-statements in bringing about the subsequently observed affective and self-evaluative responses.

Second, thought listing as an independent variable is important for its application in therapy. As a component of a treatment intervention, a therapist might want to select a subset of thoughts and have the client memorize these (e.g., the favorable self-statements in a phobic situation) to facilitate the client’s affective and behavioral change.

In sum, the thought-listing procedure has provided a reliable and valid measure of cognitive responses. The procedure does not appear to be reactive, because it does not affect the responses to the task under investigation. Thought listings appear to be sensitive to environmental manipulations and to individual differences. The measure appears to tap thoughts that mediate affective responses rather than post hoc rationalizations for these responses. Finally, it has proven useful as an independent variable in assessing cognitions in research. Perhaps one of the most promising and exciting prospects for the thought-listing technique is its application as an independent variable to assessing and treating the underlying problems in an individual’s thought processes.

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