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TOWARD A HISTOLOGY OF SOCIAL BEHAVIOR: JUDGMENTAL ACCURACY FROM THIN SLICES OF THE BEHAVIORAL STREAM

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So it cometh often to pass that mean and small things discover great better than great can discover the small; and therefore Aristotle noteth well, that "the nature of every thing is best seen in his smallest portions."

(Francis Bacon, p. 178)

I. Significance

Many day-to-day impressions and judgments of others occur rapidly, unwittingly, and intuitively. A fleeting glimpse or a mere glance can lead to an instantaneous evaluative judgment. Once made, such judgments provide the anchor from which subsequent judgments are realized. Even without reaching conscious awareness, initial evaluative impressions can influence whom we sit next to on the subway, whom we ultimately hire for a job, and, perhaps, even whom we marry. Thus, as employers, we might reject a candidate on the basis of an unkempt appearance even before the employment interview has commenced. As savvy undergraduates, we might know we are going to drop a particular course even before the instructor has finished passing out the course syllabus on the very first day. And, who among us has never heard it claimed, "I knew it from the very first time our eyes met. This was the person I was going to marry"? The importance of these initial impressions is undeniable. But what is the magnitude of their importance? To what extent are our cognitions, emotions, choices, and behaviors explicit functions of these instantaneous impressions? How accurate are judgments made so quickly? Upon what are they based?

Despite the volumes that have been written on social cognition, we know very little about how first impressions naturally develop, what influences or does not influence them, and how much they determine future behavior.

A. BACKGROUND

Pioneers in the area of social perception such as Gordon Allport were very interested in the issue of the accuracy of everyday impressions and judgments of others. At the field's zenith Taft's (1955) review of the area did not provide a hint of the crash to come. In the very same year that Taft summarized what was known about interpersonal judgment, Cronbach and Gage (Cronbach, 1955; Gage & Cronbach, 1955) revealed that much of what was being concluded was in error due to methodological flaws inherent in the existing experimental designs and data-analysis techniques. Although the problems were not insurmountable, they proved discouraging. Interest in accuracy waned so much that in 1957, a landmark conference on interpersonal perception was devoted to turning the tide of research on social perception from investigating the accuracy of interpersonal judgments toward investigating the process of interpersonal judgments (Tagiuri, 1958, p. xvi). The tide did turn and interest in accuracy declined, primarily because of methodological rather than theoretical reasons (for detailed discussion of these issues see Funder, 1995; Jussim, 1991; Kenny, 1994; Kenny, Albright, Malloy, & Kashy, 1994). A critical problem was inherent in the concept of accuracy itself. After all, to be accurate is to be correct or "on the mark." In order to assess accuracy, one must know what actually is "the mark," or the truth. The assessment of accuracy implies knowledge of the truth, which in psychology typically refers to the true status of someone's behavior, disposition, or internal state—a difficult criterion to assess. Realizing the difficulty in establishing accuracy criteria for psychological constructs and the problems associated with extant accuracy metrics, researchers shifted their focus to the judgment process (Jones, 1985; Schneider, Hastorf, & Ellsworth, 1979).

During the decades that followed, social psychologists turned their attention toward examining the fallibility of human judgments (Kahneman, Slovic & Tversky, 1982; Nisbett & Ross, 1980). Innovative and intriguing research indicated that such judgments are prone to a depressing assortment of errors and biases. For example, people tend to rely on several judgmental heuristics that can lead to uninformed and poor decisions (Kahneman et al., 1982; Nisbett & Ross, 1980).

Preceding and parallel to this pathbreaking work on judgment and decision making, however, another line of research suggested that people (and

even animals) were responsive to very subtle features in their social ecology. Research on expectancy effects clearly indicated that people and animals can sense and behave in accordance with the subtle, unstated expectations that other people have of them (Rosenthal, 1966, 1991; Rosenthal & Jacobson, 1992; Rosenthal & Rubin, 1978). Systematic studies showed that these expectations are communicated through subtle variations in nonverbal behavior. In light of the evidence demonstrating how people perceive and respond to the subtlest of variations in expressive behavior, it seems surprising and paradoxical that social psychologists at that time were lamenting the inaccuracies of our social perceptions. The difference between the two streams of work was perhaps due to the domains being examined. The judgment and decision research focused on judgments regarding abstract, conceptual, and statistical information, whereas the interpersonal expectation and nonverbal communication research focused on judgments regarding individuals' actual behavior.

In response to the developing zeitgeist focusing on error, a small group of researchers reawakened interest in the attempt to quantify the accuracy of social judgments (Funder, 1987; Funder & Harris, 1986; Kenny & Albright, 1987; McArthur & Baron, 1983; Swann, 1984). Researchers began to develop the tools and the confidence needed to address the methodological issues that curtailed earlier research (Bernieri, Zuckerman, Koestner, & Rosenthal, 1994; Funder, 1982; Ickes, 1997; Judd & Park, 1993; Kenny, 1994; Snodgrass, 1985). Along with the developing methodology, theory on accuracy made huge strides as well (Funder, 1995; Funder, 1989; McArthur & Baron, 1983; Swann, 1984). This work on accuracy revealed that perceivers are not as error prone and biased as was once thought. Observers are able to make unexpectedly accurate judgments of others, especially on certain personality traits. Furthermore, these judgments can be accurate or predictive even in the absence of any personal interaction between the targets and raters—even when impressions are based on "thin slices" or observations less than 5 min long.

B. DEFINITION

A thin slice is defined here as a brief excerpt of expressive behavior sampled from the behavioral stream. By brief we mean any excerpt with dynamic information less than 5 min long. Thus, static, still frames (e.g., photographs) do not qualify as thin slices. Thin slices can be sampled from any available channel of communication, including the face, the body, speech, the voice, transcripts, or combinations of the above. Thin slices retain much, if not most, of the information encoded via dynamic, fluid

behavior while reducing or sometimes eliminating: (a) the information encoded within the ongoing verbal stream; (b) the past history of targets; and (c) the global, comprehensive context within which the behavior is taking place.

1. Importance

On-line, everyday, dynamic social cognition often begins with the identification of expressive behavior. People form immediate impressions and evaluations from ongoing behavior. Work on the judgment of thin slices elucidates the process by which impressions are extracted from the ongoing behavioral stream. These impressions and evaluations form the basis for subsequent expectations as well as for subsequent behavior toward targets (Jones, 1990). A wealth of research in social psychology has shown that social information processing is schema and expectancy driven and that inferences and subsequent judgments are strongly influenced by the initial immediate impressions of expressive behavior. Thus, because initial impressions are so influential in person perception, judgments, and resulting behavior, the reliability and accuracy of these initial impressions is paramount to the understanding of social cognition in general. In this chapter we evaluate the judgments of others from minimal information—from thin slices of the ongoing behavioral stream.

2. Behavioral Stream

Like the continuous black-and-brown ribbon of videotape that records it, the ongoing stream of individuals' behavior while navigating through their social environment is inherently unpunctuated and whole. With the possible exceptions of birth and death, the flow of behavior has no definitive points of initiation and termination. Life itself is not intrinsically segmented. Yet, when reflecting upon our own behavior and the behaviors of others, we partition it in to meaningful units so that it can be comprehended, processed, and remembered (Newtson, 1976). These slices we project on to the behavioral stream are not fixed in length. Rather, their size and nature likely reflect the various processing demands and perceiver goals operating at the given moment (Newtson, 1990).

As researchers who appreciate the concepts of representativeness and reliability, our intuition compels us to suspect that larger slices will be more representative and more useful to judge. Common sense would suggest that larger slices contain more information and therefore provide a more reliable sample of the behaviors chronically embedded within the complete behavioral stream. To know confidently the dispositional nature of something as complex as a human being, our scientific acumen demands first a vast

sampling of past history, self-reported internal states, and an understanding of the situational contexts within which they occurred. To see an individual's identity, disposition, and intention revealed within a few seconds of behavior would strike any clinician or personologist as being an incredibly fortunate outcome of an otherwise random and chaotic sampling process.

Nevertheless, social perceivers appear quite comfortable working with such thin slices. Gordon Allport (1937) observed that "a brief acquaintance often does result in amazingly rich impressions" based on cues that "are derived entirely from expressive movements—from appearance, gesture, and manner of speaking" (p. 500). Allport's observation that individuals can glean a substantial amount of information about others through brief exposure to their expressive behavior has received considerable empirical support.

3. Expressive Behavior

In their classic book, *Studies in Expressive Movement*, Allport and Vernon (1933) defined expressive movement as "individual differences in the manner of performing adaptive acts, considered as dependent less upon external and temporary conditions than upon enduring qualities of personality" (p. 23). Expressive behavior conveys important information about the cultural, social, interpersonal, and behavioral ecology—information regarding affect and emotions, personality and dispositions, internal goals and motives, and, finally, information about social relationships.

DePaulo (1992) argued that expressive nonverbal behaviors are both more difficult to suppress relative to verbal behavior and more accessible to observers than to actors. One implication of the lack of control and accessibility of expressive behavior is that such behavior provides observers with a relatively valid source of information regarding the true internal states and dispositions of another. Another implication is that attempts to intentionally manipulate expressive behaviors in the service of self-presentation are difficult and often unsuccessful. Expressive behavior may be more revealing of communicative intentions and internal states than what is being consciously and verbally communicated (Ekman & Friesen, 1969). By sampling expressive behavior, thin slices capture chronic, reliable, and stylistic psychological information not subject to conscious control and monitoring (DePaulo, 1992; Ekman & Friesen, 1969, 1974; Rime & Schiaratura, 1991).

C. SUMMARY

Thin slices are excerpts of expressive behavior drawn from the ongoing behavioral stream. The expressive behavior sampled is diagnostic of many

affective, personality, and interpersonal conditions. Examining judgments based on thin slices can inform us about the sensitivity people have to this information as well as the process by which immediate impressions are formed. This scrutiny will then lead to a better understanding of how subsequent expectations of, and behavior toward, others come about. In the next section we provide several examples to illustrate the efficiency of thin slices in providing information about social and interpersonal relations.

II. Predictive Utility of Thin Slices

A. RELEVANT DOMAINS

Thin slices contain information pertaining to a wide spectrum of psychological constructs and phenomena, including internal states, personality, interaction motives, and social relations.

1. Internal States

Thin slices of behavior reveal valid information about fleeting, temporary emotions and affect. This information is communicated through channels of communication such as the face, the voice, and the body. Thin slices also provide information about chronic, long-lasting affective states such as depression and anxiety (Waxer, 1976, 1977).

2. Personality

Fritz Heider's famous contention that "Behavior . . . has such salient properties that it tends to engulf the field" (1958; p. 54), is particularly true in the case of thin slice judgments. Dispositional and correspondent inferences are often based on glimpses or slices of behavior. So far, observable traits such as extroversion and sociability have been studied and judged from brief exposures more successfully than the more internal traits such as openness to experience or perseverance (Albright, Kenny, & Malloy, 1988; Funder, 1995; Kenny et al., 1994; Passini & Norman, 1966; Paunonen, 1991; Watson, 1989). It is possible, however, that the social context within which thin slices are sampled may strongly moderate the extent to which a given trait is manifested (Dabbs, Strong, Milun, Bernieri, & Campo, 1999).

3. Interaction Motives

Nearly all of the experimental research on deceptive communications and their detection has employed thin slices as the stimulus units of analysis

(DePaulo, Stone, & Lassiter, 1985; Zuckerman, DePaulo, & Rosenthal, 1981, 1986). Results from several meta-analyses have documented well the finding that observers, with no prior knowledge of targets, can detect deception at greater than chance levels.

Interpersonal roles and goals can also be revealed in thin slices. For example, interpersonal goals such as forming an impression of a partner, managing one's impression, or trying to get along with a partner in an interaction can be assessed from thin slices (Richeson & Ambady, 1999a).

4. Social Relations

Two published measures of interpersonal sensitivity that ask examiners to make judgments regarding social relations are composed of a series of thin slices. The Profile of Nonverbal Sensitivity (the PONS; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979) is composed of 220 video clips, each lasting no more than 2 seconds. Each thin slice is extracted from a brief "scene" in which a woman portrays herself in a number of different social and interpersonal situations (e.g., admonishing a small child, asking for forgiveness, returning an item purchased at a store, etc.). Although the verbal content has been removed from each of these clips, the overall accuracy level is above chance demonstrating that even within a scant 2 s of behavior there is some information diagnostic of social relations (Rosenthal et al., 1979). The Interpersonal Perception Task (IPT; Costanzo & Archer, 1989) is composed of longer clips ranging from 30 to 60 s and, unlike the PONS, preserves all of the channels of communication intact. The observer of the IPT makes judgments regarding the identification of kinship, level of romantic involvement, status, winners and losers in sporting events, and deception.

In addition to the standardized measures of interpersonal sensitivity, thin slices have also been used successfully to study such interpersonal relations domains as rapport (Bernieri, Gillis, Davis & Grahe, 1996), status hierarchies, power (Ambady, Koo, Lee, & Rosenthal, 1996; Costanzo & Archer, 1989), dominance, acquaintanceship, kinship (Costanzo & Archer, 1989), and level of romantic involvement (Ambady, Conroy, Tobia & Mullins, 2000; Costanzo & Archer, 1989; Gada, Bernieri, Grahe, Zuroff, & Koesner, 1997).

B. THIN-SLICE JUDGMENTS AS PREDICTORS OF OUTCOMES

Thin slices have been shown to have predictive validity in a number of different contexts. In this section, we selectively describe some recent find-

ings regarding the validity of predictions based on thin slices regarding performance in educational, organizational, and health care settings, aspects of interpersonal relationships, and individual differences such as sexual orientation and hormonal levels.

1. Individual Performance

a. *Teaching.* Judgments from thin slices reveal a great deal of information about teaching. Such judgments have been used to assess (a) expectations teachers have of their students' potential for academic success, (b) teachers' susceptibility to these differing expectations, (c) teacher effectiveness, and (d) student learning.

i. Exposing teacher expectancies. Thin-slice judgments have been found to reveal teachers' expectations of students. In one study, teachers identified students for whom they held either high or low academic expectations and then were recorded teaching them brief lessons about the concept of temperature (Babad, Bernieri, & Rosenthal, 1991). Teachers were also recorded while talking *about* the same students to the experimenter. Video segments approximately 10 s in length were judged by 15 observers on items such as warm, dogmatic, hostile, condescending, dominant, clear, and active. Both when teachers were talking about their students and when interacting with them, the teachers' expectations were revealed in the 10-s clips. Teachers were judged to be more dogmatic and less warm overall on the basis of the thin slices when they talked *about* low-expectancy targets. Thin slices of teachers talking *to* their students revealed that the negative expectancy effects found in the previous context were much larger in the body channel of communication and nearly reversed in the face channel (Babad, Bernieri, & Rosenthal, 1989a). Thus, teachers appeared to be self-presenting successfully to their low-expectancy students via their facial expressions but may have been "leaking" their true internal states through their expressive body behavior. The pattern of results dramatically illustrates the potential complexity of how expressive behavior can encode psychological phenomena.

ii. Revealing bias. Thin-slice judgments of teachers also reveal teachers' biases. Bias, in this case, refers to the extent a teacher discriminates in her evaluations of the products made by students from different ethnic/religious backgrounds (Babad, 1979). Thin-slice judgments revealed that biased teachers addressed their classes in a warmer and less dogmatic fashion verbally but in a less warm and more dogmatic fashion nonverbally than did teachers scoring low on bias (Babad et al., 1989b). In effect, high-bias teachers "leaked" negativity nonverbally relative to no-bias teachers. This research highlights the importance of thin-slice judgments. Had the researchers based

their conclusions on a record of what teachers actually said to their students throughout the day, the results likely would have led to the conclusion that the more biased teachers were warmer and less dogmatic than less biased teachers. Although this conclusion might truly reflect the 30 or so hours of verbal behavior exhibited weekly, it would lie in stark contrast to the conclusion derived from a mere 20-s thin slice of nonverbal behavior.

iii. Predicting effectiveness. Thin slices also provide valid information regarding teacher effectiveness. Using 4-min clips of 9 instructors of a course in accounting, Stallings and Spencer (1967) found that 10 judges agreed on their rankings of the instructor on a global measure of effectiveness. Moreover, the rankings were significantly related to the instructors' rankings on course evaluations ($r = .70$). Teacher effectiveness can be gauged from ratings of even thinner slices of behavior (Ambady & Rosenthal, 1993). Three 10-s silent video clips of each of 13 university teachers, teaching diverse courses, were rated by nine naïve raters on 15 variables: accepting, active, anxious, attentive, competent, confident, dominant, empathic, enthusiastic, honest, likeable, optimistic, professional, supportive, and warm. Because the variables were highly intercorrelated, one new composite variable was created by summing all the variables except anxious. Teacher effectiveness was assessed through student course evaluations collected at the end of the semester. Results were remarkably similar to those obtained by Stallings and Spencer (1967) indicating that teachers with higher student evaluations were judged more favorably on the composite variable, $r(11) = .76, p = .001$. A second study revealed similar results for a sample of schoolteachers, using the school principal's rating as the criterion variable. Additional analyses suggested that the correlations obtained were not due to the physical attractiveness of the teachers, suggesting that "teaching can proceed quite successfully no matter how unfavored the teacher is by nature" (Allport, 1953; p. 857). Thus, judgments based on thin slices seem to draw on behavioral rather than appearance-based information.

iv. Predicting learning. In the previous study the criterion used to gauge teacher effectiveness was student evaluations, but the best possible criterion for effective teaching should be student achievement (adjusted for student ability). We conducted a laboratory experiment to examine whether ratings of thin slices predict student achievement (Ambady, 1999a). Participants were assigned to the role of teacher or student. Each teacher taught four different students a mathematical language (combinations of letters of the alphabet represented different numerical symbols; e.g., 10 = djz; 3 = vfg). Teachers were given time to prepare and plan the lesson. Sessions were videotaped. Student learning was evaluated by a quiz requiring basic addition and subtraction after the session. At the end of each session, students

rated how much they enjoyed the lesson, the effectiveness of the teacher, how much they had learned, and the extent to which they had mastered the task.

Naïve raters rated one 10-s clip of each session extracted from the middle of the session. Thus, four 10-s clips of each teacher (each clip with a different student) were rated on the same variables as the previous study. Results replicated the previous study. Thin-slice ratings significantly predicted student evaluations of the teachers. But, more importantly, thin-slice ratings also predicted student performance on the test.

b. Job Performance. Thin slices have been used to examine job performance. For instance, Hecht and LaFrance (1995) found that thin-slice ratings of enthusiasm, sympathy, confidence, professionalism, and friendliness in telephone operators' voices predicted the length of their calls, a key measure of operator job performance. In another study on organizational performance (Ambady, Hogan, Spencer, & Rosenthal, 1993) three 20-s tone-of-voice clips from a sample of management consultants were rated on variables assessing task and interpersonal performance. Results indicated that judges' ratings of variables assessing interpersonal functioning accurately predicted individuals' evaluations by senior management. More specifically, consultants whose thin-slice vocal clips were rated more positively on variables such as warmth and perceptiveness were more likely to have been rated by superiors as exhibiting outstanding performance. A second study replicated this finding with a sample of sales managers, using a criterion variable combining sales performance and supervisor ratings.

c. Camp Counseling. Blanck and Rosenthal (1984) used thin slices of audiotaped behavior to predict camp counselor effectiveness. They recorded camp counselors talking about the campers under their supervision. The audio tapes were content filtered to remove all verbal content while preserving the tonal and paralinguistic qualities within the stream of speech. Division leaders were asked to evaluate the counselors recorded on various competency dimensions. Thin-slice judgments of content-filtered audio clips on warmth and hostility predicted the counselor's overall effectiveness as evaluated by the camp's four division leaders.

d. Employment Interviews. One important setting when considering the validity of first impressions is that of the employment interview. The interest and importance of this one arena is underscored by the number of consultants who make a career advising people on how to conduct themselves during such interviews. How well do judgments from thin slices correspond to evaluations made by informed interviewers after the interview process?

Preliminary findings suggest they can correspond amazingly well. A recently completed study brought 59 undergraduates in for a mock "initial screening" interview (Prickett, Gada-Jain, & Bernieri, 2000). Potential in-

terviewees who agreed to participate were told over the phone that this interview would simulate the kind of on-campus screening interviews large companies conduct throughout the academic year. Interviews were conducted by trained interviewers in pairs from a team of six interviewers available for this project. Interviews ranged from 8 to 30 min, after which interviewers completed an extensive evaluation form covering such areas as personality traits, interpersonal skills, professional competencies, and overall employability (for a detailed description of the procedures see Gada-Jain, 1999). Thin slices from each interview, that began with the interviewee knocking on the door and ended 10 s after the interviewee took his or her seat, were extracted and shown to a group of untrained observers. Presented with a thin slice showing the initial greeting and settling into chairs (i.e., no formal interview questions had been asked at this point), observers were asked to assess a number of qualities that the interviewers themselves had evaluated. These included employability, competence, intelligence, ambition, trustworthiness, confidence, nervousness, warmth, politeness, likability, and expressiveness. Results indicated that thin-slice judgments of the preinterview greeting correlated significantly with the final evaluation of the interviewers for 9 of the 11 variables listed. Only judgments of trustworthiness and ambition failed to correlate with interviewers' final evaluations (Prickett et al., 2000). In sum, a thin-slice judgment of an initial handshake and introduction predicted the outcome of a structured employment interview.

Besides the behavior of interviewees, aspects of the relationship between interviewers and interviewees also seems to be captured by thin slices. It has been long acknowledged that the rapport an interviewee establishes and maintains with an interviewer positively influences the interviewer's assessment of the interviewee (Cardy & Dobbins, 1986; Imada & Hakel, 1977). Previous work had established both empirical (Bernieri, 1988; Bernieri, Davis, Rosenthal, & Knee, 1994) and theoretical (Tickle-Degnen & Rosenthal, 1987, 1990) links between rapport and an aspect of expressive behavior known as interactional synchrony (Bernieri, Reznick, & Rosenthal, 1988). Interactional synchrony is the degree to which the movements of one individual are similar to, and coordinated with, the movements of another (Bernieri & Rosenthal, 1991). Gada-Jain (1999) examined whether the level of interactional synchrony between an interviewer and interviewee assessed within a 30-s slice of a job interview would predict the interviewer's evaluations of the interviewee. The level of synchrony assessed correlated significantly with interviewers' reports of (a) how similar they thought the interviewee was to them, (b) the rapport they experienced with the interviewee, and (c) the overall success of the interview including their overall recommendation to hire (Gada-Jain, 1999). Thus, even some-

thing as subtle as the coordination of movements accurately predicted the outcome of an interview.

e. Health Care. Thin slices have been used to predict doctor's effectiveness in their referrals of alcoholic patients (Milmoe, Rosenthal, Blane, Chafetz, & Wolf, 1967) and patient satisfaction with their doctors (Hall, Roter, & Rand, 1981).

Recent work has shown that thin-slice judgments predicted the malpractice history of general practitioners and surgeons. Utilizing very brief clips of doctors' voices extracted from physician-patient interactions during medical visits, Ambady, LaPlante, Nguyen, Chaumeton, Rosenthal, and Levinson (1999) examined the relationship between thin-slice judgments of physicians' voices during routine office visits and malpractice claims against the same physicians. Thin slices were rated in two different channels: full audio and tone-of-voice channels. Consistent with prior work, results revealed that a mere 20 s of audio and vocal tone from the behavioral stream reveals a wealth of information. Thin-slice ratings of dominance both in the full audio as well as in tone of voice channels were significantly related to surgeons' past history of malpractice claims. Surgeons who sounded more dominant were more likely to have been sued in the past. Similarly, ratings of lower anxiety (interpreted as concern) both in the full channel as well as in the tone of voice was significantly related to primary care physicians' past history of malpractice claims. Thus, primary care physicians who sounded less anxious or concerned were more likely to have been sued in the past than those who did not.

More evidence regarding the validity of thin-slice judgments in predicting health-related outcomes was gathered in a study examining the relationship between physical therapists' behavior and the health outcomes of geriatric patients. Thin-slice judgments of silent video clips of physical therapists' positive affect and infantilization of patients were associated with both short- and long-term improvement in patients' mobility and ability to perform the activities of daily living—from the time of admission to the time of discharge, as well as from the time of admission to 3 months following discharge (Ambady, Koo, Rosenthal, & Winograd, 1999).

Practitioner effectiveness can also be judged from thin slices (Rosenblum et al., 1994; Tickle-Degnen, 1998). For example, Rosenblum et al. (1994) found that ratings of six 15-s slices of medical students in a pediatric clerkship, videotaped interviewing adult patients, predicted the grades assigned by their clinical supervisors. In addition, 15-s thin-slice judgments of occupational therapy students predicted their clinical performance (Tickle-Degnen, 1998; Tickle-Degnen & Puccinelli, 1999). Moreover, these thin-slice judgments proved sensitive enough to distinguish between specific therapist attributes uniquely suited to specific clinical contexts. Specifically,

students who were judged as less nonverbally responsive and more dominant were more effective in a pediatric rehabilitation setting, whereas less friendly students were more effective in a physical rehabilitation context.

Finally, thin slices can reveal psychological pathologies as well. Condon (1982) has performed detailed microanalyses examining individuals' synchronization of body movements to their speech rhythms and has claimed that asynchrony, which can be observed within extremely thin slices, is associated with schizophrenia, autism, and dyslexia. Similarly, certain personality disorders can be predicted from judgments of thin slices (Oltmanns, Turkheimer, Wagner, & Haury, 1999).

2. Relationships

a. Type of Relationship. In addition to effectively judging characteristics of individuals, thin slices have also been found effectively to differentiate characteristics of dyadic relationships. Ambady, Conroy, Tobia, and Mullins (2000) investigated whether the nature of the relationship between two opposite-sex strangers could be discerned from judgments of thin slices of their behavior. In contrast to the previous thin-slice work that examined accuracy in making judgments of individuals, this study addressed the accuracy of judgments about dyads. In this study, 15-s clips of opposite-sex college students interacting were shown to participants who were asked to identify the relationship between the two targets, whether they were strangers, platonic friends, or lovers. Raters were able to identify accurately the type of relationship both from the silent nonverbal channel as well as from the full channel (audio and video). Further analyses revealed that raters used cues from body and seating position in making their judgments. Consistent with previous work, the study further supports the notion that perceptions and impressions of interpersonal relationships are formed accurately almost instantaneously.

b. Quality of Relationships. Promising evidence indicates that the quality of interpersonal relationships is revealed via thin slices. The degree of rapport between two individuals has been linked theoretically and empirically to the nonverbal behaviors they exhibit while interacting (Tickle-Degnen & Rosenthal, 1990). For example, Harrigan and Rosenthal (1986) demonstrated that the apparent rapport between a doctor and patient could be predicted by the nonverbal behaviors observed between them within a 4-min slice.

In a series of studies Bernieri and colleagues have analyzed 30-s slices of five 25-min-long interactions of unacquainted opposite sex partners while planning a trip together and then later while debating a controversial topic (Bernieri & Grahe, 1998; Bernieri et al., 1996; Gillis, Bernieri, & Wooten, 1995). Precise microcodings of such theoretically relevant behaviors as

proximity, interactional synchrony, and partner responsiveness in the form of head-nods and "hmm-hmms" strongly predicted (multiple $R > .70$) the interactants' self-reports of rapport made after the conclusion of each interaction (Bernieri et al., 1996). In addition, naïve observer assessments of rapport based on the same thin slices also correlated significantly with the self-report criterion.

Perhaps the ultimate assessment of relationship quality involves the love two people have for one another. In light of this, Gada and colleagues had naïve observers judge the degree of love that existed between 48 opposite sex couples from three 20-s thin slices taken from the beginning, middle, and end of a 10-min-long conflict-resolution interaction (Gada et al., 1997). Naïve judgments were correlated with the couple's scores on two published love scales (Rubin, 1973; Sternberg, 1986). Results showed that observer judgments of love correlated significantly with female reports of love for their partner but less so with male reports of love. In addition, when the thin slices were coded for the same types of behaviors employed in the research on rapport, it was found that several cues, including proximity, interactional synchrony, and touching in a positive manner, were all significant predictors of both female and male love for their partner.

c. Interpersonal Expectations. Thin slices of behavior have been used frequently to assess interpersonal expectancies and biases in experimental as well as naturalistic situations (Harris & Rosenthal, 1985; Rosenthal, 1966, 1969; Rosenthal & Rubin, 1978). For example, a series of studies conducted by Bugental and her colleagues revealed that parental expectancies, identified from brief voice clips, are related to their children's behavior (Bugental, Caporalet, & Shennum, 1980; Bugental, Henker, & Whalen, 1976; Bugental & Love, 1975; Bugental, Love, Kaswan, & April, 1971). Thus, ratings of the tone of voice of mothers of normal children and children with behavior problems in school differed significantly, with the latter mothers revealing a lack of confidence in their tone of voice in their ability to control their children (Bugental & Love 1975). As discussed previously, research in the classroom has shown that thin-slice judgments can distinguish biased from unbiased teachers and also can identify differential teacher expectancies and affect toward students (Babad, Bernieri, & Rosenthal, 1987, 1989a, 1989b). Research in the courtroom has shown that ratings of thin slices of judges' instructions to jurors in actual criminal trials reveal the judges' expectations for the trial outcome and the criminal history of the defendant (Blanck, Rosenthal, & Cordell, 1985; Blanck, Rosenthal, Hart, & Bernieri, 1990).

3. Individual Differences

a. Personality. Accumulating evidence indicates that certain personality and dispositional variables can be judged rapidly from brief observations

(Borkenau & Liebler, 1992; Kenny 1994; Funder & Sneed, 1993). For example, Gangestad, Simpson, DiGeronimo, and Biek (1992) found that judges' ratings from 1-min video clips agreed with targets' ratings of socio-sexuality and social potency.

Other personality traits are also revealed by thin slices. In a recent study, 148 participants were videotaped entering a room, walking over to a seated female experimenter who greeted them, and then taking their seat and beginning a brief interview (Dabbs & Bernieri, 1999). Only the first 30 s was extracted. Thus, the thin slice contained little more than the entry, meeting, greeting, and seating. Participants had all been previously assessed on the big five personality traits (Costa & McCrae, 1995). Naïve observers viewed and judged each of the 148 participants on each of the big five traits. Whereas observer judgments of neuroticism did not correlate with target neuroticism as assessed by the NEO-PI (Costa & McCrae, 1995), judgments of extraversion, agreeableness, openness, and conscientiousness did correlate significantly with targets' psychometrically assessed traits (Dabbs & Bernieri, 1999).

b. Gender. Thin slices also reveal gender-related features. A fascinating line of research has focused on the information that is revealed in the expressive manner in which an individual moves through space. This work began when Johansson (1973) created his dynamic motion displays where he affixed lights to various points on a human body and recorded a high-contrast image such that all an observer could see was a field of point lights. He found that still-frame pictures of these point lights could not be reliably identified as being of a human. As soon as movement was introduced, however, the human form became immediately apparent. Subsequent research using similar or related methodological procedures that screen out all visual information except for dynamic movement has found that the sex of the target is somehow manifest in this movement as well (Bernieri, Sharpe, & Knee, 1992; Cutting & Koslowski, 1977).

These findings led other researchers to look for the related personality attributes of masculinity and femininity within thin slices. Several studies have confirmed that the masculinity and femininity of targets can be predicted from naïve observer judgments of thin slices (Bernieri et al., 1992; Cutting & Koslowski, 1977; Frable, 1987; Lippa, 1978).

c. Sexual Orientation. The previous section reveals that gender-related variables are accurately diagnosed from thin slices. We now turn our attention to a more complex and controversial variable—sexual orientation. Ambady, Hallahan, and Conner (1999) conducted a series of studies to examine the accuracy of judgments of sexual orientation from brief dynamic (10- and 1-s silent video clips) as well as static cues (still pictures of the participant). Heterosexual and homosexual participants were videotaped for 1 min discussing how they handled the competing demands of academic

and extracurricular activities. To ensure that the targets behaved as naturally as possible and were making no explicit attempt either to hide or to express their sexual orientation, participants were informed about the purpose of the study only after being videotaped.

A 10-s clip was created for each of the 25 participating targets by extracting the 25th through the 35th second of their recorded discussions. 1-s clips were extracted from the middle of the 10-s clip. Eight stills were selected by freezing frames every 700 ms from the middle 2 s of the 10-s clip. None of the discussions on the 10-s clips made reference to targets' sexual orientation. Heterosexual and homosexual undergraduates then rated the extent to which they thought the person on each clip or each set of stills was homosexual in one of three conditions: 10-s silent video, 1-s silent video, and 8 still pictures. Accuracy was significantly greater than chance for judgments based on 10- and 1-s clips. Judgments based on still pictures, however, were less accurate than chance.

In an attempt to examine how minimal the information transmitted for accurate detection could be, we created an outline white figure of each individual against a black background using a special effects generator. Sixteen judges rated 5-s clips of these outline figures. Accuracy of detecting sexual orientation was significantly above that expected by chance. Thus, exclusively gestural information is associated with fairly accurate judgments of sexual orientation.

d. Testosterone Level. In a series of studies, three hundred fifty-eight male and female college students whose testosterone levels had been previously assessed (a) entered a room, stood, and spoke to a video camera; (b) stood and talked with an experimenter; (c) sat and talked with an experimenter; or (d) sat and talked with a peer (Dabbs et al., 1999). In each of these conditions, the first few seconds of the context were extracted for a thin-slice analysis of behavior. Microcodings of behaviors as well as naïve observer assessments of certain interpersonal dimensions (e.g., friendliness, hostility, etc.) were made. The effects of testosterone were visible in these thin slices such that high-testosterone subjects entered the room more quickly, focused more directly on their targets, and looked more confident and independent. Thus, even variations in male hormones are potentially revealed in the careful analysis of a thin slice of behavior less than a minute long.

These data clearly suggest that in a real sense our personality pervades every aspect of our behavior and movement. Even within the simple and highly scripted act of entering a room, meeting an interviewer, and taking a seat, our core dimensions of personality manifest themselves and are revealed in the expressivity and style of our movements.

C. SUMMARY

Thin slices are useful in predicting outcomes in diverse areas of social life. These findings have important practical applications. For example, the finding that slices of doctors' voices postdict malpractice suits has serious implications for the selection and training of medical personnel. Table I presents a meta-analytic summary of the studies reported in this section by domain [excluding those reported in the Ambady & Rosenthal (1992) meta-analysis], and Table II presents a summary of the individual studies.

III. Perception of Thin Slices

A. RELIABILITY AND CONSENSUS

In the previous section, accuracy was operationalized as the correlation between raters' judgments and an outcome of interest. Another measure of accuracy that can be employed under some circumstances involves consensual accuracy or the agreement among judges (Funder, 1995; Kenny, 1994; Kruglanski, 1989). It can be argued that some psychological constructs (e.g., hostility, warmth, pleasantness, politeness, likability, etc.) must be defined from the perspective of social perceivers and their culture. For example, regardless of how friendly individuals try to be, or consider themselves to be, friendliness rests in the eyes of the beholder. If the world proclaims that an individual is behaving in an unfriendly or hostile manner

TABLE I
SUMMARY OF PREDICTIBILITY OF THIN SLICES
BY OUTCOME

Domain of criterion	Mean <i>r</i>
Performance while teaching	.45
Performance in the workplace	.39
Interviewing	.27
Health care outcomes	.18
Relationships	.27
Personality	.20
Sexual orientation	.58
Testosterone level	.20
Unweighted mean <i>r</i>	.25
Weighted mean <i>r</i>	.20

TABLE II
SUMMARY OF PREDICTABILITY OF THIN-SLICE JUDGMENTS BY STUDY

Domain of criterion	Study	Variables rated	Channel(s)	r	N	Z	p	Criterion
Performance while Teaching	Ambady (1999)	Warmth/interpersonal composite	Silent video	.451	25	2.25	.012	Average of student evaluations and learning
Performance in the workplace	Ambady, Hogan, Spencer, & Rosenthal (1999, Study 1)	Ratings of molar variables	Tone of voice	.362	12	1.22	.113	Ratings by superiors
Performance in the workplace	Ambady, Hogan, Spencer, & Rosenthal (1999, Study 2)	Ratings of molar variables	Tone of voice	.233	12	.727	.233	Ratings by superiors and sales performance composite
Performance in the workplace	Hecht and LaFrance (1995)	Positive affect	Tone of voice	.560	18	2.37	.009	911 operator call duration
Interviewing	Gada-Jain (1999)	Synchrony	Silent video	.266	29	1.40	.081	Average of rapport, personality, and hire recommendation
Health Care	Ambady, LaPlante, Nguyen, Chaumeton, Rosenthal & Levinson (1999)	Ratings of molar variables	Audio and tone of voice	.070	57	.72	.235	Malpractice claims against surgeons
Health Care	Ambady, LaPlante, Nguyen, Chaumeton, Rosenthal & Levinson (1999)	Ratings of molar variables	Audio and tone of voice	.063	53	.68	.248	Malpractice claims against physicians
Health Care	Ambady, Koo, Rosenthal, & Winograd (1999)	Ratings of NV and verbal variables	Video	-.005	51	-.04	.483	Various improvement outcomes
Health Care	Liggon, Weston, Ambady, Colloton, Rosenthal, & Reite (1992)	Ratings of molar variables	Tone of voice	.344	26	1.86	.032	NOFTT mothers
Health Care	Tickle-Degnen & Puccinelli (1999a)	Ratings of molar variables	Silent video	.294	44	1.87		Supervisor ratings of therapy student effectiveness
Health Care	Tickle-Degnen & Puccinelli (1999b)	Ratings of molar variables	Silent video	.152	44	.99		Supervisor ratings of therapy student effectiveness
Health Care	Rosenblum, Wetzel, Platt, Daniels, Crawford, & Rosenthal (1994)	Ratings of molar variables	Silent video	.277	36	1.10		Medical students' clinical grades
Health Care	Tickle-Degnen (1998)	Ratings of molar variables	Silent video	.227	34.3	.91		Supervisor ratings of therapy student effectiveness
Relationships	Ambady, Conroy, Tobia, & Mullins (2000)	Type of relationship	Silent video	.458	30	2.41	.011	Nature of cross-sex dyadic relationship
Relationships	Bernieri & Grahe (1998)	Rapport	Full	.162	41	1.05	.147	Rapport
Relationships	Bernieri, Gillis, Davis, & Grahe (1996)	Synchrony behaviors	Full	.281	50	1.98	.024	Rapport
Relationships	Gada, Bernieri, Grahe, Zuroff, & Koesmer (1997)	Degree of love	Full	.139	48	.94	.173	Scores on love scales
Personality	Dabbs & Bernieri (1999)	NEO personality	Silent video	.14	40	.847	.198	Target self reports on NEO
Personality	Dabbs, Strong, Milun, Bernieri, & Campo (1999)	NEO ratings	Full	.185	148	2.22	.013	Target self report on NEO
Personality	Oltmanns, Turkheimer, Wagner, & Haury (1999)	NEO personality	Full	.202	229	5.04	.001	Personality disorders
Personality	Gangestad, Simpson, DiGeromimo, & Biek (1992)	Personality ratings	Silent video	.263	158	3.27	.001	Target self-reports

TABLE II *continued*

Domain of criterion	Study	Variables rated	Channel(s)	r	N	Z	p	Criterion
Sexual orientation	Ambady, Hallahan, & Connor (1999)	Sexual orientation	Silent video, outline figures, stills	.577	25	2.29	.011	Self-reported sexual orientation
Testosterone level	Dabbs, Strong, Milun, Bernieri, & Campo (1999a, Study 1)	NEO ratings	Full	.030	148	.36	.358	Testosterone
Testosterone level	Dabbs, Strong, Milun, Bernieri, & Campo (1999b) Study 1	Micro codings of behaviors entering room	Full	.131	97	1.29	.099	Testosterone
Testosterone level	Dabbs, Strong, Milun, Bernieri, & Campo (1999b) Study 2	Molar nonverbals	Full	.074	76	.64	.260	Testosterone
Testosterone level	Dabbs, Strong, Milun, Bernieri, & Campo (1999b) Study 3	Entry behavior	Full	.290	138	3.41	.0003	Testosterone
Testosterone level	Dabbs, Strong, Milun, Bernieri, & Campo (1999b) Study 4	Independence	Full	.460	18	1.96	.025	High or low testosterone

and reacts accordingly, then, in one real sense that behavior is unfriendly and hostile, regardless of the individual's motivations and internal states. One might say that the individual is correct and the world is in error, but it seems more parsimonious to argue that it is the individual, not the world, who needs to be corrected. In this case, consensus could be equated with accuracy. On the other hand, if many perceivers agree that a person who wears glasses is more intelligent than one who does not, then clearly, the perceivers are in error. In this second case, consensus should not be equated with accuracy. The difference is that the former example is one of perceptual identification (e.g., the world agrees to call the color of the daytime sky "blue") where reality is defined by consensus (Funder, 1995). The latter example is one of consensual hypothesis (e.g., thunder is the sound of the gods bowling up in the heavens) that can be proved false.

Regardless of their relationship with accuracy, the factors that moderate consensus are important to understand. How much do people agree in their judgment of thin slices? What variables do they judge most reliably and under what conditions? A meta-analysis examined the reliability of thin-slice judgments across different channels and different variables (Richeson & Ambady, 1999b). Five important determinants of interjudge agreement have been identified (John & Robins, 1993): (a) the trait being assessed, (b) the observability of the trait-relevant behaviors, (c) the social desirability of the trait, (d) the level of acquaintance between the judge and the target, and (e) individual differences in the judgability of the target person. We focused on the first two factors as they are most relevant to thin-slice research already conducted. Research on personality judgments has found that interjudge agreement is higher for certain variables than for others (Block, 1978; Funder & Dobroth, 1987; Norman & Goldberg, 1966). Specifically, this work has found that variables associated with Extraversion (such as being outgoing or talkative) exhibit higher interjudge agreement than variables associated with Emotional Stability (such as being anxious or irritable). Further, traits associated with more observable behaviors tend to have higher interjudge agreement than traits with less observable behaviors (John & Robins, 1993). For instance, Funder and Dobroth (1987) found that items in a Q-sort that were more observable were associated with higher levels of agreement among judges compared to less observable items.

Research on the accuracy of personality judgments, however, has been based mostly on ratings of people who know the target very well or people who have been exposed to the target for more than brief periods of time. For example, it is typical in studies assessing personality for targets to rate themselves on a number of personality scales and, in addition, for friends, family members, or close associates to rate targets on the same personality

dimensions. Even in studies in which strangers are used as judges, contact with the target typically exceeds 5 min and therefore provides substantially more exposure to a target than is provided in thin-slice studies. Hence, it is not clear whether the type of variable being examined (for instance, extraversion or emotional stability), or whether the observability of the variable, or whether both type and observability are associated with increased reliability of judgments from thin slices. To address these issues, a meta-analysis was conducted to investigate the relationship between the type of variable, the observability of the variable, and the reliability of thin-slice judgments.

The meta-analysis also considered the channel of communication because, as is apparent from our review of the predictive utility of thin slices in the previous section, the channels of behavior examined in studies using thin-slice judgments vary substantially. For instance, in some studies judges rate content-filtered audio clips of speech. In other studies, judges rate silent video clips. It is possible that the reliability of judgments might vary depending on the channels of communication being judged. It is also possible that certain variables may be more reliably assessed from some communication channels than from others. Thus, the meta-analysis also examined differences in the reliability of judgments associated with different channels of communication.

The meta-analysis included 26 studies, primarily from our respective laboratories and the laboratories of our collaborators.¹ We only included studies that (a) assessed variables from brief segments of expressive behavior (less than 5 min long), (b) correlated those judgments with some criterion and were therefore able to evaluate the accuracy of the judgments, and (c) employed naïve observers (see Appendix 1 for a complete listing of the studies included in the meta-analysis). For instance, in some studies, judges rated clips of physicians on variables such as anxiety, dominance, tension, warmth, or enthusiasm. The interjudge reliability (the reliability of a single judge) for each of these variables was extracted. For studies that reported the reliability of several judges, the interjudge reliability was calculated using the Spearman-Brown formula (Rosenthal & Rosnow, 1991). From 26 studies, the interjudge reliability for 45 variables was identified.

The 45 variables extracted from the studies were coded by three graduate student experts on nonverbal communication on two dimensions: (1) how much the variable tapped into affect and (2) how judgable or observable the variable was. These expert ratings were sufficiently reliable ($R = .90$ for affective ratings and $R = .89$ for observability ratings) and, therefore,

¹ Often the reliability of single variables is not reported in published work; it was necessary to draw from studies for which we could obtain such "unpublished data."

the mean of the experts' ratings was used as an index of the "affectivity" and the "observability" of each variable. Based on previous research we hypothesized that the observability of the variable should influence the reliability with which it is judged. We also hypothesized that variables that tap affect should be judged more reliably. As expected, there was a positive correlation between ratings of affectivity and ratings of observability ($r = .60$). Although quite related, these dimensions do seem to be somewhat nonoverlapping. In order to examine the relationship between variable affectivity, observability, and reliability, the mean of the judges' ratings for each variable was computed and then correlated with the mean reliability of each variable, averaged across channels. Results suggested that affectivity of the variables only modestly correlated with reliability ($r = .23$), but observability correlated quite substantially with reliability ($r = .42$).

In order to examine affectivity and observability in tandem, the expert ratings were dichotomized via a median split to construct four diagnostic categories by which to classify the 45 variables: (1) observable and affective, (2) observable but not affective, (3) not observable but affective, and (4) neither observable nor affective. The number of variables falling into each category and their mean reliability were computed and are shown in Table III. The values presented in Table III can be interpreted as the expected correlation between judgments made by any two thin-slice observers sampled at random. As expected, variables assessed by our expert raters as observable did indeed have higher reliability than variables not rated as observable.

Variables rated as observable but not affective (e.g., active, competent) were associated with the highest interjudge reliabilities (mean $r = .27$). However, variables that were neither observable nor affective (e.g., analytical, self-perceptive) had the lowest mean reliability ($r = .18$). These findings suggest that observability is a key determinant of the reliability of thin-

TABLE III
RELIABILITY OF THIN-SLICE JUDGMENTS: AFFECTIVITY AND OBSERVABILITY
OF VARIABLES

Variable type	Observable	Nonobservable	Mean
Affective	$n = 15$.247	$n = 9$.218	$n = 24$.232
Nonaffective	$n = 7$.274	$n = 14$.175	$n = 21$.224
Mean	$n = 22$.261	$n = 23$.197	.233

slice judgments. But even variables that are not observable can be judged reliably as long as they tap into affect (e.g., loving). Interestingly, observable and affective variables (e.g., nervous) seem to be less reliably evaluated than observable but nonaffective variables (e.g., active). This finding seems somewhat counterintuitive, but corroborates research on personality judgment indicating that variables associated with extraversion have greater interjudge agreement than variables associated with neuroticism (Block, 1978; John & Robins, 1993). Perhaps both the personality literature and the present work assess a counterintuitive, yet important, determinant of judgment consistency. Variables that are readily identifiable by their associated behaviors tend to be observable but not affective. For instance, the rate of movement in a silent video clip or the frequency of utterance in a content-filtered speech segment provide enough information to judge a target's level of activity. Although the target may be accurately judged to be active, the explanation for this behavior may differ considerably between judges. For example, is the target angry? Or, is the target enthusiastic? Anger and enthusiasm are relatively more complex, affective variables that draw on some of the same underlying, nonaffective behavioral traits (activity). Hence, the stage of mapping an emotion or affective state onto readily observable behavior might be accompanied by a reduction in reliability.

Does the reliability of thin-slice judgments differ according to the channel of communication on the basis of which judgments are made? Of the 45 variables, 22 had reliability estimates for more than one channel of nonverbal communication. The mean reliability of each variable for each channel is shown in Table IV. As can be seen in the bottom row of Table IV, reliability was greater on average for judgments of full-channel clips that included both video and sound than on silent video clips. Silent video clips were judged more reliably on average than audio clips, which, in turn, were judged more reliably than content-filtered speech. Previous research has already documented the dominance of the video channel in nonverbal research (Noller, 1985). The present results furthermore suggest that, on average, variables used in studies employing thin-slice judgment methodologies are more consistently judged in the video compared to the vocal channels. Inspection of the mean reliabilities by the channel of communication, however, suggests that for certain variables, the opposite is true. For instance, judgments of activity, anxiety, and dominance were more reliable when based on content-filtered speech rather than silent video clips. Thus, it appears that the reliability with which different variables are judged differs according to the channel from which those judgments are made. These findings, while provocative, are based on a small number of studies and suggest the need for systematic studies to further probe these trends.

TABLE IV
RELIABILITY OF DIFFERENT CHANNELS: ONE JUDGE

Variable	CF	Audio	Silent video	Full
Active	.447	—	.392	.366
Anxious	.149	.060	.094	—
Attentive	.183	.030	.249	.460
Cheerful	.337	.478	—	—
Competent	.126	.164	.208	—
Confident	.241	.262	.293	—
Depressed	.273	.320	—	—
Dogmatic	.178	.093	—	.378
Dominant	.230	.210	.170	—
Emotional	.210	.169	—	—
Empathic	.170	—	.287	—
Enthusiastic	.276	.320	.435	—
Happy	.303	.396	—	.324
Honest	.139	—	.177	—
Hostile	.111	.202	—	—
Likable	.171	.188	.345	—
Loving	.164	.158	—	—
Optimistic	.205	.333	.428	—
Professional	.217	—	.216	—
Relaxed	.153	.111	—	—
Supportive	.150	.133	.337	—
Unstable	.149	.142	—	—
Warm	.176	.234	.372	.460
Mean	.208	.214	.289	.399

B. MODERATORS OF ACCURACY

Consensus among judges cannot be universally substituted for judgment accuracy. Thus, in this section, we discuss variables that moderate judgmental accuracy. These include person moderators such as the characteristics of judges and targets, cultural moderators, and contextual moderators.

1. Person Moderators

a. The Target: Who Is Being Judged? What are the attributes of people who are more accurately judged, that is, people who are more "legible"? Not much work has directly examined the attributes of people who are more accurately judged based on thin slices. In general, people who are more extraverted and more expressive are better encoders and are better judged in minimal interaction, zero-acquaintance settings (Ambady,

Hallahan, & Rosenthal, 1995; DePaulo, 1992; Kenny, 1994). In judgments of love and rapport, observers have been more accurate in assessing the self-reports of females than males (Bernieri & Grahe, 1998; Bernieri, Gillis, & Curtis, 1999; Gada et al., 1997). In addition, the personality judgment literature suggests that people who are better adjusted are more accurately judged (Colvin, 1993).

Most of the research has focused on the variables or traits that are most accurately judged. Of course, it follows that people who possess these traits to a greater degree should also be more legible than other people. As with reliability and consensus discussed in the previous section, studies on the accuracy of personality judgments, using self-reports as a criterion and peer and stranger ratings as predictors, have generally found that observable traits and behaviors are more accurately judged than less observable ones (Albright et al., 1988; Funder & Colvin, 1988; Kenrick & Funder, 1988; Kenrick & Stringfield, 1980; Koretzky, Kohn, & Jeger, 1978; McCrae, 1982; Watson, 1989). Thus, traits such as extraversion can be judged reliably and accurately from minimal acquaintance and from very little information in contrast to traits such as openness (Borkenau & Liebler, 1992; Funder, 1995; Funder & Colvin, 1988; Kenny et al., 1994). The Richeson & Ambady (1999b) meta-analysis revealed that observable characteristics are more reliably judged from thin slices than less observable characteristics. Based on these findings, thin slices may be most appropriate in predicting variables characterized by observability.

b. The Judge: Who Is the Judge? What characteristics distinguish better judges from worse judges on thin slice judgment tasks? In a meta-analysis on the accuracy of person perception, Davis and Kraus (1997) found that people who are more accurate judges of others tend to be more intelligent, more cognitively complex, less dogmatic, better adjusted, and more interpersonally oriented. Whereas these findings were based on studies using the PONS as well as on studies using self-reports and peer ratings, accurate judges of thin slices seem to possess similar attributes.

Characteristics of individuals who score higher on the PONS have been examined in some depth (Rosenthal et al., 1979). People who score higher tend to be less dogmatic and Machiavellian and more democratic, extraverted, and socially adjusted than people who scored lower. In addition, people who perform better on the PONS tend to be rated as more interpersonally sensitive and more popular than people who perform worse on the measure by others who know them well such as their clients, teachers, supervisors, and spouses (Funder & Harris, 1986; Rosenthal et al., 1979). Further, several studies have found that both adults and children who have more successful interpersonal relationships are better decoders of nonverbal behavior (Baum & Nowicki, 1998; Boyatzis & Satyaprasad, 1994;

Funder & Harris, 1986; Gottman & Porterfield, 1981; Noller, 1980; Noller & Feeney, 1994; Nowicki & Carton, 1997). Depressed adults tend to be poor decoders of nonverbal behavior (Carton, Kessler, & Pape, 1999). In a similar vein, shyness and social anxiety have been associated with poorer performance on the Interpersonal Perception Task (Schroeder, 1995a, 1995b). These results suggest that people who are rated by others as more interpersonally skilled and as better socially and interpersonally adjusted should be better judges of thin slices.

Are better judges of thin slices also more intelligent? The relationship between intelligence and the accuracy of thin slice judgments is less consistent. While cognitive ability has been positively related to empathic accuracy (Davis & Kraus, 1997), other work suggests that intelligence is not related to performance on the Profile of Nonverbal Sensitivity (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979) or the judgment of interactant rapport from thin slices (Bernieri & Gillis, 1995a).

Recent work suggests that individual differences in accuracy may vary extensively across judgment tasks and judgment contexts. For instance, a recent study, using the PONS (Rosenthal et al., 1979) and the IPT (Costanzo & Archer, 1989) in addition to two "in-house" thin slice judgment tasks involving rapport assessment (Gesn, Bernieri, Gada-Jain, & Grahe, 1999), revealed low intercorrelations between the four tasks (median $r = -.01$). Another study found that occupational therapy students in a pediatric rehabilitation setting who were judged to be better performers by clinical fieldwork supervisors scored higher on the PONS than their peers, whereas those judged to be better performers in a psychiatric rehabilitation setting scored higher on the accuracy of facial but not body cues on the PONS than their peers (Tickle-Degnen, 1998). Thus, people in different roles and contexts perform differently on different subscales (e.g. full body vs face only), suggesting that different elements of sensitivity may be context dependent. In general, individual difference moderators of accuracy should be discussed with respect to specific thin-slice judgment tasks.

2. Cultural Moderators: Where Are the Judges and Targets From?

Cross-cultural studies on the accuracy of judgments of others have, for the most part, examined the accuracy of judging emotions from still photographs which represent a static channel of communication (Ekman, 1994; Russell, 1994, 1995). Studies that have investigated judgments based on dynamic behavior suggest that culture can be an important moderator of accuracy of thin-slice judgments. For example, the PONS test was administered to over 2000 individuals from 20 nations. Americans were the most accurate judges, suggesting that people are most accurate at judging targets

from their own culture. Further, people from cultures more similar to the United States were more accurate than people from less similar cultures. Thus, cultures whose languages most closely resembled English performed better than cultures whose language was not quite so similar (Rosenthal et al., 1979). A recent study of rapport judgments, however, found cross-cultural consistency in judgments and also found that competency in English did not affect the accuracy of judgments (Bernieri & Gillis, 1995a; Bernieri et al., 1999b).

3. Context Moderators: Under What Conditions Is the Assessment Being Made?

Contextual factors play an important role in the accuracy of thin-slice judgments. Consider the trait of extraversion. Although extraversion can be judged fairly accurately from limited exposure to a target, the accuracy of judgment of extraversion increases when targets are observed in group rather than dyadic interactions (Kenny et al., 1994).

We would argue that thin-slice judgments are most accurate when the context is appropriate, ecologically valid, and diagnostic. For example, Dabbs et al. (1999) found that, of the Big Five traits, openness was the most accurately assessed from a 2-min slice taken from a diagnostic context: when targets were asked to talk about themselves in front of a camera. Earlier, we reported that openness was not easily judged from observing individuals in a face-to-face interaction. When people are talking about themselves in front of a camera, however, the situation pulls more for self-disclosure and openness. So within this diagnostic context, openness becomes more easily judged and thin-slice judgments of this trait are more accurate.

The diagnosticity of both the situation as well as the behavior in relation to the criterion is extremely important (Nisbett & Ross, 1980). Our intuition suggests that thin-slice judgments are constrained. Thin slices probably provide "circumscribed" rather than "global" accuracy (Swann, 1984) and thus are accurate only in relation to a particular context. When individuals are judged in similar situations, thin slices should provide reliable and valid information. At this point, we do not know how well such judgments generalize to other contexts. Thus, for example, will a person judged "warm" in a teaching situation also be judged "warm" when interviewing for a new job? Perhaps the likelihood of being judged "warm" in both situations depends on the extent to which warmth is a dispositional quality.

Subtle differences in the context have been shown to have profound differences in accuracy. In one study (Gesn et al., 1999), judges rated the

rapport within thin slices of 37 dyads involved in debates. Then, a week later they rated the rapport within the very same 37 dyads having a cooperative discussion that involved them planning a fantasy trip around the world together. Accuracy of judging rapport within one context correlated negatively with judgmental accuracy in the other context. One possible explanation for this result is that judges may have had stable differences in how they judged rapport. For some judges, their implicit judgment policy worked better within the debate context, whereas for others, their judgment policy worked better within the cooperative contexts.

In much of our social life, it seems reasonable to conjecture that actions and behavior do convey information about dispositions, skills, motivation, affect, and personality. Indeed, as some have suggested, the fundamental attribution error and the tendency to make correspondent inferences may often produce accurate attributions and judgments in certain contexts (Funder, 1987, 1995; Jussim, 1993). Of course, thin-slice judgments are prone to errors arising from impression management tactics and blatant deception, but these very same tactics might also be extremely diagnostic in certain circumstances. Consider the case of the car salesman overly concerned with impression management. Although thin-slice judgments might not accurately predict how good a friend he is going to be, such judgments should be able to predict his sales ability because impression management is an important attribute in being able to sell cars. Thus, appropriate contexts seem to be extremely important for the validity of the judgments from thin slices.

If predictions are being made across domains and contexts, then behavior should be sampled and judged in all the relevant contexts. Traits and behaviors to be judged should be carefully selected because certain traits are only revealed in and are relevant only to certain situations (Allport, 1966; Bem & Funder, 1978; Epstein, 1979; Funder & Dobroth, 1987; Kenrick & Funder, 1988; Kenrick, McCreath, Govern, King, & Bordin, 1990). For example, the low validity of unstructured interviews in predicting job performance, college success, and professional success (Hunter & Hunter, 1984) could, perhaps, be attributed to the inadequate sampling of truly relevant behaviors (Ross & Nisbett, 1991). Therefore, both the relevance and ecological validity of the behavior as well as the outcome measures are important for accurate prediction. To the degree that situations overlap and individuals are consistent in their style of behavior across different situations, these predictions probably can be generalized across situations (Allport, 1937; Epstein, 1979; Kenrick & Stringfield, 1980). Clearly, the cross-situational generalizability of thin-slice judgments needs to be further examined.

C. SUMMARY

Expressive people are more reliably and accurately judged from thin slices. More accurate judges of thin slices tend to be better socially adjusted than less accurate judges. But the skills and abilities associated with accurate judgments tend to vary depending on the judgment task. Cultural factors can affect both accuracy and accessibility of constructs associated with thin-slice judgments. Finally, thin-slice judgments are context dependent and possess circumscribed accuracy. At this point, we do not know whether these judgments can be generalized across different situations with different criteria. Having reviewed the role of important moderators on the accuracy of thin-slice judgments, in the next section we discuss the cognitive and affective mechanisms that influence the processing of information from thin slices of the behavioral stream.

IV. Processes and Mechanisms Underlying Thin-Slice Judgments

A. AUTOMATIC VERSUS CONTROLLED COGNITIVE PROCESSES

Several dual-process models of social cognition suggest that person perception consists of two stages. The first is a relatively automatic, evaluative stage, involving minimal cognitive processing, whereas the second is a more controlled, deliberative stage involving more elaborate cognitive processing and effort (Anderson et al., 1996; Chaiken, Liberman, & Eagly, 1989; Eagly & Chaiken, 1993; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Fiske & Neuberg, 1990; Gilbert & Krull, 1988; Gilbert, Pelham, & Krull, 1988; Trope, 1986). The initial evaluative stage is likely to be more prominent in thin-slice judgments because of a combination of the brevity of the stimuli being perceived and the nature of the information being conveyed.

Recent work in the area of social cognition suggests that initial perceptual appraisals, particularly those involving an evaluative component, are automatic processes requiring few cognitive resources (Anderson, Krull, & Weiner, 1996; Devine, 1989; Fiske & Neuberg, 1990; Neuberg, 1988; Srull & Wyer, 1979; Tesser & Martin, 1996). Such automatic processes include classifying behaviors rapidly in terms of traits and accessible constructs (Carlston & Skowronski, 1994; Higgins & Bargh, 1987; Smith & Lerner, 1986; Uleman, Newman, & Moskowitz, 1996), stereotyping (Greenwald & Banaji, 1995), and making dispositional inferences (Gilbert & Krull, 1988; Gilbert, Pelham, & Krull, 1988). In particular, processes that involve affective

perception and evaluation occur rapidly (Bargh, 1996; Murphy & Zajonc, 1993; Pratto, 1994). As Zajonc (1980) argued in his classic paper, "preferences need no inferences," affective evaluations occur rapidly without conscious processing. Similarly, social categorization according to visible and marked categories, such as gender, race, and age, occurs automatically, within milliseconds of encountering a target (Banaji & Hardin, 1996; Blair & Banaji, 1996; Devine, 1989; Fazio, Jackson, Dunton, & Williams, 1995; Fiske, 1998; Wittenbrink, Judd, & Park, 1997; Zarate & Smith, 1990).

Social psychological processes that are considered to be automatic generally possess one important characteristic: they are efficient, meaning that they require minimal resources and can be processed in parallel with other tasks (Bargh, 1994, 1996; Devine, 1989; Neuberg, 1988; Srull & Wyer, 1979). Thus, such processes are not vulnerable to informational load, time pressure, and distracters (Bargh & Pietromonaco, 1982; Shiffrin & Schneider, 1977; Treisman & Souther, 1985). Controlled cognitive processes, on the other hand, are mental acts that (a) are intentional and conscious, (b) can be controlled, and (c) require effort (Bargh & Chartrand, 1999). Thus, there are several ways in which one can investigate the automaticity of thin-slice judgments.

1. Awareness

Are individuals aware of the process by which they assess the ongoing behavioral stream? Can people report the factors that contributed to their final judgment? Anyone who has ever debriefed a participant in an interpersonal perception study can tell you that people have little trouble reporting the factors that led to their judgment. The problematic issue, however, lies in the validity of these reports. The research bearing directly on this matter is sparse but does indicate that our awareness of our own thin-slice judgment process is minimal.

In a study of rapport judgment (Bernieri et al., 1994) participants were asked to report how important each of several behavioral cues were in making their judgments. Perceivers were not able to report accurately how features of the behavioral stream contributed to their judgments. Their reports of their judgment process (indications of how much they relied on a given cue) did not agree with their actual judgment process (how much their judgments covaried with the expression of the cues). In another study, Grahe and Bernieri (1998) reported that judges' awareness of the cues driving their judgment decreased as the cues became more concrete and specific. For example, judges were more accurate in stating that their judgments of rapport depended on a target's level of friendliness than in stating that their judgments were determined by the amount of smiling.

Thin-slice judgments may not be exclusively unconscious. People can be aware of their use of nonverbal cues (Smith, Archer, & Costanzo, 1991). The relationship between their confidence and their accuracy of judgments, however, is generally quite low (DePaulo, Charlton, Cooper, Lindsay, & Muhlenbruck, 1997). And, furthermore, although people may be aware of using behavioral cues in their intuitive judgments, they are often unable to articulate or control their processing (Smith, et al., 1991).

2. Control

Can individuals deliberately control and alter their judgment process according to specific instructions? Some studies have failed to demonstrate that accuracy from thin slice displays could be improved through judgment process instruction (Costanzo, 1992; Hoffman, 1964; Rosenthal et al., 1979). More recently, Gillis, Bernieri, and Wooten (1995) attempted to instruct judges precisely how to assess rapport accurately within the thin slices they observed. Half of the participants made judgments from thin slices. The others were given quantified, graphically displayed values for each of five features within each clip previously identified as either valid but underutilized cues, such as mutual silence and proximity, or as invalid but overutilized cues, such as smiling and expressivity, in judging rapport (Bernieri et al., 1996). Participants were asked to judge the self-reported rapport on the basis of this abstracted, quantified, and graphically displayed information. Table V displays the results. Those participants who considered the quantified and graphed information, but not those who just viewed the video clips, were able to alter their judgment policies according to instructions. Thus, it seems that people can be taught to use valid cues and ignore invalid ones when making thin-slice judgments.

3. Distraction and Deliberation

Are thin-slice judgments subject to capacity limitations? An automatic process is immune to conditions that normally tax cognitive and attentional processing. For example, placing participants under an attentional or cognitive overload is thought to prevent conscious and controlled processing by limiting cognitive capacity (Gilbert 1991, 1993; Wegner, 1992, 1994). Using a cognitive load manipulation, Ambady (1999b) found that load did not disrupt the accuracy of judging teacher effectiveness or the accuracy of judging the relationship between opposite-sex dyads.

An informative pattern of relevant findings was reported by Patterson and Stockbridge (1998), who asked half of their perceivers to make intuitive

TABLE V
CORRECT CHANGES IN JUDGMENT POLICY OF RAPPORT AFTER INSTRUCTION AS A FUNCTION OF INFORMATION PRESENTATION: THIN-SLICE VIDEO DISPLAYS VERSUS ABSTRACT GRAPHICAL / VERBAL PROTOCOLS

	Actual relationship of cue to criterion	Correct change in cue dependency after instruction	
		Graphical display	Thin-slice video display
Invalid cues			
Expressivity	.17	+.39*	+.12
Smiling	-.03	+.50*	+.07
Valid cues			
Silence	-.36*	+.08	.00
Female gestures	.44*	+.52*	+.13
Proximity	.28*	+.09	-.11
Mean cue use correction		+.32	+.04

* $p < .05$

initial impressions and the other half to pay attention to specific details and cues within the thin slices observed. Here, cognitive load increased accuracy for those asked to make the intuitive judgments but decreased accuracy for those making judgments analytically (i.e., attending to and processing specific cues).

Interestingly, increased attention and capacity devoted to an automatic process is thought to reduce the effectiveness of the process. That is to say, the application of cognitive resources to otherwise-effective automatic judgments can reduce accuracy (Dunning & Stern, 1994; Gilbert & Krull, 1988; Greenwald & Banaji, 1995; Schooler & Engstler-Schooler, 1990; Vallacher & Wegner, 1987; Wilson, Hodges, & LaFleur, 1995; Wilson & Schooler, 1991). For example, the verbalization of the mental content of tasks that call for nonverbal processing, such as facial processing, has been found to disrupt processing and performance (Schooler & Engstler-Schooler, 1990). Using this line of reasoning, participants were asked to judge teachers under a reasons-analysis condition, in which they were asked to generate reasons to support their judgments (Ambady, 1999b). These participants performed significantly worse than controls or participants under cognitive load. Similar results were found for participants asked to judge the relationship between members of a dyad who were friends, strangers, or lovers.

Perhaps under deliberative conditions, people attend to the wrong or irrelevant information. Murphy and Balzer (1986) found evidence suggesting that this might be the case. College students made judgments of teachers on a number of dimensions such as organization and clarity from videotapes either immediately after viewing them or on the next day. When their judgments were compared with those of "expert" rater graduate students, participants who made judgments after the delay were more accurate than those who made judgments immediately after viewing the clips. Judgments made on the next day were less hampered by irrelevant or misleading detail and were likely driven by larger global gestalt impressions. Indeed, further analysis indicated that with the delay, ratings converged with the criterion on relatively important dimensions but not on unimportant dimensions. The results are reminiscent in some respects to the findings by Meehl (1954), who suggested that people have a tendency to "over fit the model" in their clinical assessments of others in their zeal for accuracy. We can easily imagine, too, that thin-slice observers who are eager to hit the nail on the head might chronically fall in to the trap of overestimating the importance of an idiosyncratic and vivid cue (e.g., a cough, a scratch, a certain gesture or utterance, etc.).

Thus, tasks that tax cognitive resources, such as rehearsing a series of numbers, do not seem to impede the accuracy of thin-slice judgments. In contrast, thin-slice judgments suffer when information is processed more deliberately, such as under conditions when people have to come up with reasons and justifications for their judgments.

4. Effort

Are thin-slice judgments made effortlessly? Automatic processes, being more or less effortless, should not succumb to the effects of fatigue. At least one study has examined whether accuracy declined with fatigue (Bernieri & Gillis, 1994). This was done after several participants in previous experiments spontaneously complained that the judgment tasks ran too long. A separate thin-slice judgment accuracy coefficient was calculated for every 10 slices judged, which represented one-fifth of the total judgment task. It was predicted that, at some point, subsequent accuracy coefficients would begin to decline as fatigue and boredom set in. Contrary to expectations, however, no interpretable pattern of accuracy over time was observed. In addition to accuracy, interjudge agreement shows little evidence of varying due to practice or fatigue (see also Bernieri, 1988).

A follow-up study created a 37-item version of the original 50-item stimulus tape. The properties of the shortened stimulus tape in terms of criterion variance and the ecological validities of the micro and macro cues

were equated with the original tape. The 20% reduction in length was intended to reduce fatigue and was expected to increase accuracy of judgments. No such increases were observed despite the fact that participants reported fewer complaints about the length and/or boredom of the task during debriefing (Bernieri et al., 1999a; study 1).

Additional evidence suggests that the accuracy of thin-slice judgments is not susceptible to monetary incentives. Monetary incentives used to increase accuracy by increasing motivation have shown little impact on accuracy. In one study, participants were informed that of the 100 or so participants who would judge rapport, the 10 most accurate judges would receive \$5 and a chance to win \$100 that would be given randomly to one of these 10 (Bernieri & Gillis, 1994). Although this offer generated a good deal of enthusiasm and effort on the part of participants, no increase in accuracy was observed for this sample. The same general procedure failed to increase scores on the PONS (Bernieri, 1988) and the IPT (Gada, Bernieri, & Grahe, 1996). Similar results were found by Ambady (2000) in a study examining the effects of a monetary incentive on the accuracy of judging teaching effectiveness and the relationship between opposite-sex dyads from thin slices. In sum, there is little evidence that effort affects thin-slice judgment data despite the fact that observers, or, more accurately, experimenters observing the observers, may suspect their presence.

5. Summary

In the studies reported above, thin-slice judgments were not normally affected by motivation, effort, or cognitive load. The process by which judgments are generated may not be directly accessible to judges. Furthermore, this process may be difficult to alter and control. Overall, the research points to thin-slice judgments as being typically, though not necessarily exclusively, an automatic rather than controlled process. An important theme in future research will be to understand more fully how this automatic versus controlled distinction impacts the judgments of thin slices both in terms of normal day-to-day social perceiving and in the initial development of an individual's implicit social perception policies.

B. AFFECTIVE MECHANISMS

1. State-Related Affect

Induced mood has received considerable empirical attention, particularly over the past decade. Performance has been assessed on a wide range of

activities, from physics problems (Isen, Means, Patrick, & Nowicki, 1982), to analytic tasks (Melton, 1995), to resource dilemmas (Knapp & Clark, 1991), to interpersonal problem-solving tasks (Mitchell & Madigan, 1984), and to creative tasks (Isen, Daubman, & Nowicki, 1987).

Some authors propose that moods may induce different processing styles and thus the influence of mood may depend, in part, on the type of task involved (Hirt, Melton, McDonald, & Harackewicz, 1996; Sinclair, 1988; Forgas, 1992). For instance, Hirt et al. (1996) suggest that positive mood may enhance performance on creativity tasks, yet impair performance on tasks requiring more detailed, systematic processing. Further, they argue that negative mood states are conducive to more systematic processing. In a similar vein, Sinclair (1988) argues that negative (or depressed) mood states may lead to processing strategies that result in less error. Work by Forgas (1992) suggests that different moods induce different processing styles; happy moods were associated with less systematic attention to stimulus details and poorer recall, whereas negative moods were associated with better recall and more systematic processing of stimulus information.

Although there is less evidence regarding how mood influences interpersonal perception, there is some indication that induced mood influences the nature of impression formation judgments. For example, induced mood can increase the extremity of positive and negative judgments made by children (Forgas, Burnham, & Trimboli, 1988). The idea of mood congruency in social judgments has also received some empirical support. For example, Forgas and Bower (1987) report that happy subjects formed more favorable impressions and made more positive judgments than did sad subjects. Mood also appears to influence what information is attended to and how it is evaluated (Bower, 1991; Clore & Parrott, 1991; Fiedler, 1991; Forgas, 1992; Forgas & Bower, 1987; Forgas, Bower, & Krantz, 1984; Isen, 1984; Schwarz & Bless, 1991).

How might induced mood influence accuracy in interpersonal perception based on minimal information? At this point, evidence supporting a particular association, although sparse, is intriguing. Work associating positive moods with less systematic processing (Forgas, 1992; Sinclair, 1988) suggests that positive moods should be associated with improved accuracy in interpersonal perception. Ambady (2000) examined the differential effects of mood on thin-slice judgments of teacher effectiveness and dyadic relationships. Positive and negative moods were induced by having subjects watch a 5-min film clip (Gross & Levenson, 1995). Interestingly, the positive mood condition was associated with improved accuracy in judging both teacher effectiveness and the type of dyadic relationships, compared to a control group. Negative mood was associated with decreased accuracy compared to a control group with no mood induction. Thus, it seems that positive

affective states facilitate and negative affective states impede the accurate processing of thin slices.

2. *Trait-Related Affect*

Whereas temporary, experimentally manipulated positive moods increase the accuracy of thin-slice judgments, a mixed pattern of results emerges for stable, chronic affective traits. Shyness and social anxiety were negatively correlated with performance on the Interpersonal Perception Task (Schroeder, 1995a, 1995b). This might lead one to expect that negative mood related traits would lower judgment accuracy. Work on depressive realism suggests, however, that depressed people should be more accurate in their judgments of others (Alloy & Abramson, 1979, 1982). Chronic negative states, such as depression, have been associated with increased accuracy of judgment, particularly for negative stimuli (Bargh & Tota, 1988; Ruehlman, West, & Pasahow, 1985). For judgments of rapport, Bernieri and Gillis (Bernieri & Gillis, 1993; Gillis & Bernieri, 1993) found that moderately or mildly depressed participants were slightly more accurate than normal participants. Furthermore, depressed observers were more likely to track the negative partner in the dyad, suggesting schematicity for negative information. While some studies have found a similar decoding advantage associated with depression (Giannini, Folts, & Fiedler, 1989; Pietromonaco, Rook, & Lewis, 1992), others have reported a decoding disadvantage (Giannini et al., 1995; Aube & Whiffen, 1996; Russell, Stokes, Jones, Czogalik, & Rholeder, 1993; Zuroff & Colussy, 1985), and still others have reported no differences between depressives and normals (Prkachin, et al., 1977).

Perhaps the severity of depression is relevant here. It is possible that severe depression might be associated with poor thin-slice judgments, whereas mild or moderate degrees of depression might be associated with increased accuracy. Another possibility is that the exact effect of depression interacts with the particular construct being assessed.

C. PERCEPTUAL MODELS

Having reviewed potential cognitive and affective mechanisms underlying thin-slice judgments, below we review two different perceptual models that provide insights into the processes underlying thin-slice judgments.

1. *Brunswik's Lens Model: A Framework for Description*

Egon Brunswik (1956, 1966) argued that perceivers are often trying to apprehend a "distal" environmental variable, one that is not directly

observable (i.e., an intrinsic property of some stimulus target). The perceiver has only imperfect indicators of that variable. The identification of an indicator gives the perceiver only probabilistic information regarding the presence or future presence of the variable. But although no indicator or cue is a perfectly reliable predictor of the distal variable, typically there are several cues available for determining its status. The perceiver's task is to combine information from these uncertain sources to reach the best estimate of the criterion.

Heider (1958) proposed Brunswik's scheme as a basic model of interpersonal perception in that it took account of the perceptual arc linking two end points: the object or person to be perceived and the percept itself, the way the object appeared to the perceiver. Klaus Scherer (1977, 1978) observed that the model was especially appropriate for the study of nonverbal behavior because it involved the expression, information transmission, and impression aspects of the communication process. He applied the model to the ecology of vocal tones, examining the extent to which such tones served as cues to emotional states. The application of the lens model in thin-slice research has provided intriguing demonstrations of the wealth of psychological information that has yet to be mined (Gillis & Bernieri, in press).

In particular, the lens model approach to the perception of rapport based on thin slices has led to precise microcodings of such theoretically relevant dimensions such as proximity, interactional synchrony, and posture that strongly predict rapport (Bernieri et al., 1996). While perceiver judgments have shown little sensitivity to changing cue validities (Bernieri et al., 1996) and remain influenced by a small set of stereotypical cues (Gillis et al., 1995), the lens model is sensitive to diagnostic cues that vary slightly across situations in response to changing interaction goals and physical constraints (Bernieri et al., 1996). Thus, Brunswik's lens model, by integrating the perceiver, the target, and the mediating cues, provides a theoretical framework and methodological structure that allows an investigator to examine thin slices with a degree of precision and perspective that reveals the wealth of information contained within a few brief seconds of expressive behavior.

2. Gibson's Event Action Approach: A Framework for Explanation

In contrast to the largely descriptive lens model above, the ecological approach to interpersonal perception is most relevant for understanding accuracy or responsiveness to thin-slice stimuli. Fairly recently, James Gibson's (1979) ideas on ecological perception have been extended to social psychological phenomena (Baron & Boudreau, 1987; Baron & Misovich, 1993; McArthur & Baron, 1983).

The central idea from this perspective involves the notion of *affordances*, which are, in simple terms, the experience opportunities a perceiver has with any given stimulus or target. For example, a glass of water has an affordance of "drinkability," a chair offers an affordance of "can be sat upon," and a nurse in uniform might provide an affordance of nurturance. Whereas affordances are assumed to be genuine properties inherent within objects and organisms, they are, by no means, perceptible to all living things or individuals. An organism must have an *attunement* to a specific affordance in order to perceive it. The attunement to any given affordance is believed to be a function of the importance that affordance has to the organisms' survival and well-being. Thus, small pointed pieces of sea shells on a beach are perceived as hazards to be avoided by the barefoot human walking among them because they are affording the experience of pain, if not lacerations and punctures. To the hermit crab, however, these very same human hazards may be perceived to afford enormous protective potential as prized building materials for its home. Attunements vary within species as well, and are a function of development and prior experience. Adults, therefore, perceive their car keys as a necessary means to start their car, whereas 6-month-old infants may simply see them as offering an opportunity to mouth and gum.

The notion of affordances and attunements has been employed often in the discussion of thin-slice findings as a way to understand why we can perceive the things that we do (Zebrowitz, 1990). It is argued that humans are attuned to various social affordances relevant to survival and ultimately reproductive success (Baron & Boudreau, 1987). Thus, humans are astute at perceiving the human form in thin-slice point-light dynamic displays of motion (Johansson, 1973). We can perceive attributes such as gender (Bernieri et al., 1992; Cutting & Koslowski, 1977; Frable, 1987), sexual orientation (Ambady, Hallahan, & Conner, 1999), acquaintanceship (Cutting & Koslowski, 1977), power (Montepare & Zebrowitz-McArthur, 1988), and the intention to act (Runeson & Frykholm, 1983) because the perceptions of these affordances have survival value.

Certain attunements appear consistent across cultures. In a cross-cultural study on personality judgments, Chinese and American participants showed high levels of consensus in their judgments of the extraversion of Chinese and American targets, suggesting that extraversion is afforded through facial appearance (Albright, Malloy, Dong, Kenny, & Fang, 1997). Members of diverse cultures might be attuned to such information, perhaps because extraversion signifies social orientation, an adaptive function. The perception of rapport also seems to be similar across cultures (Bernieri & Gillis, 1995b; Bernieri et al., 1999b). Other attunements, however, appear to be culture specific. In a study on the judgment of status cues, Koreans were

more accurate than Americans. Koreans might be more attuned to status because of their hierarchically structured culture (Ambady & Hecht, 2000).

These ideas can be extended and used to understand the individual differences observed in thin-slice research. The general principle is that the needs of an organism will help to influence the nature and sensitivity of the various attunements that develop over time, and can even affect the attunements operating within a given situational context. For example, individuals who are powerless to the will of stronger others may exhibit attunements to various precursors of threat and harm, such as anger, irritability, aggressiveness, and other forms of negative affect as well as the precursors to impending altruistic or nurturing behaviors. If individuals cannot impose their will onto others directly and forcefully, then the next best thing is to possess the means to do so indirectly. A powerful and controlling individual would have less need to be attuned to emotional affordances because their perception would be less relevant to their achieving interpersonal goals, which could be gained through sheer force (Baron & Boudreau, 1987; Hall & Halberstadt, 1994).

The ecological approach to person perception, then, provides the theoretical background to generate a vast array of experimentally testable hypotheses concerning the perception and judgment of thin-slice stimuli. In general, individuals who have prior experience interacting with a given attribute in their social environment and who either (a) have a chronic need to be able to assess this attribute or (b) have a transient need to assess this attribute given the present context should be more attuned to variations in the relevant affordance and its associated behavioral manifestations. It follows, then, that their thin-slice judgment accuracy will be greater than those of other individuals who have less experience with, and less of a need to assess, the attribute.

D. SUMMARY

We have discussed the thin-slice judgment process from different perspectives, all of which are well known in the social cognition literature. In fact, it is important to note that the thin-slice judgment process is not a unique process at all. The processes involved should be the same as those already posited to occur generally with respect to the perception and judgment of others, the only difference being the relatively constrained nature of the stimuli to be judged. The next two sections discuss in more depth the theoretical and methodological boundaries of thin-slice judgments.

V. Boundaries and Limitations of Thin-Slice Judgments

Thin slices of the behavioral stream contain information relevant to, and predictive of, a potentially large number of personality and social psychological constructs. But such judgments are bounded. For example, thin-slice judgments are predictive and accurate only to the extent that relevant variables are observable from the thin slice sampled. As an illustration, consider the variables that distinguished superior from average consultants and marketing managers in the study discussed earlier (Ambady, Hogan, Spencer, & Rosenthal, 1993). Thin-slice judgments of observable variables such as warmth and perceptiveness that tap interpersonal functioning predicted performance effectiveness, in contrast to thin-slice judgments of noninterpersonal, task-related variables such as perseverance or being analytical. The information diagnostic to constructs such as perseverance and analytical ability is more likely revealed through completed actions and behavioral events that unfold over a relatively long period of time than information that is revealed within 30 s of expressive behavior. Below we discuss some additional boundaries and limitations of thin-slice judgments.

A. ABSTRACTION LEVEL OF THE CONSTRUCT BEING JUDGED

The constructs accessible from thin slices vary in the extent to which they refer to unambiguously defined objective referents. For example, a clip of two people interacting could be assessed in terms of (a) the average physical distance separating them measured at 10-s intervals; (b) the specific behaviors such as their posture configuration, smiles, and gaze; (c) the general impression of each target's apparent "friendliness" or the overall friendliness impression of the dyad; or (d) a judgment as to the quality and nature of the relationship that exists between them (i.e., friend, stranger, colleague, etc.). In general, judgments of impressionistic, fuzzy, molar variables related to affect and interpersonal functioning have yielded more accurate judgments than have quantitative assessments of microlevel behavior such as smiles and nods. This is because the same specific behavior might signal very different types of affect. As Brunswik (1956) argued long ago, our ecologies contain cues that are correlated imperfectly with the distal environmental variable a perceiver is attempting to apprehend. Heider (1958) referred to this phenomenon as "ambiguous mediation" (see also, Tolman & Brunswik, 1935). Consider the smile. A smile, depending

on the context and accompanying behavior, may signal warmth, anxiety, or, hostility (Ambady & Rosenthal, 1993).

The results of one lens model analysis suggested that perceivers may not be as sensitive to microcoded cues (e.g., head nodding) as they are to the more abstract macrocoded cues (e.g., partner responsiveness) that are inferred from the microcoded cues in judging rapport from thin slices (Grahe & Bernieri, 1998). Thus, although individual cues can contradict each other within a given social context, observers can still glean meta-messages from overall behavior. The more abstract molar judgments, by directly assessing such latent constructs as warmth, anxiety, or hostility, capture the overall gestalt impression conveyed in the slice.

B. NONVERBAL VERSUS VERBAL CONTENT

Does the validity and accuracy of thin-slice judgments vary depending on whether purely nonverbal information or both verbal and nonverbal information are available to judges? Earlier meta-analytic work suggested that the inclusion of verbal information did not increase the accuracy of judgments (Ambady & Rosenthal, 1992). More recently, Grahe and Bernieri (1999) have shown that thin-slice judgments based purely on nonverbal information (silent video clips) are more accurate in predicting rapport between members of dyads than are judgments based on both nonverbal and verbal information. But counterexamples can also be found. For example, one study indicated that key words in dyadic conversation (e.g., emotion words, the use of present tense, self-referents, etc.) communicated more important information about the competency, dominance, and warmth of the target than did nonverbal information (Berry, Pennebaker, Mueller, & Hiller, 1997).

At least two factors contribute to the relevancy of nonverbal versus verbal information in thin-slice research. First, the relevance of the nonverbal and verbal channels is necessarily related to the psychological construct being assessed and the nature of the key diagnostic indicators and communication mediators associated with the construct. For example, dyad rapport may be a construct that is chronically revealed throughout the behavioral stream. Studies have established a robust association between perceived rapport and such features as interpersonal proximity, synchrony, and forward lean (Tickle-Degnen & Rosenthal, 1990), all of which can be reasonably sampled within thin slices. Other constructs, such as openness to experience, may be less likely to be manifested in expressive behavior. As suggested by the meta-analytic results presented earlier in this chapter, some constructs are more observable than other constructs.

Second, a thin slice normally does not contain enough verbal information to adequately assess the content of a target's cognitions and schemas. The utility of content analysis of verbal behavior as a tool to assess mental structures is undeniable. But it is precisely here where thin slices are most limited. For instance, thin slices might not provide a large enough sampling of verbal behavior to adequately estimate inner motivations and desires of a single target, let alone those of a dyad or of a small group. But, again, exceptions exist. Thus, one study found that judgments of written transcripts of thin slices (30–50 words) of patients' speech in psychotherapy sessions on variables such as helplessness, anxiety, and hostility, predicted the onset of psychological and somatic symptoms such as migraine headaches, momentary forgetting, depression, and phobic behavior. Interestingly, ratings of 300- to 400-word transcripts yielded less significant results (Luborsky, 1996).

It is important to note that we are not arguing a position of universal exclusion of verbal variables within thin-slice research. Clearly, verbal content is critical for the expression and communication of a vast array of psychological constructs and relationships (e.g., Archer & Akert, 1977; Berry et al., 1997). Instead, we are arguing that psychological constructs differ across contexts in the channels through which they are revealed, mediated, and communicated to others and, often, the context under investigation might not be conducive to a thin-slice analysis of verbal behavior. So far, research findings suggest that nonverbal behavior may be relatively more important than verbal behavior: (a) in the expression and communication of spontaneous affect (e.g., Argyle, Salter, Nicholson, Williams, & Burgess, 1970), (b) in the assessment of self-presentation and communication motives (e.g., DePaulo, 1992), (c) in the expression and communication of rapport and the related trait of extraversion (e.g., Funder & Colvin, 1988; Levesque & Kenny, 1993), and (d) when perceptions are based on thin slices of behavior (Ambady & Rosenthal, 1992). More work needs to be done, however, before we can begin confidently to map out the behavioral ecology of thin-slice judgments.

C. EXPERTISE OF THE THIN-SLICE JUDGE

Are experience, competency, and familiarity with a domain necessary for valid judgments? Again, the psychological domain will be a likely factor. In examining the accuracy of judgments of sexual orientation, Ambady, Hallahan, and Conner (1999) speculated, based on the popular literature on sexual orientation (e.g., Di Lallo & Krumholtz, 1994), that homosexual judges, in comparison to heterosexual judges, might show greater accuracy

in their judgments of sexual orientation because of greater domain familiarity and accessibility. Indeed, this was found to be true for extremely thin-slice judgments of 1 s and less, but the advantage disappeared at the longer clip length of 10 s (Ambady et al., 1999). In another study examining the accuracy of judging sexual orientation, judgments were made by observers from a different culture. Silent videoclips were rated by a sample of South Asian Indian women who had grown up in a conservative environment with little exposure to homosexual exemplars. Their accuracy of judgment was below chance levels (Ambady, Dudkin, & Hallahan, 1999). The studies suggest that an observer's direct experience with the psychological construct being assessed can moderate judgment validity.

A third study underscores the role of accessibility and familiarity in thin-slice judgments. A great deal of theory and research suggests that people from Western cultures tend to be more individualistic and independent in their orientation and values, whereas individuals from Eastern cultures tend to be more collectivistic and interdependent (Fiske, Kitayama, Markus, & Nisbett, 1998). It was hypothesized that these orientations would be related to greater accuracy of judgments related to culturally determined accessible constructs. In order to test this hypothesis, Korean and American students were presented with a computer task in which they were shown brief clips of Koreans and Americans talking to another target (a superior, subordinate, or a peer). Participants were asked to indicate the status of the person whom they thought the target was addressing. We hypothesized that Koreans should be more accurate as well as respond faster on this task because of the hierarchical orientation of their culture (Ambady, Koo, Lee, & Rosenthal, 1996; Hwang, 1990; Matsumoto, 1989). Both latency as well as accuracy measures supported the hypotheses (Ambady & Hecht, 2000). Thus, thin-slice judgments can be affected by judges' familiarity with the psychological domain being assessed as well as their expertise and competency with the given social context and culture.

D. SUMMARY

A few theoretical and pragmatic issues moderate the accuracy of thin-slice judgments. Such judgments are most predictive of psychological constructs that are likely to be accessible within brief segments of time. Moreover, thin slices are more likely to be useful in assessing constructs emphasizing nonverbal over verbal variables. And, finally, the experience and competency of the judges employed can moderate the validity of the assessments made.

VI. Methodological Issues

Thin-slice methodology is characterized by a number of flexible alternatives that result in a methodology that is both ecologically valid and informative. Variations in target content, information quantity, display format, variables assessed, and conditions under which observer assessments are made can be incorporated systematically into thin-slice research.

A. CONTENT

The first decision a thin-slice researcher makes before carrying out a study concerns the phenomenon or theory under investigation. Thin-slice methodology will be useful only to the extent that relevant and valid information can be extracted from the behavioral stream. Although this chapter implies that the domain to which thin-slice methodology applies is quite large, it is far from being universal. Psychological phenomena that involve or are affected by controlled and prolonged cognitive processing (such as gauging long-term goals or investigating rational decision making) will not likely benefit from thin-slice methodology.

In addition to the theoretical content, one must also be concerned with integrity of the behavioral content. By this we are referring to the spontaneity of the behavioral stream. In other words, to what extent are the targets acting for the camera? We are not referring to general self-consciousness processes (Carver & Scheier, 1981; Duval & Wicklund, 1972) or basic self-presentation strategies (Jones & Pittman, 1982) because these processes are involved in every face-to-face interaction regardless of whether a camera is present. Rather, we mean deliberate attempts by an individual to control specific behaviors (e.g., smiles, gestures, gaze behavior) and general expressivity (e.g., tone of voice, posture movements, speed, etc.). At this point in time we simply do not know how well the ecology of a consciously controlled behavior stream compares to that of a spontaneous behavior. The few studies we report below may foreshadow the complexity of what future research will yield.

For instance, one study examined whether individuals could control the expression of their sexual orientation. Twenty-two homosexual (11 female, 11 male) participants were videotaped (a) behaving naturally, (b) trying to pass as heterosexual, and (c) exaggerating their sexual orientation (the last two conditions were counterbalanced across participants). Male participants were less likely to be judged homosexual when trying to pass as straight, suggesting successful volitional control of their behavior. Female partici-

pants, however, showed less variability in their behavior across the conditions (Ambady, Dudkin, & Hallahan, 1999).

In general, research has found that some people are better at controlling their behavior than are others (DePaulo, 1992). Individual differences seem to play a large role in the ability to control self-presentation and behavior (DePaulo, 1992). Thus, dispositionally expressive people seem to be more successful at hiding deceptive communication than less expressive people (DePaulo, Blanck, Swaim, & Hairfield, 1992). Similarly, people high on traits such as self-monitoring are more able to modify and regulate their behavior according to the demands of the situation than are people low on such traits (Riggio, 1986; Snyder, 1987).

Undoubtedly, however, there are limits to what can be controlled. There may exist a domain of automatic expressive behaviors that resist monitoring and control (e.g., Bargh & Chartrand, 1999; Bernieri & Rosenthal, 1991; Ekman & Friesen, 1969). For example, Gada-Jain (1999) attempted to have interviewees intentionally synchronize (i.e., mimic the posture of, and coordinate their movements with, a target) with an interviewer in a job interview situation. Mimicry and synchrony had been observed earlier to correlate with interactant rapport (Bernieri et al., 1992) and interviewer evaluations of job applicants (Dabbs, 1969). Normally interviewer evaluations are more favorable when applicants spontaneously synchronized to the interviewer (Gada-Jain, 1999). When instructed to do so, however, applicants could not intentionally increase the subtle coordination of movements involved in the synchrony phenomenon. Although they could grossly mimic the interviewer intentionally, this controlled mimicry did not influence the interviewer evaluation and contrasted sharply with the positive effects found for spontaneously occurring mimicry (cf. Bernieri, 1988; Chartrand & Bargh, 1999).

Researchers examining thin slices need to be mindful of how the psychological constructs under investigation might be manifest within the behavioral stream they are sampling. Variations in the spontaneity of the behavior being analyzed, in particular, may have a profound impact on outcomes and should be treated as a potential moderator variable throughout thin-slice research.

B. CHANNEL OF COMMUNICATION

Meta-analytic findings indicate that thin slices from both nonverbal and verbal channels of communication accurately predict criterion variables (Ambady & Rosenthal, 1992). In an effort to reduce the amount and complexity of information contained in just a few seconds of expressive

behavior, researchers sometimes focus their attention on specific features within the entire behavioral stream to the exclusion of all else. In our laboratories, thin slices have been extracted from diverse channels of communication, including silent videotapes, audiotapes, content-filtered audiotapes, and standard videotapes. This flexibility in the type of channel allows researchers to assess the predictive value of various channels of communication. In addition, this flexibility also permits secondary analyses of existing data sets. Such further analyses yield unique insights not revealed by the original analyses (Ambady et al., 1999; Grahe & Bernieri, 1999).

C. SAMPLING OF SLICES

Perhaps one of the most important and seemingly most idiosyncratic decisions that thin-slice researchers make involves behavior sampling. How many slices are needed? And precisely where will they come from? The assumption underlying the entire paradigm is that a thin slice is somewhat representative, or predictive, of the entire behavioral sequence in terms of the critical information to be extracted from it. Some information (e.g., physical features, general vocal tone) is spread chronically and uniformly throughout the behavioral stream and is accessible no matter what the temporal resolution (i.e., thickness of the slice). Other information might appear at such a low base-rate that one might have to analyze an entire interaction sequence in order to assess it with any reliability (e.g., kissing, use of profanity). Generally, the sampling of slices has been governed by the experience and intuition of each experimenter. Despite a lack of a formal prescription for exactly how slices should be sampled, several tendencies can be observed throughout the literature.

When an interaction sequence has a definite beginning and end, as is very nearly always the case for behavior recorded in the laboratory, a therapy session, or a teaching interaction, thin-slice researchers tend to extract three samples covering the beginning, middle, and end of that interaction (e.g., Ambady & Rosenthal, 1993; Babad et al., 1987, 1989b; Blanck, Rosenthal, Vannicelli, & Lee, 1986; Rosenthal, Blanck, & Vannicelli, 1984). One advantage of this strategy might be that it approximates and parsimoniously samples social reality. Almost any interaction scene is more or less culturally scripted (Goffman, 1959), especially its initiation and ending. Therefore, whereas the center piece from an interaction scene might highlight individual differences in spontaneous behavior and affect due to the relative lack of structure, the end pieces might highlight individual differences in knowledge of, experience with, and the skills involved in, negotiating through that particular context. A second advantage

of the three-slice sampling technique is that it allows for the assessment of linear trends throughout an interaction sequence. Statistically, linear trend effects are carved out of main effects (Rosenthal & Rosnow, 1985; 1991) and are involved in any situation in which there might be practice effects, fatigue and satiation effects, or other developmental effects.

For example, Bernieri, Zuroff, and Koestner (1999d) reported that linear decreases in interactional synchrony between loving partners, in contrast to average levels of synchrony between them, predicted decreased involvement and satisfaction with conflict-resolution outcomes. The context of the interaction observed was such that the variance in mean levels of synchrony was influenced by many factors but a linear decrease could only be understood in terms of disengagement and withdrawal during the conflict. When such trends are neither theoretically relevant nor predicted, however, differences between clips sampled at different time periods, especially beginning and end, are not found (e.g., Bernieri et al., 1996).

Another tendency is to employ an arbitrary time-sampling technique using rigid chronologically based criteria (e.g., the slice begins on the 31st second after the subject sits down and continues for 30 s). This common technique eliminates duration variance across targets and maximizes behavior quantity variance (e.g., amount of talking, gesturing, etc.). Another alternative employs thin slices that are meaningful action units. One example might be to define a slice as, "the point from which the target enters the room (i.e., foot crosses threshold) to the point at which the target finishes uttering their first sentence." Notice that this sampling procedure standardizes the behavioral event(s) and lets duration vary from target to target. The important point is that the choice of one technique over the other will necessarily constrain the nature of the information accessible to an observer.

D. LENGTH OF SLICES

The trade-off of clip length for convenience should concern most researchers familiar with the notions of reliability and validity. Intuition and dogma would suggest that more is better. Surprisingly, a meta-analysis investigating the accuracy of thin-slice judgments found that observer judgments made with slices under 30 s in length were as accurate as judgments based on slices nearly 5 min in length (Ambady & Rosenthal, 1992). Thus, longer lengths of the behavioral stream do not lead to more accurate assessments of their content.

Furthermore, the predictive validity of thin-slice studies rivals the level found in several classic studies that employed entire behavioral streams

(i.e., interviews, etc.) and test data. For example, the results of the meta-analysis were compared to the classic work of Holt and Luborsky (1958), who studied over 200 psychiatric residents at the Menninger School of Psychiatry, using several different methods to predict psychiatric competence. The major criterion variables were supervisors' evaluations and peer ratings of competence. Four judges' ratings of about 65 residents, using different methods of evaluation (such as analyses of application materials, interviews, Thematic Apperception Test, and Rorschach protocols), were correlated with peer and supervisor ratings of residents' competence. Judges' ratings were correlated with supervisor and peer ratings of the residents on psychotherapy competence, diagnostic competence, management competence, and overall competence. The effect sizes from these "thick chunks" did not significantly differ from the effect sizes of the meta-analysis on thin slices (Ambady & Rosenthal, 1992). Thus, ratings from thin slices of behavior apparently predict certain criteria as well as do those based on observations over much longer periods of time.

Two studies have tested directly the validity-length hypothesis by systematically decreasing the length of a clip to which observers were exposed (Ambady & Rosenthal, 1993; Bernieri & Grahe, 1998). Ambady and Rosenthal (1993) created a series of 10-, 5-, and 2-s clips for an investigation of teaching effectiveness by randomly selecting portions from the longer clips. There were no significant or appreciable differences in the accuracy of judgments with respect to clip length. Another study on rapport perception examined judgments of thin slices ranging from 5 s to judgments based on the entire interaction (ranging from 15 to 50 min) and arrived at the same conclusion (Bernieri & Grahe, 1998). Targets were observed in two interaction contexts, one cooperative and the other more adversarial (i.e., a debate). The correlation between the rapport assessment made by a typical observer-of-the-whole interaction and the criterion variable (rapport reported by members of the dyad) was significant, $r = .29$. Judgments of thin-slice clips of the adversarial interaction, ranging from 5 to 50 s in length, showed very slight declines in accuracy as a function of slice length. To put this into perspective, however, this drop was not nearly as large in magnitude as suggested by the corresponding drop in exposure; 40 min per target to 50 s per target (a 98% reduction in the behavioral stream sampled). Furthermore, no declines in observer accuracy across slice length were found in judgments of these same targets in a more cooperative, rather than an adversarial, discussion (Bernieri & Grahe, 1998).

Two possibilities can explain the minimal impact of clip length. One is that the information influencing observer judgments of the psychological constructs in question is chronically embedded throughout the entire behavioral stream. Such would be the case if the information was not contained

in actions, behaviors, or events but rather contained in the style or manner in which these behaviors are executed. The other possibility is that observers form an almost immediate impression and then remain anchored to this impression regardless of the amount of information to which they are ultimately exposed. Such a process would be consistent with current stage theories of interpersonal perception (Gilbert & Malone, 1995; Trope, 1986). Although more systematic research is needed to explore each of these hypotheses, at present we are comfortable in concluding that, for many constructs, slice length does not seem to affect the accuracy of thin-slice judgments.

Having stated this, we must remind the reader that the validity and utility of a thin slice ultimately depends on the construct being assessed. A thin slice may provide valid information regarding an individual's affective state, for example, but may provide completely invalid information regarding that same individual's specific motivations or future intentions. At this point the literature is not extensive enough to demarcate precisely which constructs are validly examined with thin slices and which are not.

Finally, it is worth mentioning here that even very brief dynamic information increases judgmental accuracy compared to static photographs. In the study examining sexual orientation (Ambady, Hallahan, & Conner, 1999); sexual orientation was judged from still frames in addition to the 2- and 10-s-long stimuli. Accuracy was significantly lower in the static still-photo condition than in the thin-slice conditions, supporting previous work which indicated that dynamic cues generally yield more accurate perceptual judgments than static cues (Barclay, Cutting, & Kozlowski, 1978; Valenti & Costall, 1997).

E. CONSENSUAL JUDGMENTS VERSUS AVERAGE JUDGMENTS

There are two common methods used to assess judgmental accuracy. Researchers can combine the judgments of all perceivers first to model the group mean judgment (e.g., Gifford, 1994; Gifford & Hine, 1994), or they can model the judgments of each perceiver individually and then summarize the results across the observed sample (Bernieri & Gillis, 1995b). The first approach generalizes to those situations where a single assessment or outcome evaluation is generated from some small group or committee, such as a personnel committee. It would also be an appropriate way to maximize the validity of a thin-slice assessment by increasing the reliability through the use of multiple items (i.e., judges). The second approach generalizes and applies to the "typical" social perceiver.

As a rule, group mean judgments will be more reliable and potentially more predictive than judgments from any single individual (Rosenthal, 1987). Therefore, pooled judgments bring more power to bear on the study of targets. Pooled judgments, however, overestimate the level of predictability or accuracy that can be achieved for a typical individual perceiver. Also, it is not a mathematical necessity for the mean of a group of perceivers to represent or reflect the modal pattern of responses over a series of trials. In other words, when researchers model the group mean consensus judgment, there might not be a single individual within that group for whom that consensus model applies. Therefore, consensus judgments should not be employed when the results are intended to apply or generalize to social observers (Bernieri & Gillis, 1995). In sum, the decision to pool the judgments from observers or analyze them separately should depend entirely on whether the goal of the research is to describe (a) a target, (b) a group judgment, or (c) the judgment of a typical social perceiver.

Some recent reviews of the error-accuracy debate have suggested that reports of accuracy based on thin slices may be due to methodological artifacts (Kunda, 1999). Specifically, the robust accuracy coefficients found in thin-slice studies are attributed to use of multiple judges, and the averaging or pooling of their judgments. Consequently, the accuracy reported in the Ambady and Rosenthal (1992) meta-analysis is thought to be inflated (Kunda, 1999). While the logic that aggregation bolsters correlation is true, the following points need to be considered.

First, these reviews confuse validity with reliability. The validity coefficient in the Ambady and Rosenthal meta-analysis was $r = 0.39$. Kunda used a version of the Spearman-Brown equation used to compute reliability estimates (Nunnally, 1978, p. 243) and inferred that the average accuracy of a single judge was $r = .02$. This would be an appropriate equation to use if the reliability of a single judge were being computed based on aggregated reliability estimates. The meta-analysis, however, reported aggregated validity estimates. The appropriate equation for estimating the validity or accuracy of a single judge would be the equation 14.37 described in Guilford (1954, p. 407). As discussed earlier in this chapter, Table IV indicates that depending on the channel being judged, the average judge to judge reliability in thin slice studies varies from $r = .21$ to $r = .40$. Applying Guilford's equation (14.37) to the overall validity coefficient of $r = .39$ reported in the Ambady and Rosenthal (1992) meta-analysis, we can estimate that if the average judge to judge reliability is $r = .50$, the validity of a single judge of thin slices is $r = .28$. If the average judge to judge reliability is $r = .30$, the validity of a single judge is $r = .22$. Even if the average judge to judge reliability is lower than that of the vast majority of thin-slice studies— as low as $r = .10$ —the validity of a single judge is $r = .14$.

Second, several studies assessing the accuracy of judgments based on thin slices of nonverbal behavior do not aggregate judges' ratings. Instead, these studies correlate each individual judgment with the criterion and then average the individual validities (i.e., level of agreement with criterion). Thus, such accuracy estimates are already at the level of the individual judge, and are, therefore, not boosted by aggregation. Dividing these accuracy coefficients by the median number of judges is, therefore, not a true reflection of the accuracy of judgments.

F. IMPROVING/TRAINING OBSERVERS

Several studies indicate that training increases the accuracy of decoding facial expressions and sensitivity to nonverbal cues (for a review, see Rosenthal et al., 1979). Research using the Profile of Nonverbal Sensitivity indicates that the accuracy of thin-slice video judgments of affect improves considerably with practice and improves slightly with training. Benefits due to practice and training are particularly striking for judgments of the body. The judgment of channels involving audio cues also seems to show smaller benefits from practice and training (Rosenthal et al., 1979).

The benefits of practice have also been noted in performance on the IPT. Costanzo (1992) found that individuals who received practice and feedback in attending to and in correctly interpreting critical cues on the IPT improved their performance compared to individuals who received training regarding potentially useful cues, but no practice, on a posttest 9 days after the practice or training session.

An interesting distinction exists between training that provides individuals with immediate performance feedback and training instructing them how to make the most accurate judgment. In the former case, a researcher simply gives the observer the actual criterion value after each trial so that they can immediately determine how accurate their judgment was on that trial. A simplification of this is simply telling an observer whether their judgment was "correct." This feedback says nothing about the judgment process or how to go about improving it. Nevertheless, providing observers with performance feedback alone with no instruction appears to improve their judgment accuracy (Gillis et al., 1995). Performance feedback seems to be the most explicit and direct means to attempt to manipulate and improve the judgment process. Unfortunately, the instruction method, when employed alone without practice and performance feedback, shows little evidence of being able to improve judgment on thin-slice displays (Gillis et al., 1995; Costanzo, 1992). These findings are consistent with what would

be expected if the cognitive processes primarily responsible for thin-slice judgment were automatic (Bargh, 1994, 1996).

G. SUMMARY

The preceding section attempted to make explicit a number of methodological issues impacting the outcome and interpretation of thin-slice research. Until now, these issues have primarily been dealt with in an intuitive manner by experimenters, according to their own laboratory experience and expertise. As a result, reviews of the literature and empirical meta-analyses are made more difficult. Our intention is to encourage authors to address more of these issues explicitly in future reports so that secondary analyses and reviews of the literature might have access to the very important moderator variables presented above.

VII. Conclusions

Thin slices provide insight into basic social perceptual processes. Judgments based on thin slices reflect fundamental, almost reflexive, evaluative processes of social perception and social judgments. Work on thin-slice judgment has implications for two important areas of social cognition: the process of stereotyping and the development of correspondent inferences.

A. THIN-SLICE JUDGMENTS AND STEREOTYPING

Thin-slice judgments draw on the real-world, rich, social knowledge that people have acquired. The accuracy of thin-slice judgments reflects knowledge of the social ecology, including knowledge of exemplars, prototypes, and stereotypes. But such judgments are probably most accurate when the behavioral evidence upon which these judgments are based is valid, meaningful, veridical, and relevant to the category being judged (Heider, 1958; McArthur & Baron, 1983; Moskowitz & Roman, 1992). Thus, stereotypes and categories irrelevant to the situation and wrongfully applied should be associated with inaccurate judgments. Appropriate implicit knowledge that is correctly applied, however, will be associated with accurate judgments. Consider, for example, the judgment of an individual's potential to be a good teacher. The observer's use of tacit knowledge about the behaviors and skills associated with good teaching ("she is enthusiastic

and clear") should be associated with more accurate judgments of teaching potential rather than the use of implicit race or gender stereotypes ("she is Asian and likely to be shy").

We believe that thin-slice judgments are accurate because they rely on implicit knowledge of mental representations of exemplars pertaining to the category being judged (Smith & Zarate, 1992). Although such judgments might rely on stereotypes, there is considerable evidence that when stereotypes and expectancies are pitted against behavioral information, individuals use the behavioral information more than either stereotypes or expectancies in making their judgments (Jussim, 1991, 1993).

B. THIN-SLICE JUDGMENTS AND CORRESPONDENT INFERENCES

A prevailing assumption in the literature on social cognition is that traits and intentions are not directly observable (Fiske & Taylor, 1991). Undoubtedly this is sometimes true. It is also true, however, that people do not or cannot hide all (or most) of their dispositions and motives all (or most) of the time (DePaulo, 1992; Jussim, 1991; Kenny, 1991). We are often seen for who we are in many psychological domains.

In our complex social interactions, when we are both actors as well as perceivers, both encoders and decoders of social information, several perceptual and cognitive processes occur simultaneously. In order to navigate this complex social world effectively, perception, cognition, and behavior occur routinely, unintentionally, and rapidly (Abelson, 1981; Bargh & Chartrand, 1999; Langer, 1988; Langer & Abelson, 1974; Uleman et al., 1996; Zajonc, 1984). To paraphrase William James, "effortless attention is the rule" (James, 1890/1983, p. 427). Thus, many evaluations, judgments, and inferences regarding traits, attitudes, and personalities of others are often made spontaneously, nonconsciously, on-line, and from limited behavioral information (Uleman et al., 1996; Weiner 1985). For the most part, this process appears to be adaptive and efficient, and initial impressions and judgments remain uncorrected.

These initial evaluations may be adjusted later in the second stage of information processing (Gilbert & Krull, 1988; Gilbert & Malone, 1995; Trope, 1986). This stage involving corrections, attributions, and explanations generally occurs only when a log jam occurs in the nonconscious, evaluative stage of processing (James, 1890/1983), and when we need to expend effort: when we are motivated to obtain diagnostic information or when we are confronted with unexpected, novel, or inconsistent events or behaviors (Clary & Tassar, 1983; Fiske & Neuberg, 1990; Hastie, 1984;

Kanazawa, 1992; Weiner 1985). Nevertheless, the present work highlights the efficiency of our spontaneous on-line judgments based largely on non-verbal behavior and suggests that, to the extent that much of the relevant and diagnostic information is present when initial judgments are made, these judgments can be quite accurate.

C. CONCLUDING REMARK

The material reviewed in this chapter suggests that (a) thin slices of the behavioral stream contain important diagnostic and predictive social psychological information; (b) because thin-slice perception and judgment is as good as it is, our interpersonal perceptions can occur immediately, automatically, and to some extent validly before much can be communicated verbally or through actions and events; and (c) given the limited conditions under which social inference and correction occur, these initial judgments may determine the lion's share of our ultimate perceptions, evaluations, and theories about those with whom we interact face to face.

We agree with Renato Tagiuri who summarized the landmark 1957 conference on interpersonal perception by stating, "evaluation of other persons, important as it is to our existence, is largely automatic, one of the things we do without knowing very much about the 'principles' in terms of which we operate. Regardless of the degree of skill which an adult may have in appraising others, he engages in the process most of the time without paying much attention to how he does it" (Tagiuri, 1958, p. ix).

We end with two recent newspaper accounts that poignantly illustrate the importance of the accurate communication and perception of thin slices. The first concerns the capture of U.S. soldiers in April, 1999 in Macedonia. A report in the *Boston Globe* stated that "Staff Sergeant Chris Stone's voice was so flat, so unemotional, that when he radioed for help his superior officer, Sergeant First Class Jim LaShelle, didn't think he was serious." While Stone was identifying his location, his skeptical superior officer cut him off to make sure he wasn't kidding, at which point the radio went dead. Because he was cut off, Sergeant Stone had provided only half the information needed to identify his location and was captured along with two fellow soldiers by the Serbs. The misperception of this thin slice of communication may have contributed directly to their capture ("We're Trapped," 1999). Fortunately, the soldiers were released a few months later.

The second account concerns the recent Kennedy-Bessette airplane crash off the coast of Martha's Vinyard. As we write this chapter, there are reports that the Federal Aviation did not respond as promptly as it should have to early information that the plane was missing. On Friday,

July 16, an employee of the Martha's Vineyard Airport alerted the FAA only 25 min after Kennedy's plane was lost on the radar, 4 h before the Kennedy family friend called and the search for the plane began. A FAA spokesman, defending the organization's initial lack of response to the employee's call, responded by implicating the importance of vocal cues in such a communication asserting that, "there was no tone of concern in the voice or anything out of the ordinary. There needed to be some expression that this airplane is overdue." Thus, a misinterpretation and miscommunication of a thin slice of affective information contributed to a substantial delay in action regarding the search for the plane ("Early Alert," 1999).

Incidents such as these, together with the research reported in this chapter, provide compelling illustrations of the importance of thin slices and their perception. It may be wise and even necessary for social psychologists to learn more about the perception and judgment of thin slices of the behavioral stream in order to understand more fully how individuals come to know and to negotiate their social environment. The present chapter is intended to be a step toward this goal.

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Appendix A

STUDIES INCLUDED IN META-ANALYSIS

- Ambady, N., Hogan, D. B., Spencer, L. M., & Rosenthal, R. (1993). *Ratings of thin slices of behavior predict organizational performance*. Poster presented at the 5th Annual Convention of the American Psychological Society, Chicago, IL.
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