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Michael L. Slepian
Tufts University

Kathleen R. Bogart
Oregon State University

Nalini Ambady
Stanford University

Abstract

Clinicians make a variety of judgments about their clients, from judging personality traits to making diagnoses, and a variety of methods are available to do so, ranging from observations to structured interviews. A large body of work demonstrates that from a brief glimpse of another's nonverbal behavior, a variety of traits and inner states can be accurately perceived. Additionally, from these *thin slices* of behavior, even future outcomes can be predicted with some accuracy. Certain clinical disorders such as Parkinson's disease and facial paralysis disrupt nonverbal behavior and may impair clinicians' ability to make accurate judgments. In certain contexts, personality disorders, anxiety, depression, suicide attempts and outcomes can be detected from others' nonverbal behavior. Additionally, thin slices can predict psychological adjustment to divorce, bereavement, sexual abuse, and well-being throughout life. Thus, for certain traits and disorders, judgments from a thin slice could provide a complementary tool for the clinician's toolbox.

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Thin Slice Judgments in the Clinical Context

In a well-known case study of a suicidal patient, Paul Ekman (1985) describes an interview with "Mary." During an interview, Mary claimed that she was feeling well, and asked for a weekend pass to leave the clinic. From a video recording of this interview, many psychiatrists believed that the patient was indeed recovering as she claimed. Yet, before she received her pass, Mary confessed that she had lied in order to receive the opportunity to leave the clinic. She still wanted to commit suicide. In reviewing a video recording of the interview, Ekman & Friesen (1969) discovered a brief, but informative micro-expression. "In a moment's pause before replying to her doctor's question about her plans for the future, we saw in slow-motion a fleeting facial expression of despair" (p. 17, Ekman, 1985). Perhaps this facial expression revealed Mary's true intentions. Possibly, by reviewing Mary's nonverbal behavior, clinicians could have predicted a relapse—in the event she herself did not admit her intention to commit suicide. The current article reviews a body of research, which suggests that, in certain contexts, from merely observing *thin slices* of nonverbal behavior, individuals' clinically-relevant traits and outcomes can indeed often be accurately predicted. In this paper, first, we describe thin slice methodology. Next, we review the role of clinician nonverbal behavior in clinical interactions, and discuss patients' nonverbal behavior. We then present evidence for accurate perceptions of clinically relevant traits and disorders from thin slices. Finally, we discuss the ability of thin slices to predict clinical outcomes.

Thin Slice Methodology

A *thin slice* is a random sample of the behavioral stream that is less than five minutes long (often merely seconds long; Ambady, Bernieri & Richeson, 2000; Ambady & Rosenthal, 1992). In studies utilizing thin slices, naïve *judges* rate *targets* who have been recorded in some way. The judges (i.e., the participants who are observing the thin slices) are typically unacquainted with the targets (the people who have been recorded and will be judged). Targets can be recorded across a variety of *channels*, including video, audio, and transcripts. A *full-video* clip displays many channels. These refer to video clips that feature a target (whether just their face, or body, or both), but also includes audio in addition to the video. Silent video clips are video clips that mute the audio from targets.

Audio clips also come in different varieties. *Full-audio* clips are unaltered audio recordings that feature both what a target is saying, and how they are saying it. This can be contrasted from *content-filtered* audio clips. Content-filtering removes specific audio frequencies associated with word recognition, which leaves vocal tone audible, but actual speech content unintelligible. Conversely, some studies examine transcripts from targets' speech, which remove vocal tone, but retain targets' speech content.

Broadening the original definition of thin slices (Ambady et al., 2000; Ambady & Rosenthal, 1992) as samples of the behavioral stream containing *dynamic* information (recordings of behavior over time), we now include photographs as instances of thin slices as well. Static photographs can be conceived of as containing dynamic information. For example, although smiling happens across time, the configuration of muscles that make up a smile between its onset and offset, recorded in a photograph, can capture information diagnostic to differing levels of positive affect. *Duchenne* smiles, those expressed during genuine happiness, are those that include muscular activations around the eye, forming "crow's feet," in addition to

raising the corners of the mouth, whereas so-called *non-Duchenne* smiles do not activate muscles around the eye, and can be displayed for a variety of reasons other than positive affect (e.g., politeness; Ekman, 1992). And thus a photograph of a person smiling, for instance, can contain information from the dynamic behavioral stream that conveys a person's happiness.

In addition to capturing a critical expressive moment of a dynamic behavior, photographs can leave cues to prior behavior. For example, the cumulative effects of healthy and unhealthy behaviors can yield healthier and unhealthier looking skin, respectively, giving visual cues to identify social groups that have healthier lifestyles (Rule, Garrett, & Ambady, 2010). Additionally, tensing facial muscles, over time, can influence facial development (e.g., jaw development) with influences on facial appearance (Kreiborg, Jensen, Moller, & Bjork, 1978). People who often express anger, for example, over time can appear to look angry even when displaying a neutral facial expression (Malatesta, Fiore, & Messina, 1987; see also Zajonc, Adelmann, Murphy, & Niedenthal, 1987). Thus certain behaviors or psychological states can, both over time and in the moment, be etched into the face. Therefore, we now include photographs as examples of thin slices.

From these thin slices (including any of the above discussed channels of behavior; e.g., video, audio, photographs, transcripts), naïve judges rate targets and accuracy is measured in a variety of ways. Judges' ratings can be compared to targets' own self-reports about internal states or personal traits, acquainted peers' ratings of the targets, or actual known outcomes. For example, naïve judges could rate targets who have recently married on how satisfied or happy the targets are, and ratings could be compared to targets' levels of self-reported marital-satisfaction, friends' ratings of the couple's satisfaction, the couple's self-reported marital satisfaction in the future, and actual longevity of the marriage (e.g., does the couple ultimately get divorced, and if so, when?). The current article reviews studies that record targets across a variety of channels, and measures naïve judges' ability to accurately perceive clinically-relevant traits and outcomes from thin slices of those recordings.

Clinicians' Nonverbal Behavior

Over the last 30 years, healthcare has shifted from a medical model to a biopsychosocial model. Along with it, the view that medicine is a technical practice of the clinician has shifted to the view that medicine should be a dynamic interaction with the patient involving psychological and social information (Engel, 1977). Out of this shift, has emerged a large amount of research on the importance of nonverbal and verbal behavior in healthcare interactions. For instance, clinician's nonverbal behavior has been found to influence clinician-patient rapport and patients' adherence to medical regimens (DiMatteo, 1979; Hall, Harrigan, Rosenthal, 1995).

Many studies have examined the provider behaviors associated with patient liking and satisfaction, as these factors have been associated with patient retention and adherence (Gauchet, Tarquinio & Fischer, 2007). Generally, practitioners who are more interpersonally sensitive, emotionally expressive and whose nonverbal cues indicate attentiveness towards the patient (looking less at the chart and more at the patient, leaning forward) receive more positive ratings from patients (e.g. Bensing, 1991; DiMatteo & Hays, 1980). Such behaviors, including reassurance, attentiveness and emotional support can lead to better patient outcomes (DiMatteo, 1979; Egbert, Battit, Welch, & Bartlett, 1964).

Given the wealth of information that doctors can glean from patients, researchers have also been interested in healthcare practitioners' nonverbal sensitivity, that is, their ability to

attend to patients' nonverbal behavior and understand a patient's feelings and thoughts. Indeed, physician's nonverbal sensitivity is associated with patient satisfaction (DiMatteo, Friedman, & Taranta, 1979). As part of their training, medical students take part in role-playing interactions, called Objective Structured Clinical Examinations, with mock patients, called standardized patients. These interactions are often video recorded for evaluation purposes, making them an ideal source for examining the role of nonverbal behavior in clinical interactions. Hall, Roter, Blanch, and Frankel (2009) examined the influence of medical students' nonverbal sensitivity on standardized patients' behaviors. Standardized patients behaved in a less distressed, more empowered, and more engaged manner when being interviewed by students who had greater nonverbal sensitivity. Standardized patients liked highly nonverbally sensitive medical students more and rated them as more compassionate compared to students with less nonverbal sensitivity.

Rapport, a dynamic process theorized to include mutual attentiveness, positivity, and coordination, is widely recognized as important to the healthcare relationship (Tickle-Degnen & Rosenthal, 1990). The ability to build rapport in a healthcare relationship has been hypothesized to increase patient liking, trust, and adherence. In a study using the Objective Structured Clinical Examination, trained coders viewed video recordings of medical students and standardized patients, and rated their rapport (Hall, Roter, Blanch, & Frankel, 2009). Dyads were rated as having higher rapport when medical students provided more positive statements, less medical information, and when medical students appeared more respectful and warm, and less anxious and dominant. Moreover, the more medical students were sensitive to their patients' nonverbal behavior, the more rapport they achieved, as rated by the trained judges.

At the extreme end, patient dissatisfaction and poor communication may result in malpractice lawsuits (Hickson et al., 1994). Ambady and colleagues (2002) found differences between the vocal behavior of physicians who had been sued for malpractice two or more times and physicians who had never been sued. As malpractice lawsuits contribute to high healthcare costs and are a great source of anxiety and hardship for both the patient and the doctor, future studies should examine whether training in communication can improve communication, adherence, and change the likelihood of dissatisfied patients suing for malpractice. Doctors whose nonverbal vocal expressions were rated as showing higher dominance and lower concern for or about the patient were more likely to have been sued for malpractice.

Clinician Gender Differences

Only a few studies have examined gender differences among practitioners and patients in nonverbal behavior during healthcare interactions. Given that sensitivity to patients' nonverbal behavior enhances rapport, and that, on average, women tend be more nonverbally sensitive than men, including both medical students (Hall et al., 2009), and clinicians (Roter, Hall, & Aoki, 2002), female clinicians might tend to have more rapport with their patients. In a study of video recorded doctors' visits, Hall and colleagues (1994) found that female clinicians exhibited warmer, more communicative behavior. They conducted longer visits, made more positive statements, asked more questions, and smiled and nodded more. Interestingly, male and female practitioners did not differ in their amount of social conversation, technical language, and emotional support. Focusing on female-female clinician-patient interactions revealed a generally additive pattern, in which female doctors and patients had the longest appointments, the most equal speaking ratio, and displayed more of these warm, communicative behaviors than any

other gender combination. However, when female doctors interacted with male patients, a puzzling set of behaviors emerged: doctors used less technical language, smiled frequently, and used voice quality that was dominant in the beginning and less friendly late in the visit. This pattern of behavior may reflect female doctors' responses to role strain. The use of smiling may be interpreted as an effort to appease the patient, and their use of simpler medical language may have been an effort to downplay the non-normative gender power differential. Although differences in patient outcomes as a function of patient and practitioner gender have not been systematically examined, behaviors like those displayed by female practitioners and patients have been linked to improvements in physical health, pain, adherence and comprehension of information (Stewart, 1995).

Clinician Cultural Differences

There has been very little research examining cross-cultural differences in healthcare interactions. Van den Brink-Muinen and colleagues (2003) examined verbal and nonverbal communication in healthcare visits in six European countries (The Netherlands, Spain, the UK, Belgium, Germany, and Switzerland). Consultations were shortest in Germany and Spain and longest in Switzerland and Belgium. Belgians had the most information exchange, the healthcare visits in The Netherlands and Spain were focused more on instrumental and biomedical information, communication was more affective and biomedical in Germany, and British and Swiss communication was more affective and psychosocial. The healthcare communication literature has been generally focused on American culture. Within this culture, affective and psychosocial communication styles are generally associated with positive health outcomes (Stewart, 1995). Future research should examine the outcomes associated with these communication styles in their various cultures, as this is likely to vary.

A rare exception to the focus on Western cultures with Western practitioners and patients is Ishikawa's (2006) study of Objective Structured Clinical Examinations in Japan. In contrast to the often-reported role of positive facial expression in Western studies, in Japan, medical students' facial expressions were not associated with positive ratings by standardized patients. Rather, medical student behaviors associated with positive ratings from standardized patients included facing the patient, nodding frequently, matching the patient's vocal speed and tone, and spending equal amounts of time looking at the patient whether talking or listening. Relative to Western culture, display rules in Asian cultures dictate that expressiveness is less socially acceptable overall (Matsumoto, 1990). Thus, it is not surprising that facial expressivity is not valued in the Japanese healthcare context. However, behaviors associated with attending to the patient, such as facing the patient and interpersonal coordination, which are frequently associated with patient satisfaction in Western culture (e.g. Ambady, Koo, Rosenthal, & Winograd, 2002), appear to hold true in Japan as well. This suggests that, perhaps, an American doctor's positive expression would be less valued by a Japanese patient. With increased globalization, healthcare interactions in which the doctor and patient may be from different cultures is becoming increasingly common. This is an area ripe for future study.

Patients' Nonverbal Behavior

Doctors frequently make diagnosis and treatment decisions based on thin sliced behaviors of patients' nonverbal behavior. For example, severity of pain is commonly assessed through a

combination of measures, including clinical judgments of pain facial expressions, vocalizations, and pain behaviors (awkward postures, limping), in addition to patient self-report (Turk, Wack, Kerns, 1985). Indeed, research suggests that pain can be readily detected from facial expressions. Prkachin (1992) found that naïve observers could accurately detect real pain from faking pain in facial expressions. However, Poole and Craig (1992) found that participants who were in pain and were asked to exaggerate their pain expressions fooled raters into thinking they were in more pain than they actually were. Participants in this study were also asked to try to hide their pain, but judges could still detect it. Coronary artery disease has also been linked to distinctive vocal and facial expressions. Rosenberg and colleagues (2001) interviewed patients with coronary artery disease while assessing them for ischemia. Patients with ischemia showed significantly more anger expressions and false smiles than patients without ischemia (see also Chesney, Ekman, Friesen, Black, & Hecker, 1990). More generally, nonverbal behavior provides a rich source of information that can provide perceivers with cues to form accurate impressions. Even just a thin slice of the behavior stream can provide surprisingly diagnostic information. We next describe evidence that thin slices can provide diagnostic cues for accurately perceiving clinically relevant traits and disorders.

Accurately Perceiving Clinically Relevant Traits and Disorders from Thin Slices

Clinicians make a variety of judgments about their clients, from judging their clients' personality traits to making diagnoses, and a variety of methods are available to do so, ranging from observations to structured interviews (Garb, 2005). There are a variety of instruments at clinicians' disposal to make these decisions, including inventories, checklists, and guidelines, but how much information should be collected before arriving at a decision? As described above, sometimes, a thin slice of behavior can provide a wealth of information, including information that clients may not volunteer (as in the opening example about Mary). Thus, for certain traits and disorders, judgments from a thin slice could provide a complementary tool for the clinician's toolbox. The current section reviews a range of evidence demonstrating the contexts in which perceivers can accurately perceive clinically-relevant traits and outcomes from thin slices of behavior. By accuracy, here and throughout the article, we mean ratings that better than chance predict some criterion. Of course very high accuracy will have great clinical utility, whereas only "slightly above chance" accuracy may have little clinical utility. Yet even cues with lesser utility on their own may prove useful when combined with other diagnostic tools. Additionally, the demonstration of better than chance accuracy could lead future research to uncover more diagnostic cues with clinical utility.

Personality Disorders

Personality disorders consist of enduring patterns of behavior associated with distress and disability. Perceivers can accurately perceive personality traits in healthy control populations. Traits including extraversion, conscientiousness, neuroticism, confidence, interpersonal warmth, intelligence, self-esteem, life satisfaction, sociosexuality and sexual orientation can all be perceived accurately from short silent videos of others (Albright, Kenny, & Malloy, 1988; Ambady, Hallahan, & Conner, 1999; Borkenau & Liebler, 1992, 1993; Rule, Rosen, Slepian & Ambady, 2011; Slepian, Young, Rutchick, & Ambady, in press; Yeagley, Morling, & Nelson, 2007). Personality disorders have been considered to be maladaptive variants of personality traits

(Widiger & Mullins-Sweatt, 2009), and indeed some personality disorders can be accurately perceived from thin slices.

One study examined perceptions of personality traits in a population composed of about a third of individuals who met the criteria for a personality disorder (Oltmanns, Friedman, Fiedler, & Turkheimer, 2004). Replicating prior work, personality traits were indeed perceptible from thin slices, with certain traits like extraversion being the most visible. Additionally, ratings from 30-second video clips predicted ratings made on the Structured Interview for DSM-IV Personality. Participants could accurately perceive traits characteristic of schizoid and avoidant personality disorders (low extraversion), histrionic personality disorder (high extraversion), borderline personality disorder (high neuroticism), obsessive-compulsive personality disorder (high conscientiousness), and antisocial personality disorder (low conscientiousness).

A second study (Friedman, Oltmanns, Gleason, & Turkheimer, 2006) replicated these results and examined the channels that contributed to accuracy. Merely reading transcripts of targets' speech did not lead to accuracy, demonstrating that the content of individuals' speech was not the valid cue to personality disorders. Rather, audio from interviews, and (silent) nonverbal behavior were the most reliable channels, with nonverbal behavior being particularly informative. Impressively, in this and the study described above, all targets were military recruits wearing a standard military uniform and bearing similar short haircuts. Thus, these results occur even when diagnostic cues such as clothing and hair-style were controlled for.

In yet another follow-up study (Friedman, Oltmanns, & Turkheimer, 2007), traits specifically diagnostic to personality disorders were rated from 30-s videoclips. Targets were rated on indicators of personality disorders, such as "prefers to do things alone" and "has no close friends" for schizoid personality disorder, "worries that other people will criticize or reject him or her" and "thinks he/she is clumsy, unattractive or inferior to other people" for avoidant personality disorder, "is unhappy when he/she is not the center of attention" and "uses physical appearance to draw attention to him/herself" for histrionic personality disorder, and "is stuck up or high and mighty" and "takes advantage of other people" for narcissistic personality disorder. And, indeed, thin slices accurately predicted personality disorders. Sometimes, however, there was little specificity between personality disorders, such as between schizoid and avoidant personality disorders, and also between histrionic and narcissistic personality disorders. This could be due to a lack of specificity in accurate perceptions, or to co-occurrences of diagnostic categories across personality disorders. Broadly, these studies demonstrate that pathological personality traits can be perceived in thin slices. Across these studies, accuracy was found whether rating specific personality traits that vary with personality disorders or rating specific pathological traits, and whether naïve judges' ratings were compared to ratings of targets' peers or targets' own self-reports from structured interviews.

Another personality disorder that has received recent attention within thin slice work is psychopathy, characterized by interpersonal and affective predispositions toward antisocial behavior. Fowler, Lilienfeld and Patrick (2009) showed naïve judges videos of prison inmates, who had a range of psychopathic traits. Thin-slice ratings of the degree to which targets matched short descriptions of psychopathy from the *DSM-IV* accurately predicted actual criterion measures of psychopathy (Fowler, Lilienfeld, & Patrick, 2009). Both overall psychopathy and the two individual factors of psychopathy (affective/interpersonal, and antisocial/criminal lifestyle) were predicted by thin slice judgments. Moreover, the *shorter* the videos, the greater the accuracy. Ratings from 5-second clips were more accurate than those made from 10 and 20-second clips.

Individuals with psychopathy are generally seen to be charming and intelligent, and indeed judges perceived more intelligent targets to also be more psychopathic. Likewise, targets rated as attractive were also were more likely to be perceived as psychopathic. Interestingly, thin slice ratings of intelligence and attractiveness did not predict actual criterion measures of psychopathy, suggesting that while perceivers can accurately perceive psychopathy, increased psychopathy is not as related to intelligence and attractiveness. In this case, unlike what is generally found (see Ambady, Bernieri, & Richeson, 2000; Ambady & Rosenthal, 1992), verbal behavior was more informative than nonverbal behavior. Perhaps verbal behavior provides important cues to criminality and proneness to violence, cues related to accurate perceptions of psychopathy. The coding of the actual diagnostic cues to psychopathy awaits future research.

While verbal behaviors seem to provide useful information in accurately perceiving psychopathy, nonverbal cues can also reveal psychopathic traits. For instance, one recent study demonstrates that psychopathy can be accurately perceived from faces alone. Using a face-averaging technique, a subgroup of targets who scored highly on psychopathy were photographed and their faces were combined into a single composite face (Holtzman, 2011). Drawing from the same group of targets, photographs were taken of those lowest in psychopathy, and those faces were also entered into the face-averaging software to create a composite face of the low-psychopathy faces. Composite faces were also created for targets highest and lowest in narcissism and Machiavellianism. The composite faces were then shown to another group of perceivers, and perceivers could accurately guess whether those composite-faces were made up of people high (versus low) in psychopathy, narcissism and Machiavellianism. Narcissism also can be accurately judged from full-body photographs (Vazire, Naumann, Rentfrow, & Gosling, 2008). In sum, some traits specifically diagnostic to personality disorders, and some specific disorders can be accurately perceived from thin slices.

Anxiety

A recent meta-analysis examined the detection of state and trait anxiety, comparing thin-slice audio (verbal and vocal) to thin-slice visual cues (Harrigan, Wilson, & Rosenthal, 2004). First, the meta-analysis demonstrated that trait anxiety is, across studies, visible from thin slices. In an early study, for example, psychiatric patients were video recorded when undergoing a clinical interview (Waxer, 1977). From watching one-minute silent video clips, naïve judges were able accurately judge trait anxiety. In another study, participants who varied on trait anxiety were video recorded while discussing a variety of events (Harrigan, Harrigan, Sale, & Rosenthal, 1996). A thirty-second silent video segment was extracted from each video, and naïve judges rated the anxiety level of each target. Naïve judges could accurately discriminate between high and low-level trait anxiety targets, but only from silent video clips, not audio clips. In that study, trait anxiety was more detectable from visible nonverbal behavior than audio (and speech). Not much work has been done to identify nonverbal cues to trait anxiety, but one cue might be increased gaze aversion (Gilbert, 1991; Wiens, Harper, & Matarazzo, 1980).

The meta-analysis also demonstrated that, across studies, state anxiety can be perceived from thin slices. For instance, in one study, dentists could accurately detect distress, pain and anxiety from their patients (Baron, Logan, & Kao, 1990). In another study, naïve judges observed high and low state-anxious individuals describing personal experiences (either an anxious or happy event; Harrigan, Lucic, Bailyn, Zarnowiecki, & Rosenthal, 1992). From both full-video and silent nonverbal clips, perceivers could accurately detect levels of state anxiety. In

a follow-up study on specifically non-repressor participants (i.e., those who do not repress state anxiety), a different pattern of results emerged (Harrigan, Larson, & Pflum, 1994). Unlike in the study just described, which included repressors and non-repressors, state anxiety could not be detected in silent video clips; only when audio was added to the nonverbal videos could state-anxiety be accurately detected. If anything, the silent nonverbal clips seemed to present misleading information (Harrigan et al., 1994). Perhaps anxiety is normally more often expressed in the audio channel, and when individuals attempt to repress this anxiety they successfully do so in the audio channel, but then their anxiety leaks into other nonverbal channels. Future research could test this possibility.

Interestingly, the meta-analysis (Harrigan, Wilson, & Rosenthal, 2004) also demonstrated that channel informativeness varies systematically across state and trait-anxiety. Whereas trait anxiety is more reliably detected from video clips, state anxiety is more reliably detected from audio clips. In one study on both state and trait anxiety, healthy control participants were compared to patients with panic disorder, social phobia, and major depressive disorder (McNally, Otto, & Hornig, 2001). All participants described their most frightening experience (designed to elicit state anxiety) along with a neutral emotional experience. Subsequently, judges listened to audio recordings that were content-filtered. Fear memories were rated as more anxious-sounding than neutral memories, but there were no difference across groups in either the neutral or fear memory conditions. Thus, whereas trait anxiety can be accurately perceived in visual nonverbal thin slices, it is not as readily heard in audio clips, unlike state anxiety. One audio cue to state anxiety might be increased voice pitch and jitter (Fuller, Horii, & Conner, 1992; Laukka et al., 2008); yet trait anxiety does not appear to be related to stable differences in such acoustic measures (also see Hagenaars & van Minnen, 2005). While some audio cues to state anxiety have been found, more work needs to done on this subject. Additionally, very little work has systematically examined the visual nonverbal cues to trait anxiety, and thus this an area ripe for future research.

Depression

Depression can also be accurately detected in thin slices. In an early study, patients were video recorded when undergoing an admission interview, and half of these targets were later admitted for depression (Waxer, 1974). Naïve and expert judges watched two-minute silent video clips of targets and guessed whether targets had depression or not. Participants, as a whole, guessed who had depression better than chance, and experts did slightly better than non-experts. This early study noted some nonverbal cues that differed among the two groups, albeit with a small target sample size. One of the largest differences was level of eye contact. Depressed and non-depressed patients looked at the interviewer for an equal amount of time, but depressed patients maintained eye contact less. A follow-up study (Waxer, 1976) replicated these results, and also demonstrated differences in the orientation of the head, mouth and hands. Depressed patients displayed more contraction of lower corners of their mouth (associated with negative emotion), looked downward more, and moved their hands less. Additionally, continuous judgments of the severity of depression predicted scores on the Minnesota Multiphasic Personality Inventory Depression scale (see also Hinchliffe, Lancashire, & Roberts, 1970). Another study comparing participants who had recovered from depression to those who were still depressed found that those who were still depressed maintained less mutual eye gaze (Hinchliffe, Lancashire, & Roberts, 1971).

Vocal qualities can also distinguish those with depression. For example, positive responses to depression treatment led to less pausing when speaking, greater pitch variability, and faster speech rates (Mundt, Snyder, Cannizzaro, Chappie, & Geralts, 2007; Mundt, Vogel, Feltner, & Lenderking, 2012). In a study that recorded audio from interviews with depressed patients, naïve judges rated target depression severity from content-filtered speech extracted from the first three questions of the interview (Yang, Fairbairn, & Cohn, 2013). These ratings predicted actual target depression severity. In that study, only participants on the high and low end of depression were selected as targets from a larger pool. Would judges be able to detect depression from the full continuum of depression severity? A recent study (Mehl, 2006) suggests that perhaps only moderate to severe depression can be accurately perceived from thin slices of the behavior stream. Using a naturalistic observation method, a non-clinical sample of 96 participants were tracked with a digital voice recorder that recorded approximately five 30-second samples of ambient sounds per every waking hour, across two days. These recordings picked up any sounds around participants, whether recordings from when the participant was alone, talking to others, or engaging in various activities. Naïve judges listened to these recordings and rated targets' depression. Ratings of depression level did not correlate with criterion measures for depression for non- and mildly-depressed participants, but ratings of moderately and severely depressed patients were related to their actual levels of depression. One possibility is that only higher levels of depression can be detected from thin slices. Another possibility is milder forms of depression are only detectable from thin slices in certain channels. In the Mehl (2006) study, both verbal and vocal elements of sounds were available to judges. Perhaps content filtering the speech could lead to a different pattern of results. Future work could compare ratings from different channels of thin slices across the spectrum of depression severity.

Suicide

Beyond the case study that began this review (Ekman & Friesen, 1969), a few studies have examined thin slices ratings as predictors of suicide and suicide attempts. For instance, as coded from videos, reduced upper activity of the face (Heller & Haynal, 1997), and increased oral activity (Heller, Haynal-Reymond, Haynal, & Archinard, 1997) and asymmetric expressions (Heller & Haynal, 1997) were associated with increased risk for suicide reattempts, suggesting perhaps an inhibition to communicate or effort to control mood (Archinard, Heller, Haynal-Reymond 2000). This work noted some possible nonverbal cues to suicide attempts, but was based on a rather small sample.

A recent set of studies examined the ability to predict from just a face, whether a particular person committed suicide (Kleiman & Rule, 2013). This set of studies had the advantage of having an impressively larger sample size of targets. In their first study, 40 high school and college yearbook photos of individuals who committed suicide were obtained, and the nearest photograph next to each target (matched for sex and race) served as control targets. Participants judged whether these 80 individuals committed suicide or were still alive based on the photographs. As shown by the signal detection statistic A' (which ranges from 0 to 1, with .5 being chance), participants could with some accuracy discriminate between who did and did not commit suicide (e.g., Study 1b *mean* A' = .55) indicating participants' (undergraduates, online respondents across the U.S., or psychotherapists) guesses were more accurate than chance even when hair style and face shape were obscured. Of course, such accuracy is quite low for clinical utility, making further identification of perceptual cues needed. Indeed, in another study Kleiman

and Rule explored potential different cues. Those who committed suicide and those who did not were not perceived differently in attractiveness, emotional expression, life satisfaction, hopelessness or depression. Suicide victims' faces were perceived, however, as more impulsive than matched controls. Thus in a final study, Kleiman and Rule explored perceptions of impulsivity and found that the two groups differed in perceptions of impulsivity, in particular toward violence in the heat of the moment (rather than impulsivity in domains of monetary spending or sexual acts), with those who had committed suicide being judged as more likely to commit. The discovery of which facial cues provide signals to potential violent impulsivity against others or to the self awaits future research.

Impressions of People with Expressive Disorders

As we have discussed, thin slices provide a rich source of information and often allow people to form accurate impressions about not only social information such as personality and emotions, but about many clinically-relevant traits as well. However, certain conditions, such as Parkinson's disease and facial paralysis, limit a person's expressivity in various communication channels. The impoverishment of expressive behavior during first impressions can elicit negative and inaccurate impressions from others. Good healthcare communication involves empathic accuracy, positivity, and rapport, which may be disrupted by disordered expressivity (Tickle-Degnen & Lyons, 2004). The most widely studied expressive disorder is Parkinson's Disease, which often involves expressive masking symptoms, or reduced spontaneity, fluidity, and intensity of facial, bodily, and vocal expression (Tickle-Degnen & Lyons, 2004). Recognizing the importance of clinical impressions of people with Parkinson's disease, the majority of thin slice studies of this population have involved impressions formed by healthcare professionals.

In several early studies, Pentland and colleagues (1987, 1988) and Pitcairn and colleagues (1990) had rehabilitation professionals (physical, occupational, or speech therapists) or rehabilitation students observe audio recordings or silent 1.5 minute video clips of patients with Parkinson's disease and a control group consisting of heart disease patients, which provided a comparison group with severe chronic disease. Although Parkinson's disease patients did *not* differ from heart disease patients in levels of depression and anxiety, Parkinson's disease patients were rated by rehabilitation students and professionals as more depressed and anxious. Indeed, overall, they were rated less positively: as more hostile, suspicious, bored, introverted, less intelligent, less likeable, and perceived to achieve less rapport. Linguistic and acoustic analyses of thin slices of the voice revealed that the Parkinson's disease patients had more pauses and varied their pitch less, which likely contributed to raters negative impressions (Pitcairn et al., 1990) as these are also vocal cues to depression (Mundt et al., 2007, 2012).

A notable finding in this literature is that even healthcare practitioners who are experienced with Parkinson's disease and who understand expressive masking symptoms had similar levels of bias as students and lay people (Hemmesch, Tickle-Degnen, & Zebrowitz, 2009; Tickle-Degnen & Lyons, 2004). Even with such explicit knowledge, first impressions about others' interpersonal attributes are often automatically swayed by minimal information (such as facial and vocal expression) because this is usually an effective heuristic strategy (Zebrowitz & Collins, 1997). However, in the case of Parkinson's disease or facial paralysis, the face is not a valid cue to the person's social attributes. Even the most well-intentioned healthcare practitioners may have difficulty overriding this natural human tendency to form social judgments based on facial expression (Tickle-Degnen & Lyons, 2004).

A number of studies have shown that practitioners form inaccurate and negatively biased impressions of patients' personalities (relative to patients' self-reports) (Lyons, Tickle-Degnen, Henry, & Cohn, 2004; Tickle-Degnen & Lyons, 2004; Tickle-Degnen, Zebrowitz & Ma, 2011). Compared to rehabilitation professionals, rehabilitation students were particularly likely to rate patients with high levels of masking as less extraverted (Tickle-Degnen & Lyons, 2004). Among populations without expressive disorders, extraversion is typically the most accurately judged trait, and it is associated with positive expressivity in the face, body, and voice (Ambady & Rosenthal, 1992). Indeed, follow-up studies have demonstrated that practitioners base their impressions of extraversion primarily on the expressive mask, rather than patient cues that are actually related to their extraversion such as talkativeness (Lyons, Tickle-Degnen, Henry, & Cohn, 2004).

In one of few cross-cultural thin slice studies examining perceptions of patients, Tickle-Degnen and colleagues (2011) examined American and Taiwanese healthcare practitioners' impressions of the social supportiveness, competence, and depressiveness of American and Taiwanese patients with Parkinson's Disease. The U.S., a highly individualistic culture, places higher importance on sociability, whereas Taiwan, a collectivistic culture, places higher importance on competence and social supportiveness (Markus & Kitayama, 1991). Consistent with previous studies, practitioners judged people with facial masking as more depressed and less sociable, less socially supportive, and less cognitively competent. Importantly, practitioners were more biased by masking when judging the sociability of American targets compared to Taiwanese targets, and they were more biased by masking when judging the cognitive competence and social supportiveness of Taiwanese targets compared to American targets. Thus, it appears that practitioners tended to penalize targets for facial masking specifically when ratings attributes of high importance within the targets' culture (e.g. sociability in American culture and social supportiveness in Taiwanese culture). In addition, American practitioners' judgments of target sociability were more negatively biased in response to masking than were those of Taiwanese practitioners. Taiwanese practitioners' judgments of target cognitive competence were more negatively biased in response to masking than were those of American practitioners. This indicates that when practitioners were rating attributes that were valued within their own culture, they were also more negatively biased by masking. These findings suggested that differences in cultural importance of attributes affect practitioners' impressions of people with Parkinson's disease. It is important for practitioners to recognize this potential "cultural mismatch." For example, an American occupational therapist working with a Taiwanese patient with Parkinson's disease may incorrectly judge the patient as shy, whereas a Taiwanese physical therapist, or perhaps even the patients' Taiwanese family, may incorrectly judge the patient as being less cognitively competent. This patient would receive inconsistent treatment, as the occupational therapist may assume that the person is less interested in pursuing social goals, and the physical therapist may assume that the person is not capable of adhering to complex instructions.

Not only do these studies of Parkinson's disease cause concern for the social lives and healthcare relationships of people with Parkinson's disease, but they also raise concerns about how Parkinson's disease may affect practitioners' ability to form accurate diagnoses. More than 30 studies have reported high rates of apathy, a proposed symptom or syndrome characterized by a lack of motivation, in people with Parkinson's disease (Bogart, 2011). As there are no formalized criteria for apathy, it is difficult to assess the validity of these studies. At least six measures have been used to assess apathy in Parkinson's disease. Most of these scales include

items which require the clinician or a caregiver to make a judgment about whether or not the person seems or acts apathetic. For example, a commonly used measure, the Apathy Evaluation Scale, instructs the clinician to base their ratings on both verbal and nonverbal information (Marin, et al., 1991). Given the reliable finding that people form negative impressions of people with Parkinson's disease and tend to rate them as more depressed, bored, and less engaged, there is a real concern that judgments of apathy may be inflated by the appearance of the expressive mask (Bogart, 2011).

Although Parkinson's disease has been the most widely studied expressive disorder in the thin slice paradigm, facial paralysis is a unique population ripe for further research. While Parkinson's disease is a neurodegenerative progressive disorder that can reduce expressivity in all communication channels, facial paralysis (e.g. Bell's palsy or Moebius syndrome) typically only limits one—the face. This raises the possibility that people with facial paralysis can compensate for their lack of facial expressiveness by increasing expressiveness in other channels. Bogart, Tickle-Degnen, and Ambady (2012) predicted that people with congenital forms of facial paralysis would be more likely to have developed compensations over time, compared to people with acquired forms. Trained coders rated thin slice video clips of people with facial paralysis talking about their emotions. Indeed, people with congenital facial paralysis used more compensatory expressive behavior (increased intensity and frequency of body and vocal expression). Expressive disorders are a unique way to examine theories involving communication. For example, facial expression is a naturally occurring situation in which facial expression is "held constant." Future studies can examine how perceivers integrate information from an inexpressive face and an expressive body and voice to form impressions. Healthcare professionals may be able to improve the accuracy of their impressions of patients with these expressive disorders by looking for cues in the expressive channels that remain intact. In the case of Parkinson's disease, practitioners should pay attention to the content of patients' speech, and, when in doubt, ask patients directly about symptoms related to apathy and depression. For people with facial paralysis, practitioners should look for cues in the patients' body, voice, and speech.

Thin Slice Impressions by People with Expressive Disorders

One form nonverbal sensitivity can take is that of *emotion contagion*. Simple exposure to another's emotion, can lead others to adopt facial musculature that matches that emotion expression and even feel that emotion as well (Hatfield, Cacioppo, & Rapson, 1994; Dimberg, Thunberg, & Elmehed, 2000). It has been proposed that people recognize facial expressions and others' emotions, more generally, by mimicking observed expressions, which in turn generates the corresponding emotional experience in the observer (Goldman & Sripada, 2005). Emotion contagion, therefore, has often been proposed to be a healthy trait, one that enhances empathy and understanding of others (see Hatfield et al., 1994). Yet, it can also have negative consequences as well. For instance, if one is in a negative environment, emotion contagion could be damaging, as an individual "catches" the negative emotions in his or her environment. Indeed, young women in emotionally negative family environments who are likely to experience emotion contagion exhibit unhealthy eating attitudes and habits in response to such negative environments (Weisbuch, Ambady, Slepian, & Jimerson, 2011).

The proposal that people can understand others' inner and emotional states by mimicking their facial expressions (which consequently provokes those states in the perceiver) predicts that people with expressive disorders like Parkinson's disease or facial paralysis, who have difficulty

mimicking expressions, should have difficulty recognizing them. There have been only a few small studies of facial expression recognition ability of people with facial paralysis. A study of three participants with Moebius syndrome, a condition characterized by congenital facial paralysis, found that they made several more mistakes than a control group, but these differences were not significant, possibly due to low power (Calder, Keane, Cole, Campbell, & Young, 2000). A large study of emotion recognition among people with facial paralysis, with 37 people with Moebius syndrome and 37 matched controls found no differences in emotion recognition ability and found that accuracy was not related to the degree of facial paralysis (Bogart & Matsumoto, 2010). The fact that people with facial paralysis are able to recognize emotions in these two studies establishes that facial mimicry is not *necessary* for facial expression recognition.

There have been numerous studies on the emotion recognition ability of people with Parkinson's Disease. Unlike facial paralysis, which usually involves relatively specific impairments in facial expression resulting from isolated lesions in areas such as the pons or peripheral nerves, Parkinson's disease involves central progressive destruction in dopaminergic pathways in the basal ganglia, areas implicated in recognizing emotions (Adolphs, 2002). Further, as Parkinson's disease progresses, it impairs cognition, working memory, motor planning, and may be associated with endogenous depression. A meta-analysis of 34 studies found a robust deficit in the ability to recognize facial and vocal expressive cues in patients with Parkinson's disease (Gray & Tickle-Degnen, 2010). These results do not appear to be due to depression or visuospatial impairments. However, a small body of research suggests that general deficits in executive functioning may play a role in the emotion recognition difficulties among people with Parkinson's disease (Pell & Leonard, 2003; Dara et al, 2008). Taken together, these findings suggest that people with Parkinson's disease experience numerous social functioning challenges: not only do others have difficulty recognizing their own emotions, but people with the condition may also be unable to recognize others' social cues, resulting in a bi-directional emotional disconnect. This may be particularly challenging for doctor-patient interactions, where the therapeutic relationship may suffer.

Thin Slicing Clinically Relevant Traits

The studies reviewed above demonstrate the contexts in which people can detect clinically relevant traits from thin slices. Personality disorders, anxiety, depression and even suicide attempts and outcomes can be detected from others' nonverbal behavior. In certain contexts, thin slicing others can be difficult, such as in the case with those with expressive disorders, who also can reciprocally have deficits in perceiving others' nonverbal behavior (such as in Parkinson's disease). We next turn to the utility of thin slices in predicting clinical outcomes.

Thin Slices Predicting Outcomes Clinician and Patient Outcomes

Not only can thin slices be used to accurately detect whether another has a disorder, but ratings based off thin slices can predict future outcomes. For instance, ratings made from thin slices of clinicians' nonverbal behavior predicts outcomes of their patients. In one study, physical therapists were video recorded during interactions with elderly inpatients (Ambady, Koo, Rosenthal, & Winograd, 2002). Naïve participants judged 20-second silent video clips from these interactions, and their ratings of how distant physical therapists seemed during these

interactions predicted patients' clinical improvement after discharge, and even 3 months post-discharge. Nonverbal behaviors of not smiling and looking away from the patient were associated with decrements in patients' physical and cognitive functioning, whereas smiling and nodding were associated with improvements in patients' physical and cognitive functioning. Moreover, distancing behavior was also associated with increased confusion at discharge. Thus, the outcomes of patients can be predicted from thin slices of clinicians' nonverbal behavior.

Another study examined whether physicians' verbal and nonverbal behavior, sampled from interviews, could predict whether alcoholic patients were successfully referred for treatment (Milmoe, Rosenthal, Blane, Chafetz, & Wolf, 1967). While discussing their experiences with alcoholics, physicians were audio recorded, and these, on average, 1.5 minute responses were made into transcripts (speech only), content-filtered audio (vocal tone audible), and full audio clips (speech and vocal tone audible). Doctors who were rated as less angry in the content-filtered thin slices were actually more successful in referring alcoholic patients (who arrived in an emergency room) for further treatment at an Alcoholic Clinic. Additionally, for full (non-content-filtered) audio clips, lower ratings of anxiousness were also associated with more successful referrals. No ratings from the speech only condition (transcripts) predicted referral success.

Not only can patient outcomes be predicted from thin slices, but so can clinician outcomes. As briefly described earlier, one study recorded 114 conversations between surgeons and patients during routine medical visits (Ambady, LaPlante, Nguyen, Rosenthal, Chaumeton, & Levinson, 2002). Naïve judges rated either full audio (including surgeons' speech) or content-filtered 10-second clips. Ratings of vocal tone (but not speech) predicted whether surgeons had malpractice claims filed against them in the past. Surgeons who had higher ratings of dominance and lower ratings of concern were more likely to have been sued relative to surgeons with lower ratings of dominance and higher concern. It is striking that it was only how surgeons spoke, not what they said that was associated with whether patients had previously launched a malpractice suit against them. Perhaps a dominant and low-concern voice implies indifference on the part of the surgeon, predicting malpractice claims following negative outcomes. In sum, both patients and clinicians' outcomes can be predicted from thin slices of behavior.

Well-Being and Longevity

Thin slices of nonverbal behavior can predict future well-being. In one study, bereaved participants spoke about their recently deceased spouse at six months post-loss (Bonanno & Keltner, 1997). Expressions of negative emotion during those five and a half minutes predicted even more severe grief 14 and 25 months later, as well as poorer health. These outcomes were particular to anger, rather than sadness. Positive emotion, such as laughing and smiling, in contrast, expressed during those few minutes, predicted reduced grief 14 and 25 months later. Those positive expressions were associated with better relationships with current significant others as well as more dissociation from distress (Keltner & Bonanno, 1997). Positive expressions also predict psychological adjustment for survivors of sexual abuse (see Bonanno et al., 2007; Gupta et al., 2011). In yet another context, that of adjusting to a recent marital separation, from such positive expressions, naïve judges can accurately perceive current psychological adjustment, and furthermore, ratings of vocal tone predict future adjustment to marital separation (Mason, Sbarra, & Mehl, 2010).

In another study, while husbands and wives discussed a conflict, negative emotion expressed by either person predicted dissatisfaction with the marriage, as well as whether the couple eventually divorced (Gottman & Levenson, 1992). Follow-up work demonstrated that negative displays including criticism, contempt and "stonewalling," and the absence of positive affect, predicted divorce, and divorce could even predicted 14 years later (Gottman & Levenson, 2000). Ratings made from the way married couples discussed a conflict could not only predict whether couples divorced, but even *when* they divorced (either earlier or later in the marriage). The same study also demonstrated that affect expressed outside of conflicts could predict divorce, such as when telling one's spouse what happened that day. Even more remarkable, the ratings made from the first three minutes of an interaction between two newlyweds predicts whether they will get divorced six months later (Carrère & Gottman, 1999).

Martial satisfaction can also be predicted from a single nonverbal time point. In one study, researchers collected women's 1958-1960 college yearbook photos (these participants had also participated in a study on personality; Harker & Keltner, 2001). Expressing genuine Duchenne smiles in a single photo at age 21 was associated with being married by 27, staying married, and having satisfying marriages 30 years later. Additionally, expressing genuine smiles was associated with increases in competence and achievement orientation, and decreases in experiences of negative emotion and less susceptibility to prolonged experiences of negative affect. Finally, positive emotion, as expressed in that single time point at age 21, predicted enhanced well-being throughout life, up to 30 years later, including greater life-satisfaction, better relationships with others, and fewer psychological and physical difficulties. These effects all held when controlling for the physical attractiveness of the targets (but see Freese, Meland, & Irwin, 2007). Similarly, individuals' smile intensity in both yearbook photographs and childhood photographs has been found to predict whether they would be divorced later in life (Hertenstein, Hansel, Butts, & Hile, 2009).

Positive emotion expressed in photographs can even predict individuals' biological longevity. Based on photographs of Major League Baseball players from the 1952 Baseball Register, researchers coded whether players displayed no smile, a partial smile or a genuine "Duchenne smile" in their photograph (Abel & Kruger, 2010). Additionally, for these players a number of predictors of longevity could be controlled for (e.g., body mass index, physical fitness and performance, marital status and college attendance). Genuine smiles from that one time point were associated with longer lives (see also Danner, Snowdon, & Friesen, 2001).

Predicting Clinical Outcomes

Thin slices of nonverbal behavior can predict a range of future outcomes. Thin slices can predict psychological adjustment to divorce, separation, bereavement, and sexual abuse. Recording of newlyweds and married couples can predict actual divorce and marriage outcomes, and finally, just a rating from a single photograph can predict well-being and longevity.

Thin Slicing on the Internet

The Internet has created a new medium to examine impressions from thin slices. For example, one study asked observers to judge personalities of individuals from their personal websites, and found that ratings from websites were related to targets' actual personalities (Vazire & Gosling, 2004). More commonly today, people present themselves on online social

networking profiles (e.g., Facebook®), and perceivers can accurately perceive expressivity and likeability from these profiles (Back et al., 2010; Ivcevic & Ambady, 2012; Waggoner, Smith, & Collins, 2009; Weisbuch, Ivcevic, & Ambady, 2009). For example, impressions of extraversion and conscientiousness both made from information contained on one's Facebook page and made from posted photographs correlated with self- and peer-reports of targets' extraversion and conscientiousness, respectively (Ivcevic & Ambady, 2012). Thus, in the many channels of display on Facebook profiles (e.g., photos, personal information, number of friends), individuals' personality traits are indeed visible.

Pertinent to the current review, traits such as narcissism are also perceptible from Facebook profiles; features on profiles such as the frequency of posting self-promoting information accurately predicts narcissism as indicated by profile owners' self-reports (Buffardi & Campbell, 2008). In another study, judges rated Facebook profile owners on a variety of traits, including social anxiety, loneliness, neuroticism, and depression (Fernandez, Levinson, & Rodebaugh, 2012). The study also collected profile owners' self-reports of social anxiety and depression. While Facebook profiles can display symptoms of the profile owner's depression (Moreno et al., 2011), and these can relate to self-reported depression symptoms (Moreno, Christakis, Egan, Jelenchick et al., 2012), judges' ratings of depression in this study (Fernandez et al, 2012) were not related to scores on the Beck Depressive Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). Ratings of loneliness, however, were correlated with scores on the BDI-II. Additionally, ratings of social anxiety were also related to profile owners' reported social interaction anxiety (over and above self-reported depression and neuroticism; Fernandez et al., 2012). In another study, which examined problem drinking, judges' coding of intoxication and problem drinking references on Facebook profiles predicted targets' scores on a test that identifies being at risk for problem drinking (Moreno, Christakis, Egan, Brockman et al., 2012).

Recent work has also examined smile intensity in online photographs. In Facebook profile photos, the more intense first-semester college students' smiles were, the more life-satisfaction they had during that semester, and the more life-satisfaction they had three and a half years later, right before they were about to graduate (Seder & Oishi, 2011). Moreover, it seemed that the relationship between smile intensity in the profile photo and future life-satisfaction (3.5 years later) was partially mediated by life satisfaction during the first semester of college. The Internet is allowing individuals to express themselves across new channels, and from these online thin slices, it seems that naïve perceivers can accurately perceive a variety of traits, some of which are related to mental disorders, and to future life outcomes.

Conclusion

The reviewed studies demonstrate that a variety of clinically-relevant traits and outcomes can be accurately perceived in thin slices. Doctors have long been using nonverbal behaviors when diagnosing physical conditions, for example, looking for certain facial expressions and nonverbal behaviors when assessing pain. Personality disorder-specific traits can be accurately perceived in thin slices of nonverbal behavior, and even psychopathology can be accurately perceived in both videos of targets as well as facial photographs (e.g., Fowler et al., 2009; Friedman et al., 2007; Holtzman, 2011). Both depression and anxiety can be accurately perceived in thin slices (see Harrigan et al., 2004; Hinchliffe et al., 1970, 1971; Waxer, 1974, 1976; Yang et al., 2013). State and trait anxiety, for instance, are both detectable in thin slices, but in different channels. State anxiety is more reliably detected in audio channels, whereas trait anxiety is more reliably

detected in video channels (Harrigan et al., 2004). Even suicide attempts and outcomes can be predicted from thin slices (Heller & Haynal, 1997; Kleiman & Rule, 2013; see also Ekman & Friesen, 1969).

Not only are targets' current disorders and clinically-relevant traits detectable from thin slices, but so are their future outcomes. Whether a surgeon is sued for malpractice or a physician successfully refers a patient for alcoholism treatment can be predicted by naïve judges' ratings of their vocal tone (Ambady, LaPlante, Nguyen, Rosenthal, Chaumeton, & Levinson, 2002; Milmoe, et al., 1967). Client outcomes can also be predicted from both thin slices of clinicians' behavior (Ambady, Koo, Rosenthal, & Winograd, 2002) and clients' behavior (e.g., Bonanno et al., 2007; Gupta et al., 2011). Even from just a single photograph, ratings from naïve judges can predict psychological adjustment to distressing events (e.g., divorce, bereavement, abuse), as well as actual life-long well-being and longevity (e.g., Abel & Kruger, 2010; Bonanno & Keltner, 1997; Harker & Keltner, 2001). With new technology, the Internet is providing new channels and media to present thin slices of the behavioral stream, and ratings from these new channels also predict clinically-relevant traits and outcomes, such as social anxiety (Moreno et al., 2012) and life-satisfaction (Seder & Oishi, 2011).

The frequency that people with expressive disorders are misperceived illustrates the great extent to which clinicians and lay people alike rely on thin slices in everyday life as well as in the clinic (Tickle-Degnen & Lyons, 2004). Typically, flat affect in the face, body, and voice indicates depression or apathy, but in disorders like Parkinson's disease, which prevents expression with these channels, patients are at risk of being misdiagnosed with one of these conditions (Bogart, 2011).

While a long tradition of research has studied accurate perceptions of targets from thin slices (see Ambady & Weisbuch, 2012), only a small subset of this work examines thin slicing in the clinical context. Thin slices provide a unique glimpse into a client's states and traits. Certain nonverbal behaviors are difficult to control and can provide a window to a client's mental world unmediated by self-presentation strategies (Choi, Gray, & Ambady, 2005) and can be a better indicator of person traits than is verbal behavior (see Weisbuch, Slepian, Clarke, Ambady, & Veenstra-Van der Weele, 2010). Judgments made from thin slices thus could provide a diagnostic complement to more traditional instruments.

Future work still needs to systematically study various channels and their predictive validity across a variety of domains and outcomes (e.g., depression, anxiety, suicide), and more work needs to be done to identify the valid cues to clinical disorders. Additionally, there is a dearth of clinically relevant cross-cultural thin slice work. For example, social psychological research on the ingroup advantage shows that people within the same social group (i.e. gender, ethnicity, culture) form more accurate impressions about others within their social group (see Wang, Toosi, & Ambady, 2009; Young & Hugenberg, 2010). This may indicate that clinicians who are similar to their patients will have privileged ability to assess clients based on thin slices. Further, display rules about what is acceptable to express within a culture, and differences in expressions, may lead to misunderstandings during clinician-patient interactions (Marsh, Elfenbein, & Ambady, 2003; Matsumoto, 1990). With future work, clinicians will have new criteria to assess clients across a variety of domains that overcomes limitations of existing methods (e.g., those that rely on self report; see Nisbett & Wilson, 1977), complementing those and other methods to help treat clients and to improve their practice.

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