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The Relationship Between Displaying and Perceiving Nonverbal Cues of Affect: A Meta-Analysis to Solve an Old Mystery

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The authors address the decades-old mystery of the association between individual differences in the expression and perception of nonverbal cues of affect. Prior theories predicted positive, negative, and zero correlations in performance—given empirical results ranging from $r = -.80$ to $r = +.64$. A meta-analysis of 40 effects showed a positive correlation for nonverbal behaviors elicited as intentional communication displays but zero for spontaneous, naturalistic, or a combination of display types. There was greater variation in the results of studies having round robin designs and analyzed with statistics that do not account for the interdependence of data. The authors discuss implications for theorists to distinguish emotional skills in terms of what people are capable of doing versus what people actually do.

Keywords: affect, expression, perception, recognition, meta-analysis

We attempt to reinvigorate a decades-old quest to determine the relation between individual differences in performance at two emotional processes: the display and the perception of affect via nonverbal cues. These two skills are typically considered central to models of emotional intelligence (Davies, Stankov, & Roberts, 1998; Mayer, Roberts, & Barsade, 2008; Mayer & Salovey, 1997; Tett, Fox, & Wang, 2005), as well as to models of the related constructs of affective social competence (Halberstadt, Denham, & Dunsmore, 2001), emotional competence (Eisenberg, Cumberland, & Spinrad, 1998; Saarni, 1999), and social skill (Riggio, 1986). Theoretically, the two processes are opposite sides of the same coin, given that nonverbal communication involves both sending clear signals to others and reading clearly the signals that others send. Thus, it would be worthwhile to understand how emotional display and perception abilities relate to each other.

This question has also received attention from other corners of psychology. Clinical pathologists and developmental psychologists often assess patients' performance at emotional perception and display in order to diagnose functional deficits and monitor progress for conditions such as autism and schizophrenia (Borod, Welkowitz, Alpert, Brozgold, Martin, Peselow, & Diller, 1990; Halberstadt et al., 2001; Macdonald et al., 1989). Given how much less expensive it is to administer a standardized test of affect perception than it is to elicit expressions, record them, and code the clarity of the resulting displays, clinicians would benefit from knowing how much unique information they obtain from using both of these diagnostics.

In light of its importance, the display–perception link has intrigued social psychologists for decades, particularly between approximately the mid-1960s and the mid-1980s. When nonverbal behavior first became a flourishing area of academic inquiry, the question appeared to loom large. However, it was more or less abandoned in light of conflicting empirical findings, given results ranging all the way from $r = -.80$ (Lanzetta & Kleck, 1970) to $r = +.64$ (Levy, 1964). Over the years, researchers have consistently noted this puzzling inconsistency (see also Hall & Bernieri, 2001): "previous research is equivocal on this point" (Zaidel & Mehrabian, 1969, p. 233); there is "conflict among these research results" (Zuckerman, Lipets, Koivumaki, & Rosenthal, 1975, p. 1069); the literature "involves inconsistency" (Cunningham, 1977, p. 565); there are "conflicting findings" (Morency & Krauss, 1982, p. 183); and "results are inconsistent" (Walden & Field, 1990, p. 66). DePaulo and Rosenthal (1979a) reviewed the cumulative body of work about 30 years ago and concluded that the results were unclear, in light of a small, positive correlation ($r = .16$) yet highly varied findings across studies. In trying to reconcile the source of the recurring conflict, Fujita, Harper, and Wiens (1980) noted that "none of the explanations proposed for the apparent differences among the findings has proved satisfactory" (p. 132).

This article includes a meta-analysis of over 60 years of data, much of which was originally conducted to address this question and much of which was not. Before presenting the empirical results, we review the explanations that have been offered in past work, with theories that predict positive, negative, and zero correlations between emotional expression and perception skill.

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Display and Perception Are Positively Related to Each Other

The most common hypothesis has been that performance at emotional display and perception correlate positively with each other, as typically assumed from their inclusion together within umbrella constructs such as emotional intelligence. As early as 1964, Levy (1967) argued that "one unitary ability underlies a variety of discrete abilities" (p. 44) and individual differences converge into a "general communication factor" (p. 51). In addition to varying in their skill level—which presumably influences their performance at laboratory-type tasks—individuals can vary in their motivation, attention, and conscientiousness regarding perceiving and displaying affect-laden information. Tett et al. (2005) conceptualized the latter as "emotional self-efficacy" (p. 860) and demonstrated that it has reliable individual differences. Greater motivation and attention can, in turn, help to develop greater skills—given the value of practice for performance at nonverbal expression (Zuckerman, DeFrank, Spiegel, & Larrance, 1982) and perception (Costanzo, 1992; Zuckerman, Koestner, & Alton, 1984) tasks.

In addition to the possibility that emotional skills correlate in general, these two in particular have the potential to reinforce each other directly. Osgood (1966) grounded his argument for a positive display–perception relation in the James-Lange theory of emotion, proposing that "the person with the more expressive face [is] better able to mimic and hence empathize with the feeling of others" (p. 11). This line of reasoning fits with more recent theories of emotional contagion that suggest emotional display feeds back into subjective experience (Hatfield, Cacioppo, & Rapson, 1993; Lakin, Jefferis, Cheng, & Chartrand, 2003)—which, in turn, can help individuals sense the affective states that they have mimicked in others.

Given their mutually reinforcing nature, display and perception skills typically develop in tandem, both increasing with age (Odom & Lemond, 1972; Zuckerman & Przewuzman, 1979). Effective parental socialization helps to nurture the development of both skills (Eisenberg et al., 1998). Accordingly, Daly, Abramovitch, and Pliner (1980) found that mothers with clear displays had children who were more accurate perceivers. They argued that these children may more effectively learn how to use nonverbal cues because they find them to be a reliable and valid source of information. Likewise, parents who are good perceivers may provide better feedback to encourage their children's expressive skills.

Another argument for a positive association is that functional deficits tend to impair both skills. Indeed, many tests of nonverbal display and perception were designed explicitly to measure emotional deficits at the extreme left tail of the distribution rather than the range of normal healthy functioning (e.g., Nowicki & Duke, 1994). A number of specific functional deficits have been studied for their impact on display and perception skill. Notably, schizophrenia is characterized by flat affect in expression as well as deficits in perception (Borod et al., 1990; Flack, Cavallaro, Laird, & Miller, 1997). Children with autism are also impaired in both types of tasks, as they tend to treat social communications with no greater precedence than asocial stimuli (Halberstadt et al., 2001; Macdonald et al., 1989; Wallace, Coleman, & Bailey, 2008). Victims of domestic abuse also show impaired display and perception performance (Halberstadt et al., 2001; Hodgins & Belch, 2000), as do monkeys raised in social isolation (Miller, Caul, & Mirsky, 1967). Finally, psychoactive substances can impair both skills, notably alcohol studied in humans (Philippot, Kornreich, & Blairy, 2003) and tranquilizers studied in monkeys (Miller, Levine, & Mirsky, 1973). The ability of such a wide range of deficits to impair performance at both processes together may suggest a connection in terms of higher order communication functioning.

Display and Perception Are Negatively Related to Each Other

By contrast, those with other theoretical perspectives argued for the divergence of display and perception accuracy, inspired by Lanzetta and Kleck's (1970) surprise finding of a nearly perfect negative correlation. They argued that harsh parental socialization can train people to inhibit their emotional expressions yet make them more sensitive to the displays of others.

Subsequent theoretical development to account for a possible negative relation has also been focused on parental socialization. If the ultimate goal of the communication process is to achieve accurate understanding, individuals may differ in their paths to that goal on the basis of whether their childhood environment encouraged clear sending versus receiving. According to Halberstadt's (1986) socialization theory, children tend to compensate for their parents' emotional tendencies. "When the family environment is low in expressiveness," she argued, "individuals must become sensitive to the most subtle displays of emotion in order to relate effectively with their family members" (p. 827). By contrast, in highly expressive environments, individuals do not need to hone so sharply their perception skills. As a metaphor, if everyone is shouting then one does not need to hear very well to get the message, but if everyone is whispering then one needs to develop excellent hearing. Thus, theorists can make sense of a negative display–perception relation in terms of the different requirements for social interaction in high—versus low—expressiveness households.

These arguments fit with more general theoretical models of psychological compensation across skills. Bäckman and Dixon (1992) argued that people attempt to find balance by "making amends" (p. 259) for deficits and directing energy toward other means to the same goal or focusing on different goals. They define compensation as "inferred when an objective or perceived mismatch between accessible skills and environmental demands is counterbalanced (either automatically or deliberately) by investment of more time or effort (drawing on normal skills), use of latent (but normally inactive) skills, or acquisition of new skills" (p. 272). Those whose family environments are deficient in either emotional display or perception clarity might invest time in the corresponding process as a means to compensate and thereby achieve interpersonal communication. It may not be necessary for individuals to perceive a mismatch or deficit—rather, they may simply be exposed to better learning opportunities for one or the other and develop substitutable skills accordingly (Halberstadt, 1986).

Another theoretical mechanism that could explain a negative display–perception relation is interpersonal accommodation. Zuckerman, Larrance, Hall, DeFrank, and Rosenthal (1979) argued that a negative correlation could result if "perhaps those who find it difficult to decode an affect assume others will also find it difficult, and so they make a special effort to encode that affect clearly and effectively" (p. 725). That is, one may project one's

own emotional challenges onto others and attempt to compensate interpersonally.

The flip side of accommodating others could be inhibiting them. Gallagher and Shuntich (1981) speculated that highly expressive people could inadvertently inhibit others—bowling them over with their emotional intensity. Their inhibited interaction partners, in turn, would provide impoverished examples of emotional stimuli for highly expressive people to judge and from which to learn over time.

Display and Perception Are Unrelated to Each Other

The final hypothesis that has been put forward for the relation between emotional display and perception skill is that there is no relation. There are at least two plausible reasons for this prediction.

First, all of the above arguments for both positive and negative associations could be veridical and could cancel each other out to reveal zero apparent relation. In particular, it is possible that there are individual differences in the general communication factor but that these total levels of skill are distributed idiosyncratically across two substitutable and potentially competing activities. This could serve to decouple any underlying positive or negative correlation. Further decoupling the two skills could be individual differences in the extent of compensation for family environments—due perhaps to differences in individuals' awareness of the relevant environmental demands, their priority placed on developing a compensating skill, or their ability to develop the compensating skill (Bäckman & Dixon, 1992). There are also viable alternatives to compensating for skill deficits, such as changing one's expectations in order to relax the criterion for success or changing the domains of personally relevant skill with which one identifies (Bäckman & Dixon, 1992). This would seem likely in the case of communicating affect via nonverbal cues, given individual differences in emotional self-efficacy (Tett et al., 2005).

Second, the two skills may simply operate independently of each other. Neuroscientists have argued that emotional display and perception are dissociated from each other on the basis of distinct neural pathways (Borod et al., 1990). Display appears to result from activity in anterior brain structures, but perception appears to result from activity in posterior areas (Nakhutina, Borod, & Zgaljardic, 2006). Further, although as reviewed above, expression and perception skills typically develop in tandem, there are also documented exceptions. Notably, children who are congenitally blind can still pose recognizable facial expressions (Galati, Scherer, & Ricci-Bitti, 1997). Taken together, these factors may call into question whether to expect any relation between accurately sending and receiving affective signals.

Reconciling Conflicting Empirical Findings

Given the extreme diversity in empirical findings for studies of the display–perception link and the corresponding diversity in theoretical perspectives offered to account for them, there have been attempts over the years to reconcile these discrepancies. We focus below on two possible explanations: a theoretical moderator that has been raised before, without resolution, and methodological issues that we raise on the basis of updated research practices.

Questioning the Meaning of Performance

A number of explanations for the diverse pool of findings have referred to the distinction between affective displays that are posed purposely for an audience versus those elicited spontaneously from participants. That is, we distinguish a person's intentional performance at expressing affect from the clarity of a person's general level of expressiveness. This distinction corresponds to the theoretical distinction that has been made between spontaneous *push* factors caused by the feeling and physiology of affective experience—such as bodily changes like accelerated breath or shaking—versus *pull* factors caused by social intentions to communicate information or appeal to others for action (Scherer, 1988). The extent to which affective display consists of involuntary, versus deliberate, communication has been hotly debated and summarized elsewhere (Barrett, Lindquist, & Gendron, 2007; Ekman, 1972, 1997; Parkinson, 2005; Russell, 1994).[1] At one extreme, Ekman (1972) argued in early work that emotional expression is primarily a spontaneous readout of internal states and that it shows true feelings at all times except when managed with conscious effort. In keeping with accumulated empirical evidence, more recent perspectives appear to favor moderation, particularly Ekman's (1997) later writings and Fridlund's (1994) behavioral ecology theory—in which the social audience factors heavily into emotional expression even while internal states and conscious management influence displays. It is worth noting that these two types of influence on affective displays appear to involve two separate psychological processes, with separate neuroanatomical pathways guided by different tracts of facial nerves (Borod & Koff, 1991; Karnosh, 1945; Rinn, 1984). Indeed, clinical case studies show that voluntary and spontaneous facial movements can each be disturbed by neurological damage that leaves the other intact. For example, brain lesions can limit patients' ability to respond to posing commands without changing their spontaneous response to emotion-laden stimuli (Rinn, 1984).

Previous authors reviewing work on the affective display–perception link have pointed out that some researchers examined spontaneous affective displays in their studies, whereas others examined poses. Lanzetta and Kleck (1970) distinguished their highly negative display–perception effect from Levy's (1964) highly positive one by noting that individuals who are not very expressive in spontaneous situations—that is, the highly perceptive participants in their study—may still be proficient at posing when asked explicitly to do so. Over the next decade, other researchers who observed the accumulating body of work noted that positive associations tended to result from poses enacted on demand, whereas negative and null associations tended to result from studies examining spontaneous cues (Cunningham, 1977; Zuckerman et al., 1975). One possible explanation in the case of null results based on spontaneous displays is that they may not have been sufficiently intense for performance measurements to be reliable. This is because such displays are less frequent and weaker under the typical naturalistic design in which participants are in solitude and unaware they are being recorded, which has been

[1] Although spontaneous actions are often involuntary and posed actions are typically voluntary, the voluntary versus involuntary distinction does not always map perfectly onto the spontaneous versus posed distinction. For example, people have the ability to display voluntary actions reflexively. We thank an anonymous reviewer for making this point.

referred to sarcastically as "the problem of nonexpressive subjects" (N. Chovil quoted in Fridlund, 1994, p. 158). However—like all other explanations that had been proposed for the inconsistency in findings—the distinction between spontaneous and posed affective cues left some data unexplained (Fujita et al., 1980) and ultimately did not seem to gain acceptance as an authoritative solution to the puzzle.

We argue that it is worth revisiting this distinction between posed and spontaneous nonverbal behavior. Further, we advocate that this is a key theoretical issue. The method of eliciting emotional cues from participants provides a window into how different researchers conceptualize affective display, and it contrasts perspectives that relate to performance with those that relate to personality traits. Halberstadt (1986) argued that posed encoding is a measure of performance under optimal conditions, whereas spontaneous display assesses natural trait levels of emotional expressiveness (see also Zuckerman et al., 1976). Accordingly, these two conceptualizations have typically been measured with distinct research paradigms (Wagner, Buck, & Winterbotham, 1993). Posed sending typically provides participants with the explicit instructions to enact their nonverbal behaviors in a manner to convey an intended emotional state to other people. Spontaneous sending, by contrast, often uses techniques such as slide-viewing, in which participants are exposed to affectively evocative materials while unaware that they are being recorded (e.g., Miller et al., 1973). These paradigms define display—both theoretically and operationally—as what people can do versus what people actually do, respectively.

In keeping with the metaphors of cognitive intelligence and other abilities that are implied by concepts such as emotional intelligence and affective competence, it would be most consistent to consider posed display as a performance that indicates something about an individual's underlying ability—that is, skill at using one's nonverbal behaviors deliberately to convey information to others—but to consider spontaneous expression as legibility—that is, a personality trait referring to how visibly one reacts in a stereotypical manner to affective stimuli.[2] Carroll (1993) defined ability as "some kind of performance, or potential for performance" (p. 4). He crafted a metaphor around lifting barbells, in which ability can be defined as the potential to lift a certain amount of weight under favorable conditions. Thus, he defined ability in terms of one's maximal performance at a task—for example, the most weight that an individual can lift—even if the individual succeeds only on a single occasion (notwithstanding that psychometric properties are better when measuring ability in terms of average performance). Carroll (1993) argued that the individual performing an ability task must have some notion of the type of end result and the criterion for being assessed. Taken together, it may not be appropriate to consider one's natural level of expressiveness as an ability in conditions for which clarity is not an explicit goal.

This distinction is likely to matter empirically. Although theorists have argued that intentional facial displays are similar but clearer and more exaggerated versions of spontaneous displays (Ekman, Friesen, & Ellsworth, 1972)—in empirical work it has not been obvious that these two methods of assessing expressive skill themselves converge into a higher order individual difference (Tucker & Riggio, 1988). A number of studies have shown a positive relation between individuals' expression skill in posed and spontaneous settings (Cunningham, 1977; Zuckerman, DeFrank, Spiegel, & Larrance, 1982; Zuckerman, Hall, DeFrank, & Rosenthal, 1976). Tucker and Riggio (1988) not only found a small positive relation but also found that both intentional and spontaneous accuracy were associated with self-reported expressive ability. However, by contrast, other studies have found little to no association (Fujita et al., 1980; Halberstadt, 1981) or even a small negative association (Walden & Field, 1990). It is interesting to note that Halberstadt (1986) found that individuals low in family expressiveness could perform well under the laboratory conditions of a posing task, whereas those high in family expressiveness were clearer in naturalistic settings.

Properties of the Research Design

In addition to differences in the conceptualization of performance, a second possible explanation for the pool of discrepant findings relates to methodological challenges in doing research on the display and perception of affect. In the area of nonverbal communication—with its typically binary scoring of performance as correct versus incorrect—it has been notoriously difficult to obtain conventional levels of interitem reliability. Null findings could be common and effect sizes attenuated if measures do not reach sufficient reliability for a signal to be seen through the noise. For example, the popular Profile of Nonverbal Sensitivity (PONS) test of positive versus negative and dominant versus submissive behaviors requires 220 items to reach a Cronbach's alpha of .86 (Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979), which reveals a modest interitem correlation averaging only $r = .03$ according to the Spearman-Brown equation (Rosenthal & Rosnow, 1991).[3] If researchers use many fewer test items, then their measures may not reach conventional psychometric standards.[4] Further, those who preselect highly recognizable expressions as stimuli may also dampen individual differences by ensuring that most participants can recognize most test items, which could create a restriction in range. Accordingly, Kenny's (1994) review of individual differences in nonverbal communication accuracy showed that the magnitude of systematic variation across individual perceivers in their overall performance levels was relatively modest.

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[2] We thank an anonymous reviewer for the suggestion that nonverbal display performance is a matter of coordinating nonverbal cues to the situation at hand.

[3] Note that this analysis of interitem correlations implicitly presumes that there is one larger order factor being assessed, which is consistent with researchers' typical use of total scores on the Profile of Nonverbal Sensitivity as an indication of individual differences in nonverbal sensitivity (Rosenthal et al., 1979). Indeed, DePaulo and Rosenthal (1979a) report that large-scale factor analysis of scores on the Profile of Nonverbal Sensitivity reveals one general factor of decoding ability, in addition to four factors related to specific nonverbal channels. Further, they reported that the correlations among various types of decoding skills were "almost always positive" (p. 232). Even so, scores on the Profile of Nonverbal Sensitivity test are multidimensional, encompassing multiple aspects of nonverbal communication. Thus, interitem correlations reflect not only measurement error but also meaningful distinctions across heterogeneous types of items. We thank two anonymous reviewers for raising this topic.

[4] We note that internal consistency is just one important psychometric standard and that instruments with low interitem reliability can still reach high levels of test–retest reliability as well as high levels of predictive validity with respect to important real-world criteria. Indeed, tests with low internal consistency can be highly valid if they consist of individually valid items that are minimally redundant with each other. We thank Gerard Saucier and an anonymous reviewer for this point.

It is worth noting that the same problem does not apply to systematic variation in display performance, which tends to be quite substantial (Kenny, 1994; see also Elfenbein, Foo, Boldry, & Tan, 2006).

There is another explanation related to psychometric properties that is worth considering for some of the most extreme effect sizes found in past work. Lanzetta and Kleck (1970) used a round robin design, in which each participant in a group judged the nonverbal cues of each other participant. The social relations model (SRM; Kenny & LaVoie, 1984) is considered the authoritative statistical technique for analyzing such designs because it accounts for the interdependence in the data that is inherent in a round robin. After all, each person's display serves as each other's stimulus for perception, and vice versa. However, before the SRM was developed, researchers using round robin designs had to run conventional analyses by examining the average level of performance. That is, researchers assigned perception scores to each participant on the basis of his or her judgments of all other individuals in the round robin, and likewise, they assigned display scores on the basis of every other round robin members' judgments of that participant. Kenny (1994) reanalyzed Lanzetta and Kleck's (1970) data and found that there were no individual differences in perception performance in this sample, which means that one would not normally calculate or interpret an association between perception and display. Indeed, the absence of self-ratings inherent in the conventional analysis strategy for such designs could have inadvertently created an artifact in their reported value—because people who were highly expressive did not have the benefit of rating themselves, effectively causing their accuracy to be evaluated across a more challenging sample of stimuli. Conversely, people who were unexpressive had the benefit of discarding the hardest test items. In the hypothetical case of zero real correlation between display and perception, this would create the appearance of a perfectly negative relation (corrected for any unreliability of the expression measure), which is close to Lanzetta and Kleck's (1970) $r = -.80$. This possibility might also explain why a number of other studies with conventional analyses of round robin designs with self-ratings removed have reported a negative relation between accuracy in displaying and perceiving the same emotion but a positive relation for displaying and perceiving different emotions (Gallagher & Shuntich, 1981; Zuckerman et al., 1976; Zuckerman et al., 1975). The same-emotion effects make use of a much smaller number of test items and thus could have lower reliability to detect individual differences across perceivers. This could lead to less stable estimates of the display–perception relation. We certainly do not argue for invalidating all conclusions based on round robin designs without use of updated analytical techniques, but merely that it is worth examining whether the pool of research findings may be more consistent in their presence versus absence.

The Current Study

In this article, we attempt to reopen the longstanding mystery of the relation between performance in the display and perception of nonverbal cues of affect, which has continued importance for clinicians and renewed importance for theories of emotional intelligence and affective competence. We present a meta-analytic review of past work in order to examine the existing body of evidence, about 30 years since the last quantitative review (DePaulo & Rosenthal, 1979a).

Although empirical attention to this research question has tended to wane in light of the puzzling inconsistencies in past findings, the wide interest in the two underlying constructs has still ensured that some large-scale data sets include measures of both. It is possible that there were discrepancies in the early findings reviewed above but that the accumulated work since then has been more consistent. Further, diverse methods in the pool of studies could allow us to examine possible moderating factors to reveal the different conditions under which to expect a positive, negative, or neutral relation. By contrast, it was not feasible in past reviews to conduct formal tests of moderation for the display–perception relation, given that DePaulo and Rosenthal (1979a) had available a pool of only 17 studies. On the basis of the arguments outlined above, our moderator analyses focus particular attention on the distinction between intentional displays and spontaneous or naturalistic displays and on aspects of the research design such as psychometric properties and the use of round robins.

Method

Because many recent studies with relevant data were not specifically designed to answer this question, it is worthwhile to search comprehensively and include work that might normally be missed. In order to locate relevant studies, we conducted an initial search of Psychological Abstracts (PsychLIT) and retrieved documents containing the terms *expression* or *encoding* along with *perception*, *recognition*, *decoding*, or *understanding*. Articles referenced in usable articles from the first method were also examined. Citations of usable articles were also checked with PsychINFO and the Social Sciences Citation Index.

To be included in this meta-analytic review, a study had to satisfy four criteria. In following these criteria, we draw on Feldman Barrett and Russell's (1999) definition of affect as an experienced state that can be described along dimensions of pleasantness and activation. This corresponds also to the definition of the term *affect* from *The American Heritage Dictionary of the English Language* (2009): "feeling or emotion, especially as manifested by facial expression or body language." First, usable studies had to include a measure of affective display for which there was an objective criterion for performance. The most typical two criteria were whether outside judges could code which affective state the participant had been asked to portray and whether the judges could correctly code the experimental manipulation during which participants' displays were recorded. Following Wagner et al.'s (1993) definition of communication as "the transfer of information . . . [which] does not necessarily imply intentionality or awareness on the part of the sender" (p. 51), studies were excluded if they assessed only the quantity of expressiveness without measuring whether it could be understood clearly by others. Second, usable studies had to include a measure of perceiving affect for which there was an objective criterion for performance. The most typical criterion was whether participants correctly identified the affective state that the poser had been asked to portray or that would be typically elicited during the experimental manipulation. Third, the authors had to report—or to provide upon request—a correlation coefficient indicating the association between participants' display

and participants' perception performance. Fourth, participants could not be members of clinical populations, such as individuals diagnosed with schizophrenia or autism. However, nonclinical control groups in clinical studies could be included if analyses were reported separately.

A total of 40 articles, including at least 1,925 participants, were identified that satisfied these criteria. We note that in no studies reporting a display–perception relation were there nonverbal cues that did not fall into the definition of affect described above, which suggests that this selection criterion was not overly restrictive. To include the largest pool possible, we retained three studies that used the Profile of Nonverbal Sensitivity test, which examines nonverbal cues of positive versus negative affect but also includes cues of dominance versus submission. The pool of available studies has more than doubled since DePaulo and Rosenthal's (1979a) review. The publication years reflect a spark of interest in the topic during approximately the mid-1960s to mid-1980s, with most subsequent articles reporting effects only incidentally when using both measures to examine another research question. Indeed, every article after 1997 required private correspondence with the authors to provide an effect size.

We calculated a single overall display–perception effect size for each study and coded the studies for attributes of research design. Based on the features that are reported consistently across studies by the original authors, this included the following: the population from which the sample was drawn, the sample size, participants' age and sex composition, the channel of nonverbal communication, whether the affective displays were elicited through instructions to communicate intentionally versus elicited through spontaneous means or instructions to provide naturalistic displays (or a hybrid of these methods), whether the study used a round robin design, and attributes of the measures of nonverbal perception and display performance, including the number of test items for each. In two cases, a display–perception relation based on unpublished work was listed in DePaulo and Rosenthal's (1979a) review. Because the work was not available to be coded for its research design, this leaves 38 studies in analyses of moderating variables. To be conservative with respect to the tendency not to publish null findings, we included seven studies—including both published and unpublished work—in the review and coded them as having an effect size of zero if the authors did not report the effect size but reported that they tested the relation and found that it was not significant. In the case of hybrid display methods, given that there was insufficient information reported in five of the eight studies to distinguish the effect for naturalistic versus intentional expressions (Borod, Koff, Lorch, & Nicholas, 1986; DePaulo & Rosenthal, 1979b; Fujita et al., 1980; Morency & Krauss, 1982; Zuckerman et al., 1976), we report a single combined effect size for all such studies. Hillary Anger Elfenbein coded all data that were used in analyses. Further, Noah Eisenkraft coded 20% of the articles in order to confirm high intercoder reliability (average $r = .98$).

Results

Table 1 contains information about the studies included in this meta-analysis. The correlations generated by these studies are displayed in stem-and-leaf diagrams in Table 2 (Rosenthal & Rosnow, 1991). Table 3 presents a statistical summary of these correlations, including more information about measures of central tendency and variability (Rosenthal, 1995). The mean display–perception correlation is $r = .09$, and the median correlation is $r = .05$. Although these values are quite small (Rosenthal & Rosnow, 1991), given the large number of participants represented across the 40 studies, the positive correlation is statistically significant (Stouffer's $Z = 2.89$, $p = .002$).

We computed confidence intervals (CIs) around the mean values using both fixed-effects and random-effects models. The difference between these two types is the level of generality that can be attributed to the results (Hedges & Vevea, 1998). Fixed-effects models attempt to generalize only to the studies included in the meta-analysis and, as such, they have more narrow CIs. By contrast, random-effects models attempt to generalize to the universe of studies that could have been conducted and include wider CIs that account for both the variation within each study and the variation across studies. Listed in Table 3 are 95% CI (.03, .14) for fixed-effects models and 95% CI (.00, .17) for random effects models, calculated using Viechtbauer (2009).

To address the possibility of a file-drawer problem (Rosenthal, 1991)—in that the conventional publication criteria of editors may result in a biased sample of articles for inclusion—we computed a sensitivity analysis that showed it would require 77 studies languishing in file drawers with an effect size of zero to bring down the average effect to just barely significant at $p = .05$. This is almost twice the number of articles actually in the review.

To determine the influence of including studies in the review that were coded as having an effect size of zero because the authors reported only that there was a nonsignificant effect, we additionally report the mean value while excluding such studies. The value of $r = .11$ with 95% CI (.05, .17) for fixed effects and 95% CI (.01, .20) for random effects are similar but have slightly larger effect sizes than do the 95% CIs based on all studies. For further illustration, we display these studies separately, using italicized font in the stem-and-leaf diagrams in Table 2.

As robust as the average result might appear from these criteria, there is a very large degree of heterogeneity across studies, $\chi^2(37) = 109.72$, $p < 10^{-8}$. The heterogeneity test examines the extent to which one could expect to obtain this disparate a collection of effect sizes from the random sampling of a single underlying effect (Rosenthal, 1991)—which, in this case, appears unlikely. This strongly cautions against interpreting the average correlation and suggests the value of examining potential moderators.

Intentional communication displays versus naturalistic expressiveness. The first moderator relates to the way in which nonverbal cues of affect were elicited from participants. Consistent with past observations, the display–perception relation was substantially larger for studies with expressions that had explicit communicative intent ($r = .19$, $k = 24$ studies) than those having naturalistic methods such as spontaneous displays or a combination of measures ($r = -.08$, $k = 14$ studies). These two types of studies differ significantly, with both the formal procedures outlined in Rosenthal (1991; $Z = 5.06$, $p < .01$) and a more conservative test that treats each effect size as a single observation, $t(36) = 3.00$, $p < .01$. Thus, studies with intentional, versus naturalistic, displays also appear separately in Tables 2 and 3. From the stem-and-leaf plots in Table 2, one can see that the 10 largest positive effect sizes were for communicative intent and the three largest negative effect sizes were for naturalistic displays. These

analyses suggest that this theoretical moderator is relatively powerful in explaining past discrepancies in the empirical data.

Round robin designs using conventional analysis. Round robin designs—in which each participant judges the displays of each other participant—present statistical challenges in that they generate data that are interdependent and require relatively recent analytical techniques (Kenny & LaVoie, 1984). However, the past research in which researchers used these designs to examine the display–perception relation predated such techniques. To reiterate from above, we do not argue that all of the results based on round robin designs would be invalidated if they were reanalyzed with the SRM rather than with conventional methods. However, we do note here that these studies account for most of the extreme outliers in the existing body of research. As displayed in a stem-and-leaf plot in Table 2, the seven such studies include three of the four most positive effects and two of the three most negative.

Placing aside these seven studies substantially reduces the variation of findings within the resulting pool, according to a test of the change in heterogeneity, $\chi^2(7) = 51.07$, $p < 10^{-8}$. Further, after placing these studies aside, there is no remaining heterogeneity in the pool of studies with naturalistic methods or a combination of methods, $\chi^2(10) = 9.33$, $p = .50$. There is still heterogeneity in the pool of studies with displays with communicative intent, $\chi^2(19) = 42.33$, $p < .01$. However, from a visual inspection of Table 2, this appears to be caused by a single outlier, and there is no further heterogeneity after this one study is removed, $\chi^2(18) = 14.48$, $p = .70$.

Adequacy of measures. Given the difficulty in achieving conventional psychometric standards for reliability in tests of nonverbal perception, it is perhaps not surprising that few studies reported such reliability levels. As an alternative, Table 1 reports the total number of test stimuli included. In the case of display performance, we considered the test items to be the product of the number of poses and the number of raters who judged those poses. There was no association between the effect size and the number of test items on either the perception test ($r = .02$), $t(36) = 0.14$, *ns*, or the display test ($r = .26$), $t(36) = 1.53$, *ns*. For a threshold of 60 test items to be coded as adequate—which would yield total reliability of at least .65 if the average interitem correlation is at least .03, the value calculated above for the Profile of Nonverbal Sensitivity test—there was no difference between the effect sizes for studies that had an adequate, versus inadequate, number of items on the perception test ($r = .07$, $k = 25$ studies versus $r = .13$, $k = 13$ studies), $t(36) = 0.54$, *ns* or the display test ($r = .10$, $k = 34$ studies versus $r = .04$, $k = 4$ studies), $t(36) = 0.38$, *ns*.

Other moderating variables and additional analyses. In addition to the primary moderators that we examined above—relating to the conceptualization of performance and the research design—this meta-analysis also allows us the chance to examine other variables as potential explanatory factors for the variation in findings across the decades of research on the relation between the nonverbal display and the perception of affective cues. Without specific hypotheses, we examined a range of variables on the basis that they were documented consistently across the original research reports.

The studies in this meta-analysis included nonverbal cues conveyed via the face, the body, the voice, and combinations of these channels. Because many researchers included multiple channels in the same study, we examined their potential influence using least-squares multiple regression with dummy codes representing whether specific nonverbal channels were present or absent, rather than a categorical model. This allowed us to consider studies with multiple channels, even when the data were not reported separately by channel. Correlation effect sizes were subjected to Fisher's *r*-to-*Z* transformation prior to analysis (Rosenthal & Rosnow, 1991). Examining these studies suggests some confounding of the nonverbal channel with the communicative intent of the expressions, in that it is more common to record spontaneous displays unobtrusively from the face or body than from the voice. Thus, we conducted multiple regression analyses predicting the display–perception effect, beginning with a dummy variable for communicative intent. There was no improvement to the model fit when adding the three dummy codes for nonverbal channels, $F(3, 33) = 0.49$, *ns*, change in $R^2 = .03$.

There was no association between the year of the study and the effect size, $r(38) = -.19$, $t(36) = 1.21$, *ns*. There was no difference in the effect size for studies that sampled adults ($r = .09$, $k = 29$ studies) and those that sampled children ($r = .07$, $k = 7$ studies), $t(36) = 0.22$, *ns*. Two studies were excluded from this analysis that sampled both children and adults without reporting results separately. Of the 38 studies for which sex could be coded, 29 used mixed-sex groups, and none reported results separately for each sex. Given that one of the remaining nine was Lanzetta and Kleck's (1970) all-male study—which is an outlier 2.5 *SD* below the average effect size and 1.5 *SD* below the next closest effect—sex composition was not subjected to further analysis.

Further, given that Lanzetta and Kleck (1970) appeared to be such an extreme outlier, we examined the pool of studies with, versus without, it. Excluding this one article with a large negative effect size increases the average effect size to $r = .12$, with 95% CI (.04, .19) for fixed effects and 95% CI (.04, .19) for random effects for the entire pool of studies. For the pool of studies using naturalistic and hybrid display types, the average effect size increased to $r = .00$, with 95% CI (−.10, .10) for fixed effects and 95% CI (−.11, .10) for random effects.

Discussion

The current work provides the most comprehensive evidence to date toward solving an unresolved mystery in the research literature on individual differences in nonverbal communication: the relation between performance at displaying one's emotional cues clearly and performance at perceiving clearly the emotional cues of others. Although this question initially attracted extensive research interest—which peaked and then waned many decades ago in the face of conflicting findings—it has maintained relevance to clinicians and has taken on renewed theoretical importance in light of recent models of emotional intelligence and affective competence. Given that these models encompass both affective display and perception, we ask whether there is evidence that such skills converge together.

The analyses above were intended as a large-scale effort toward answering this question. Conducting a meta-analysis of past work, we reviewed 40 effects based on approximately 2,000 participants. A large additional body of work has accumulated in the time since the field appeared to lose interest in this question, primarily due to

(text continues on page 313)

Table 1
Summary Table of Studies Reporting the Correlation Coefficient Between Nonverbal Display and Perception Performance

Item number	Source	Sample	Effect size *r*	*N*	Measure of nonverbal perception	Perception test items	Measure of nonverbal display	Display test items	Display type	Age	Sex	Round robin design
1	Borod, Koff, Lorch, & Nicholas (1986)	Adults with no clinical diagnosis	Not significant, presumed zero	16	Judgments of facial behaviors	9	Videotaped unobtrusively while viewing emotion-laden slides and deliberately posed facial and vocal behaviors	160	Hybrid	Adult	Male	No
2	Borod et al. (1990)	Adults with no clinical diagnosis	.23	21	Judgments of facial behaviors and vocal tones	99	Posed facial and vocal behaviors	128	Communicative intent	Adult	Mixed	No
3	Boyatzis & Satyaprasad (1994)	Fourth and fifth graders	−.13	34	Judgments of facial behaviors	6	Posed facial behaviors	12	Communicative intent	Child	Mixed	No
4	Camras et al. (1988)	Mothers of abused and nonabused children	.27	78	Judgments of facial behaviors	20	Posed facial behaviors, judged by outside raters	24	Communicative intent	Adult and child	Female	No
5	Cunningham (1977)	University students	−.36	36	Judging positivity–negativity of face, voice, and body channels from participants in mood induction exercise	108	Following elation or depression mood induction, semi-spontaneous standard content vocal tone and videotapes of posed facial and vocal behaviors	108	Hybrid	Adult	Mixed	No
6	Daly, Abramovitch, & Pliner (1980)	Mothers of 5-year-old children	Not significant, presumed zero	18	Judged videotapes of others' reactions while viewing emotion-laden slides	24	Videotaped while viewing emotion-laden slides, semi-spontaneous because knew taping but not the reason	240	Naturalistic	Adult	Female	No
7	DePaulo & Rosenthal (1979a)	University students	.16	40	Judgments of (nondeceptive) affect of positive, negative, and ambivalent valence	60	Full-channel videos of posed descriptions of positive, negative, and ambivalent valence	60	Communicative intent	Adult	Mixed	No
8	DePaulo & Rosenthal (1979b)	University students	.00	40	Detecting false and real affect in videotaped segments	120	Outside raters' ability to detect false and real affect in videotaped segments	120	Hybrid	Adult	Mixed	No
9	DiMatteo (1979)	Physicians	.16	49	PONS test, naturalistic posed stimuli in video and vocal channels	220	Posed videotaped expressions	672	Communicative intent	Adult	Mixed	No

Table 1 (*continued*)

Item number	Source	Sample	Effect size *r*	*N*	Measure of nonverbal perception	Perception test items	Measure of nonverbal display	Display test items	Display type	Age	Sex	Round robin design
10	Elfenbein, Polzer, & Ambady (2007)	17–23-year-olds in a job program	.00[a]	58	DANVA test of facial behaviors and vocal tones	48	Video exercise of naturalistic behaviors judged by outside raters	40	Naturalistic	Adult	Mixed	No
11	Field & Walden (1982)	Preschool children	.07	34	Judged photographs of facial behaviors	8	Posed facial behaviors	128	Communicative intent	Child	Mixed	No
12	Flack, Cavallaro, Laird, & Miller (1997)	Adults with no clinical diagnosis	.05	24	Judged photographs of facial behaviors	6	Posed facial behaviors	18	Communicative intent	Adult	Male	No
13	Fujita, Harper, & Wiens (1980)	University students	Not significant, presumed zero	24	Viewing spontaneous and posed silent videos of individuals watching emotion-laden stimuli	124	Both posing and unobtrusive silent videotaping during slide-viewing paradigm	160	Hybrid	Adult	Mixed	No
14	Gallagher & Shuntich (1981)	University students	.35	20	Judged posed vocal tones	180	Posed vocal tone for emotional categories	180	Communicative intent	Adult	Mixed	Yes
15	Halberstadt (1981)	University students	−.12	64	Judgment of posed and spontaneous videotaped and filtered audiotaped nonverbal behaviors	224	Posed and spontaneous videotaped and audiotaped behaviors	224	Hybrid	Adult	Mixed	No
16	Halberstadt (1983)	University students	.05	28	Judgment of posed vocal tones	272	Posed vocal behaviors for emotional scenarios	224	Communicative intent	Adult	Mixed	No
17	Hall, Zuckerman, Halberstadt, & Rosenthal (1979), unpublished work cited in DePaulo & Rosenthal (1979a)	N/L	.05[b]	N/L	N/L	N/L	N/L	N/L	N/L	Adult	N/L	N/L
18	Harper, Wiens, & Matarazzo (1979)	Adults	.18	17	Judgment of videotapes of participants watching emotion-arousing slides	288	Videotaped while viewing emotion-arousing slides, with participants' awareness	144	Naturalistic	Adult	Male	No

(*table continues*)

Table 1 (*continued*)

Item number	Source	Sample	Effect size *r*	*N*	Measure of nonverbal perception	Perception test items	Measure of nonverbal display	Display test items	Display type	Age	Sex	Round robin design
19	Hill, Siegelman, Gronsky, Sturniolo, & Fretz (1981)	Students	Not significant, presumed zero	60	PONS test; naturalistic posed stimuli in video and vocal channels	220	Videotaped while enacting scenarios similar to those in the PONS test	56	Communicative intent	Adult	Mixed	No
20	Hodgins & Belch (2000)	University students	.24[a]	56	Viewed videotapes of others posing nonverbal behaviors	70	Videotaped while posing emotions with standard verbal content	230	Communicative intent	Adult	Mixed	No
21	Inoue, Fujihara, Ishii, & Muramoto (1984)	Fourth graders and university students	Not significant, presumed zero	20	Judged photographs of facial behaviors	120	Posed facial behaviors	120	Communicative intent	Adult and child	Mixed	Yes
22	Koerner & Fitzpatrick (2002)	Married couples	.04[a]	110	Judgment of live posed emotional behaviors	30	Videotaped posed emotional behaviors, rated by outside judges	525	Communicative intent	Adult	Mixed	No
23	Knower (1945)	University students	.49	N/L, at least 100	Judged facial behaviors and body movements, followed by content-free vocal tone	11 stimuli ∗2 channels and >15 raters each	Performed facial behaviors and body movements, followed by content-free vocal tone	11 stimuli ∗2 channels and >15 raters each	Communicative intent	Adult	Mixed	Yes
24	Lanzetta & Kleck (1970)	University students	−.80	12	Rating of unobtrusive videotapes made of others (waist and above) while being shocked or not	100	Outside judges ability to rate unobtrusive videotapes made of waist and above while being shocked or not	100	Naturalistic	Adult	Male	Yes
25	Levy (1964)	University students	.63	77	Judgments of vocal tones	37	Posed vocal tone with standard content	200	Communicative intent	Adult	Mixed	No
26	Manstead, Wagner, & MacDonald (1986)	University students and employees	−.24	36	Judgment of liking versus disliking in videotaped descriptions shown in video, audio, and audiovisual channels	72	Expression of liking versus disliking in videotaped descriptions shown in video, audio, and audiovisual channels	72	Naturalistic	Adult	Mixed	Yes

Table 1 (*continued*)

Item number	Source	Sample	Effect size *r*	*N*	Measure of nonverbal perception	Perception test items	Measure of nonverbal display	Display test items	Display type	Age	Sex	Round robin design
27	Miller (1966)	University students	.23	80	Judgment of posed vocal tones preselected for high agreement	96	Posed vocal tones	540	Communicative intent	Adult	Mixed	No
28	Morency & Krauss (1982)	First and fifth grade children	Not significant, presumed zero	84	Rated intended emotion in posed photos and pleasantness of spontaneous behaviors	60	Posed intended emotion in posed photos and spontaneous expressions during slide-viewing paradigm	N/L	Hybrid	Child	Mixed	No
29	Nowicki & Duke (1994)	Children	−.01[a]	184	DANVA test of facial behaviors and vocal tones	60	DANVA test of posing facial and vocal behavior	104	Communicative intent	Child	Mixed	No
30	Odom & Lemond (1972)	Kindergarten and fifth grade children	.29	64	One of two conditions: matched photos of same facial behavior or selected photo to match a situation	16	One of two conditions: posing facial behaviors or imitating photos from Izard (1971)	80	Communicative intent	Child	Mixed	No
31	Odom (1978), unpublished work cited in DePaulo & Rosenthal (1979a)	Kindergarten children	.00[b]	N/L	N/L	N/L	N/L	N/L	N/L	Child	N/L	N/L
32	Osgood (1966)	University students	Not significant, presumed zero	50	Judgment of posed facial behaviors. Half of items instructed to judge only, half to judge and to mimic	36	Facial behaviors posed live in front of the audience	96	Communicative intent	Adult	Male	No
33	Sabatelli, Buck, & Dreyer (1982)	Married couples	.08	96	Communication of Affect Receiving Ability Test (CARAT), videotaped sequences of reacting to emotional slides	32	Outside judges ability to rate unobtrusive videotapes made of face while discussing emotional slides	120	Naturalistic	Adult	Mixed	No
34	Walden & Field (1990)	Preschool children	.23	36	Judged photographs of facial behaviors	36	Posed and spontaneous facial behaviors	>64[c]	Hybrid	Child	Mixed	No

(*table continues*)

Table 1 (*continued*)

Item number	Source	Sample	Effect size *r*	*N*	Measure of nonverbal perception	Perception test items	Measure of nonverbal display	Display test items	Display type	Age	Sex	Round robin design
35	Wolf, Gorski, & Peters (1972)	University students	.04	25	Judged posed vocal tones	96	Posed vocal tones	80	Communicative intent	Adult	Male	No
36	Zaidel & Mehrabian (1969)	University students	.20	12	Tape-recorded vocal expressions and photos of facial behaviors	228	Tape-recorded vocal tones and photos of facial behaviors	220	Communicative intent	Adult	Mixed	No
37	Zuckerman, Hall, DeFrank, & Rosenthal (1976)	University students	.20	59	PONS test; naturalistic posed stimuli in video and vocal channels, 2/3 unintended sending and 1/3 intentionally posed	220	Spontaneous sending: Unobtrusive videotapes of faces made while watching positive and negative stimuli; Semi-spontaneous sending: Videotapes and vocal recordings while talking about reactions to positively and negatively valenced stimuli	116	Hybrid	Adult	Mixed	Yes
38	Zuckerman, Larrance, Hall, DeFrank, & Rosenthal (1979)	University students	.21	60	Judgment of posed and spontaneous videotaped nonverbal behavior	160	Spontaneous sending: Unobtrusive videotapes of faces made while watching positive and negative stimuli	160	Naturalistic	Adult	Mixed	No
39	Zuckerman, Lipets, Koivumaki, & Rosenthal (1975)	University students	.65	30	Judgment of posed facial behaviors and vocal tones	114	Posed facial displays and vocal tones	360	Communicative intent	Adult	Mixed	Yes
40	Zuckerman & Przewuzman (1979)	Preschool children	.05	73	Judged color slides and black-and-white photos	70	Posed facial displays	173	Communicative intent	Child	Female	No

Note. N/L indicates that an entry could not be coded. PONS = Profile of Nonverbal Sensitivity; DANVA = Diagnostic Analysis of Nonverbal Accuracy.
[a] Additional analysis conducted by original study authors for inclusion in this review upon request via private correspondence. [b] Unpublished article with correlation *r* listed in DePaulo and Rosenthal's (1979a) review. [c] Article states that 32 photographs were coded by raters, with the number not listed but presumably at least two.

Table 2
Stem and Leaf Plots of Correlation Coefficients (R) Between Nonverbal Display and Perception Performance (k = 40 Studies)

All studies		Communicative intent		Naturalistic or combination of display types		Round robin designs		Communicative intent without RRs		Naturalistic or combination without RRs	
Stem	Leaf	Stem	Leaf	Stem	Leaf	Stem	Leaf	Stem	Leaf	Stem	Leaf
.6	3 5	.6	3 5	.6		.6	5	.6	3	.6	
.5		.5		.5		.5		.5		.5	
.4	9	.4	9	.4		.4	9	.4		.4	
.3	5	.3	5	.3		.3	5	.3		.3	
.2	0 0 1 3 3 3 4 7 9	.2	0 3 3 3 4 7 9	.2	0 1	.2	0	.2	0 3 3 3 4 7 9	.2	1
.1	6 6 8	.1	6 6	.1	8	.1		.1	6 6	.1	8
.0	*0 0 0 0 0 0 0* 0 0 4 4 5 5 5 5 7 8	.0	*0* 0 4 4 5 5 5 7	.0	*0 0 0 0 0 0* 8	.0	*0*	.0	*0* 4 4 5 5 5 7	.0	*0 0 0 0 0* 0 8
−.0	0 1	−.0	0 1	−.0		−.0		−.0	0 1	−.0	
−.1	2 3	−.1	3	−.1	2	−.1		−.1	3	−.1	2
−.2	4	−.2		−.2	4	−.2	4	−.2		−.2	
−.3	6	−.3		−.3	6	−.3		−.3		−.3	6
−.4		−.4		−.4		−.4		−.4		−.4	
−.5		−.5		−.5		−.5		−.5		−.5	
−.6		−.6		−.6		−.6		−.6		−.6	
−.7		−.7		−.7		−.7		−.7		−.7	
−.8	0	−.8		−.8	0	−.8	0	−.8		−.8	

Note. For all studies, $k = 40$; for communicative intent, $k = 24$; for naturalistic or combination of display types, $k = 14$; for round robin designs, $k = 7$; for communicative intent without RRs, $k = 20$; and for naturalistic or combination without RRs, $k = 11$. Two studies could not be coded and therefore appear only in the first plot. Studies appear in italicized font if they were coded as zero because the authors reported only that they tested the display–perception relation and found that it was not significant. RR = round robin designs.

researchers who reported results incidentally while examining other topics.

The result is a pattern that is complex yet finally consistent in a literature that was previously noteworthy for its inconsistency. Overall, we found a positive effect that was small but statistically significant. However, heterogeneity analyses revealed that studies varied greatly compared with what one would expect if there were just one underlying effect. Indeed, visual inspection of the overall stem-and-leaf plot suggests an extreme distribution, with effects from $r = -.80$ all the way to $r = +.64$. Accordingly, our next goal was to explain the discrepancy in past findings by analyzing potential moderators, and we focused on two particular factors.

The first moderator of interest was whether researchers had elicited nonverbal cues as intentional communication displays on the part of participants—that is, a theoretical conceptualization of performance that could indicate an underlying ability—versus coded the clarity of naturalistic behaviors that were elicited without giving the participants a goal to express their emotions legibly

Table 3
Statistical Summary of Correlation Coefficients (R) Between Nonverbal Display and Perception Performance

Statistic	All studies	Communicative intent	Naturalistic or combination of display types
Sample of studies			
Number of articles	40	24	14
N participants[a]	1,925	1,305	620
Central tendency of effect sizes			
M effect size	.087	.190	−.083
Stouffer's *Z* statistic	2.89	3.89	−0.29
p for Stouffer's *Z* statistic	.002	.00005	*ns*
Median effect size	.050	.162	.000
File drawer statistic	77	110	not applicable
Variability in effect sizes			
SD	0.284	0.228	0.335
Fixed effects 95% confidence interval	(.031, .143)	(.121, .257)	(−.185, .021)
Random effects 95% confidence interval	(.007, .167)	(.091, .285)	(−.197, .033)
Heterogeneity test (χ^2)	109.46	66.24	27.76
df for heterogeneity test[b]	37	23	13
p for heterogeneity test	<.00001	<.00001	.01

[a] The number of participants could not be coded for two studies, leading to 38 studies included in analyses requiring sample size and an underestimate in the total number of participants. [b] The style of display could not be coded for two studies, leading to 38 studies included in analyses that separate these types of studies.

to others. This corresponds to a theoretical distinction between nonverbal ability and nonverbal behavior (Halberstadt, 1986; Zuckerman et al., 1976). Indeed, this moderating factor appeared to explain much of the variation across past studies reviewed in the meta-analysis. Studies with communicative intent had positive effects—an average of $r = .19$—when compared with those with either naturalistic elicitation or a combination of these methods, for which the effect did not differ reliably from zero. The positive value could be quite a bit higher if it were disattenuated for measurement error (Schmidt & Hunter, 1996). Given the typically low interitem correlations on tests of nonverbal perception, such error is likely to be quite substantial and serves to reduce the apparent effect size, so that $r = .19$ is an underestimate. However, a correction for error could not be done in the present analysis because authors rarely reported the reliability of their measures. As further evidence for the power of this moderator, separating the stem-and-leaf plots according to the conceptualization of performance showed that the positive tail of the distribution belonged solely to studies with communicative intent and that the negative tail of the distribution belonged solely to studies with spontaneous methods, naturalistic methods, or a combination of methods. This finding has important theoretical implications. The skills of affective display and perception should not be lumped together within a single construct such as emotional intelligence without further clarification about what is meant by performance. It appears that emotional skills may converge with each other under intentional best attempts but diverge from each other under daily circumstances.

A second moderating factor related to properties of the research design. Although we did not find differences across studies based on the number of test items, this was only a proxy for measurement reliability—the latter being the real construct of interest. It is worth pointing out that seven of the effect sizes with values of zero were coded as such when the authors stated only that the display–perception relation was tested and not significant. We speculate from the number of participants in many of these studies that the power was not so large as to infer strong conclusions from these null results. However, we did find that most of the heterogeneity among studies vanished when setting aside those studies with round robin designs but with conventional statistical techniques rather than the SRM (Kenny & La Voie, 1984) to analyze them. The use of analyses that did not account for interdependence may have introduced some type of bias or error that made these effect sizes among the most variable and extreme in both directions.

Taken together, these two moderators explained most of the heterogeneity in the pool of studies—in other words, when taking into account these two factors, the apparently inconsistent nature of prior findings nearly disappears. Analysis of other moderating variables—chosen on the basis of study attributes that were consistently reported by the original authors—did not explain further variation across studies. Thus, the analyses reported here provide a relatively comprehensive answer to the mystery of decades' worth of conflicting empirical findings about the relation between nonverbal display and perception performance.

The relation between nonverbal display and perception. Given the plethora of theories reviewed in the introduction, with data in hand, we cannot help but ask, which is right?

Our results suggest that theorists are justified in linking emotional display and perception performance together within a single model of emotional intelligence or social skill if they specify that the former refers to individuals' purposeful attempts to express themselves. For such displays, it indeed appears that emotional abilities converge—consistent with longstanding arguments that emotional skills form a general communication factor (Levy, 1964, p. 51). These findings are also consistent with—even if they do not directly test—the potential for emotional expression and perception skills to reinforce each other (Osgood, 1966), the observation that the two skills typically develop in tandem (Boyatzis & Satyaprasad, 1994), and the finding that functional deficits tend to impair both skills (e.g., Flack et al., 1997; Halberstadt et al., 2001).

We found no systematic evidence for a negative correlation between emotional display and perception skill, even for studies that did not involve purposeful attempts to communicate. After removing the studies with round robin designs before the availability of analytical techniques that account for the statistical interdependence of such designs (Kenny & La Voie, 1984), the naturalistic studies summarized in the stem-and-leaf plot in the last column of Table 2 included six zeros, three positive values, and two negative values, which combine for an average correlation of $r = -.002$. The round robin studies that were removed included two of the large negative values that originally inspired theoretical perspectives regarding a negative relation (Lanzetta & Kleck, 1970; Manstead, Wagner, & Macdonald, 1986).

These findings suggest restraint toward arguments in which an attempt is made to account for a negative relation. Given that consistent positive correlations appeared under conditions of deliberate communication, it would be difficult to maintain that people accommodate interpersonally by making special efforts to communicate clearly those messages they find difficult to understand in others (Zuckerman et al., 1979) because such logic should apply particularly to communicative intent. Likewise, it is difficult to reconcile the positive correlations for deliberate communication with the notion that highly expressive people may inhibit others and, subsequently, receive impoverished stimuli to judge and from which to learn over time (Gallagher & Shuntich, 1981).

Although affective display and perception performance may be related in terms of how people are capable of expressing themselves, our findings suggest that they are not related in terms of how people typically express themselves. This is consistent with prior work indicating that the two skills operate via independent neural pathways (Borod et al., 1990) and that display skills can develop even in blind children who have never viewed others' emotional displays (Galati et al., 1997). Therefore, theorists may want to develop further perspectives that can account for this apparent lack of relation under conditions of naturalistic expression—even at the risk of accepting a null hypothesis (cf., Kluger & Tikochinsky, 2001). Above, we advanced the idea that some arguments for each direction of the effect could be veridical and could cancel each other out to reveal no apparent relation. Although some theories predicting a negative relation are not consistent with the finding that experimental instructions to pose emotions deliberately yield a positive relation, other theoretical predictions could be sensitive to such experimental conditions. In particular, the apparent influence of parental socialization could vary based on social expectations. Experimental induction of deliberate expressive goals could overcome suppression tendencies by making it psychologically safe and even desirable to express oneself clearly.

Limitations and future research. As with all meta-analyses, the results presented above were limited by the availability of research for inclusion. They were also limited by the same limitations of the original underlying empirical work. Given that there were two moderators that accounted for most of the variation in findings across studies—with the exception of a single outlier noted by visual inspection—we emphasize several limitations related to these moderators. Future research should demonstrate whether the present pattern of results holds even with research designs that address such concerns.

The first important moderating factor was how the researcher conceptualized display performance, which makes it worth scrutinizing the theoretical meaning of this methodological choice. We raise one concern each for the studies with naturalistic and intentionally communicated displays. In the case of naturalistic studies—in which researchers typically recorded behavior while participants were unaware they were being observed—most designs make it particularly likely that studies would tap into trait-level expressivity as a personality variable relating to legibility rather than performance that reflects an underlying ability. In these paradigms, participants had no audience or reason to express themselves in a particular way. In the case of studies with intentionally communicated displays, the opposite concern emerges. In such work, one could debate whether participants were undergoing any type of affective experience at the time versus exclusively posing their displays for public consumption. For example, Cunningham (1977) and others critiqued the display–perception studies that relied on posing because participants had little opportunity to experience affect subjectively and get into a mood with a personal or dramatic context prior to enacting their displays. Such posed displays have been critiqued as artificial portrayals that may not capture the richness of authentic emotional expression (Russell, 1994; Russell, Bachorowski, & Fernandez-Dols, 2003). Thus, the current results raise issues that would be worthwhile to address in further research.

The second key moderating factor was related to methodology. The rich existing pool of work spans 6 decades, but the apparent loss of interest in the research question about two decades ago in the wake of conflicting findings means that researchers performing this work have not been able to take advantage of recent advances, particularly in the statistical techniques associated with analyzing interdependent data (Kenny & La Voie, 1984).

To the extent possible, in the future, researchers should also attempt to test directly the mechanisms implicated in the theoretical perspectives outlined above. For example, longitudinal studies of family units could provide data about children's development of complementary performance abilities. Researchers could use multilevel modeling to test the idea that individuals have relatively consistent total levels of communication performance but that intraindividually, they make tradeoffs by splitting this performance across the complementary activities of accurate display and perception.

Ultimately, we examined the relation between only two affective skills among the many skills that have been linked together in umbrella models of emotional intelligence (e.g., Davies et al., 1998; Mayer, Salovey, & Caruso, 2000). We began with affective display performance and affect perception performance because they are the flip sides of the same coin—the clear communication of affective states via nonverbal cues—and because they have a decades-old history of research available for review. However, to provide further grounding for theories of emotional intelligence, in future work, researchers should examine the convergence among additional behavioral demonstrations of affective skills, such as emotion regulation, intrapersonal awareness, and managing the emotions of others. In the meantime, the present findings offer encouraging evidence that the operational definition of affective display performance most consistent with ability models (Carroll, 1993)—that is, deliberate posing—correlates with performance at affect perception. This suggests the intriguing possibility that distinct emotional skills may converge with each other.

Practical implications. In addition to the theoretical implications discussed above, these findings have important practical implications for clinicians and researchers. Performance in communicating affective states via nonverbal cues is associated with important personal outcomes as broad as social adjustment, mental health, academic achievement, and workplace performance (for reviews, see Elfenbein, Foo, White, Tan, & Aik, 2007; Hall, Andrzejewski, & Yopchick, 2009; Nowicki & Duke, 1994; Rosenthal et al., 1979), which means that the phenomenon also touches clinical, cognitive, developmental, and industrial/organizational psychology. The measurement of nonverbal performance can assist healthcare professionals in monitoring the prognosis and treatment of conditions such as schizophrenia and autism, school counselors in monitoring the social adjustment of children, and more recently, industrial psychologists in measuring the emotional skills of current and prospective employees for selection, training, and evaluation.

Naturalistic perception. Given that the intentional, versus naturalistic, nature of emotional display had a crucial influence on the relation between display and perception skill, we feel that future work would benefit also from operationally defining the intentional, versus naturalistic, perception of affect. All of the research reviewed above examined participants' skill at the deliberate perception of emotional displays. That is, participants always took part in a perception task in which they were aware of viewing stimuli of an emotional nature, and the instructions focused their attention on judging the emotional content of these stimuli. Indeed, this is the case for most research on the perception of affect beyond the display–perception link. By contrast, in everyday life, aside from the nature of others' nonverbal displays, a perceiver has access to environmental cues (Barrett et al., 2007), with attention split across many different aspects of the environment. There may be systematic individual differences in perceivers' tendencies to focus attention on others' nonverbal behavior, perceivers' tendencies to make judgments of these displays, and perceivers' performance in real time when attention is split across competing activities (see Elfenbein, 2007, for a discussion of these distinct stages of the emotion process). We encourage researchers to consider methods of assessing perception "in the wild." This would mean freeing participants to construe interpersonal stimuli in whatever manner they choose and using perception tasks that assess participants' performance without cueing them and without changing the way in which they relate to interpersonal stimuli. Given the vast difference in results for the display–perception link when examining posed, versus naturalistic, expression, one can only speculate about the research findings that could be rewritten in the context of work on naturalistic perception.

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