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BRIEF REPORT

Dyadic effects in nonverbal communication: A variance partitioning analysis

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Using Kenny's (1994) Social Relations Model, a block-round robin design provided the first reported evidence for dyadic effects in nonverbal communication. That is, some dyads were systematically more or less accurate than the individual-level skill of perceivers and expressors would predict. This dyadic effect appears to be similar in magnitude to individual differences in emotional perception, a topic garnering extensive research attention over several decades. Results generally replicated for judgements across genders and across two cultural groups. These preliminary findings have implications for research on emotional intelligence and other models of affective skill, raising the possibility that accuracy in nonverbal communication combines individual differences with factors beyond the individual level.

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Previous research has typically treated accuracy in communicating emotion as an individual-level phenomenon: some people are better at expressing emotions than others, whereas some people are better at perceiving emotions than others. Although important, the extensive research literatures on individual differences in the ability to perceive others' emotions and to express one's own emotions clearly provide an incomplete picture because they examine separately the two inherently linked components of communicating emotion. Without accuracy in emotional expression, there is no accuracy in emotional perception, and vice versa. The present study models together these two processes, and by doing so it can also examine potential dyadic effects in nonverbal communication. The whole may be more than the sum of its parts.

We use the Social Relations Model (SRM; Kenny 1994; Kenny & La Voie, 1984) to examine the individual and dyadic effects of nonverbal communication accuracy via facial expressions. The Social Relations Model estimates the degree to which such accuracy is a function of four factors: (1) systematic individual abilities to perceive emotions (perceiver effects); (2) systematic individual abilities to express emotions (expressor effects); (3) systematic dyadic effects; and (4) measurement error. This use of SRM extends previous nonverbal communication research by modelling the dyadic level, estimating the degree to which accuracy is due to systematic effects among dyads, controlling for individual abilities. Consider an example in which Person A makes a judgement of Person B's emotional state that is scored for accuracy. The *perceiver* effect (aka, *actor*, *decoder*, *judge, receiver*, or *recognition* effect) is the extent to which A is generally accurate when judging other people's emotions, equivalent to an individual difference in emotion recognition skill. The *expressor* effect (aka, *partner*, *encoder*, *sender*, or *target* effect) is the extent to which others are generally accurate in judging B's emotions, reflecting how clearly or legibly B generally expresses himself or herself. The *dyadic* effect (aka, *relationship* or *interaction* effect), is the extent to which A understands B especially well, after controlling for A's perception ability and B's expression ability. Kenny (1994) uses the labels relationship and interaction in a statistical sense, which is not meant to imply that the data are generated by a context with interpersonal contact and/or acquaintance. That is, the dyadic term is akin statistically to an interaction term after controlling for main effects.

Individual differences in emotional communication skill

Emotion recognition accuracy (ERA) has been widely studied in clinical, cognitive, social, and developmental psychology. Stable individual differences in ERA have been demonstrated through psychometric tests validating skill-based measures in terms of reliability, divergent validity from traditional intelligence and existing personality traits, and criterion validity in predicting personal adjustment (Matsumoto et al., 2000; Nowicki & Duke, 2001; Rosenthal, Hall, DiMatteo, Rogers, & Archer, 1979; for a review, see Matthews, Zeidner, & Roberts, 2002). Although predictive validity itself does not guarantee significant variance, it is strongly suggestive. Further, in SRM terms, the presence of reliable tests to measure ERA provides direct evidence for perceiver effects, in that adequate interitem reliability indicates a high intraclass correlation for perceivers, which is the equivalent of perceiver variance.

The ability to express emotions clearly and legibly has received relatively less attention (Kenny & LaVoie, 1984). This discrepancy is likely enhanced by the greater effort required of researchers to elicit, record, and code the clarity of expressions from individual participants vs. administering a standardised test of emotion recognition to many participants. Intuitively, society's high value on actors' skill to express emotions clearly suggests substantial variability in the ability to encode. Indeed, investigations of expression ability show systematic individual differences across basic and complex emotions (e.g., Coats & Feldman, 1996; Friedman & Riggio, 1999; Wallbott & Scherer, 1986).

Despite the extensive attention paid to ERA, its effects appear relatively small. Studies examining ERA without relying on stimuli pretested for high recognition rates demonstrate little perceiver variance (zero to 5%; Kenny & LaVoie, 1984; Sabatelli, Buck, & Kenny, 1986; cf. Ekman, O'Sullivan, & Frank's 1999 study of lie detection in law enforcement and psychology). By contrast, SRM analyses reveal large variance in expressive ability, indicating extensive individual differences (35% to 49%; Kenny & LaVoie, 1984). Thus, despite of relatively sparse research attention, expressor effects in the accuracy of emotional expression are reliable and large in magnitude.

Dyadic effects in nonverbal communication

The unique contribution of the present study is to examine not only individual differences in the accuracy of communicating emotion but also the dyadic level of analysis. Although emotional skill and sensitivity is typically treated as an individual intelligence or stable personality trait, presumed consistent across partners, it is possible that some idiosyncratic pairings of individuals may be systematically more or less accurate than their individual-level skills would predict. In SRM terms, this would indicate a *dyadic* effect (Kenny, 1994; Kenny & LaVoie, 1984). Statistically, this effect is an interaction term indicating the degree of systematic accuracy of a dyadic pairing not accounted for by the individual effects of expressor and perceiver skill. Conceptually, this is an effect that is emergent at the dyadic level (Metts, 1998). Even in the absence of a physical interaction or interpersonal relationship between the two members, a dyadic effect can emerge through differences in opinion across perceivers about how to interpret cues (Kenny, 1994). For example, individuals might express their emotions using subtly different styles, and if judges vary in their rules or familiarity in interpreting these styles.

Previous research has not tested for systematic dyadic effects in emotional communication accuracy, for which the effort required can be greater by an order of magnitude. Multiple measures for each dyad are needed to separate the systematic variance from unsystematic measurement error (Kenny & LaVoie, 1984). The present design is optimised around this goal, examining judgement data from all dyads among 24 persons each judging 14 facial expressions from each other member. This round robin design with a large number of participants in a single round, as well as multiple replications per dyad, is optimal to test dyadic effects. With many degrees of freedom for the dyadic term and pooled estimates for each dyad, it is akin to a scale that achieves higher reliability with a larger pool of items, or a study achieving greater statistical power by using repeated measures, even if the study may have a smaller number of total participants (Kenny & LaVoie, 1984; Lashley & Kenny, 1998). Given the goal of documenting evidence for dyadic effects in nonverbal communication, it is also worthwhile to examine the extent to which such an effect may generalise across two contextual factors previously explored for their impact on accuracy in expressing and perceiving emotion, namely, gender (e.g., Hall, 1978) and cultural background (e.g., Ekman, 1993; Elfenbein & Ambady, 2003; Mesquita & Frijda, 1992).

METHOD

Participants

Participants were 24 (6 male, 6 female of Chinese ancestry; 6 male, 6 female of Malay ancestry) unacquainted students at the National University of Singapore. Each received S$40 (US$22). This single 24 person design generated a total of 7728 data points resulting in the same degrees of freedom to test the dyadic effect that 184 participants taking part in 46 4 person round robins would generate.

Singapore provides unusually good control for factors often creating confounds in cross-cultural research, such as language, education level, and economic status (Hall, Halberstadt, & O'Brien, 1997; Mesquita & Frijda, 1992; Nowicki & Duke, 2001), without erasing cultural differences. English is the primary medium in education and all civic life. Singapore's academic, language, and cultural programmes encourage Chinese, Malay, and Indian groups to retain their distinct heritage, whereas other policies ensure consistent cross-group contact, for example the housing in which 80% reside (Lee, 2000).

Procedure

Each participant served as both an expressor and perceiver of emotion. Expression sessions were modelled on previous cross-cultural emotion recognition research (e.g., Wang & Markham, 1999). Participants were asked to imagine an occasion during which they experienced each emotion strongly—anger, fear, disgust, happiness, sadness, and surprise, in a counterbalanced order—and to pose a facial expression ''as it would actually have appeared at the time''. The experimenter, Chinese in background, recorded two digital colour photographs for each of the six emotions and neutral expressions, resulting in 14 photographs per participant. Each participant also served as a perceiver of the entire resulting collection of facial expressions using a computerised laboratory task, in a randomised order judging all 14 photographs posed by each of the 23 other participants. Each remained on the screen until selection of one of the seven options to indicate the emotion posed. Self-judgements were removed from the analysis.

Each judgement was scored as ''1'' if the response matched the intended state of the poser, and ''0'' otherwise. Because binary dependent measures are suboptimal for SRM (Kenny, 1994), responses were aggregated for a more reliable dependent measure. SRM requires at least two measurements to test dyadic effects, and uses the equivalent of split-half reliability to separate them from measurement error. Thus, the 14 judgements per dyad yielded two 7-item composites, with one photograph per emotional state in each. Although results would be equivalent under any arbitrary method of separating the data into two halves—as SRM treats differences between the two halves as errors—to be systematic, following their posing session participants designated one of the two photographs as the more representative expression of each state. This designation determined the split-half indicators. Accordingly, all analyses examine these two halves together and no stimuli were discarded on the basis of the designation.

RESULTS

The primary research goal was to document dyadic effects in nonverbal communication accuracy. SOREMO software (Kenny, 1998) partitions the total variance in accuracy scores into the percentage attributable to perceiver skill, expressor skill, dyadic effects, and error (for a detailed description of SRM variance partitioning computations, see Kenny 1994; Kenny & LaVoie, 1984). Significance tests of these estimates used Bond and Lashley's (1996; Lashley & Bond, 1997) formulaes. Table 1 documents significant perceiver, expressor, and dyadic effects, with the greatest variance attributable to error and expressor skill. Additional descriptive statistics for judgement accuracy (M = 50.7%) are available from the first author.

TABLE 1

Social relations analysis of 24 person round robin including Chinese and Malay male and female participants as expressors and perceivers

Source			Analysis by gender[a]								Analysis by cultural group[b]							
	Overall round robin		Ms judge Ms round robin		Fs judge Fs round bobin		Ms judge Fs Half-bock		Fs judge Ms Half-block		Cs judge Cs round robin		Mas judge Mas round robin		Cs judge Mas Half-block		Mas judge Cs Half-block	
	Var	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*	*Var*	*p*
Perceivers	9.2%	<.01	21.4%	.05	2.1%	.22	7.5%	.08	6.6%	<.01	11.7%	.07	3.9%	.24	15.5%	<.01	3.6%	.03
Expressors	27.8%	<.01	19.9%	.07	30.8%	.09	32.7%	<.01	33.2%	<.01	34.0%	.04	20.5%	.11	28.1%	<.01	37.0%	<.01
Dyad	8.9%	<.01	6.5%	.20	7.2%	.18	16.6%	<.01	9.7%	.04	10.6%	.05	3.6%	.56	9.9%	<.01	10.9%	.05
Error	54.1%		52.2%		59.9%		43.2%		50.4%		43.7%		72.0%		46.4%		48.5%	
Total	100%		100%		100%		100%		100%		100%		100%		100%		100%	

Note: Var indicates the relative percentage of variance attributed to each component. For round robin analyses, variances were calculated by SOREMO. Significance values were calculated with Lashley and Bond (1997 formulae). For half-block analyses, variances and significance tests calculated using random-effects ANOVA. Additional data, including absolute variance figures for each component, are available from the first author.

[a] M refers to male participants and F refers to female participants. [b] C refers to participants with Chinese ancestry and Ma refers to participants with Malay ancestry.

The secondary goal was to examine the generality of dyadic effects across gender and cultural groups. To do so, we analysed the same data in terms of a block-round robin design (Kenny & LaVoie, 1984). The larger design generates four different smaller SRM designs. In terms of gender, two of these four are round robins of all females or all males. The other two are *half-blocks*: males judging females and females judging males, which can be analysed using conventional random-effects Analysis of Variance (Kenny, 1994). Results in Table 1 show that dyadic variance in same-sex judgements met Kenny's (1994) 5% threshold to interpret effects but did not reach significance for either gender. There were perceiver effects among men but not women, and marginal expressor effects for men and women. For opposite-sex judgements, there were perceiver, expressor, and dyad effects in both groups. Likewise, in terms of culture, Chinese and Malay each judged Chinese and Malay targets. Among Chinese ingroup judgements there were significant dyadic effects, and significant or marginal perceiver and expressor effects, but no effects for Malay ingroup judgements. In outgroup judgements for both Chinese and Malay, there were significant dyad, perceiver, and expressor effects.

DISCUSSION

Researchers have long conceptualised emotional skill as an individual intelligence or stable trait, presumed to remain consistent across interaction partners. This study provides the first evidence that—in addition to individual differences in the ability to perceive and express emotions—systematic dyadic effects can also impact communication accuracy. In our study, some dyads were especially accurate—whereas others were especially inaccurate—even controlling for perceiver and expressor skill. Because communicating emotion involves the exchange of a message between two people rather than the act of any one person alone, accuracy may incorporate phenomena that are emergent only at the dyadic level. It is important for research in the area to reflect this dyadic structure. This study is only a beginning to approach this complicated topic. Provocatively, these dyadic effects were consistently similar in magnitude to the perceiver effects that have greatly captured the attention of previous research.

The dyadic effect appeared to be somewhat robust. In the case of culture, it replicated for three of the four sets of judgements tested, even with diminished sample size. Given evidence for an ingroup advantage in the recognition of emotion (Elfenbein & Ambady, 2003), one could engineer a dyadic effect across individuals by including members of multiple cultural groups in a single analysis. However, ingroup advantage alone could not explain similar dyadic effects in the Chinese within-culture analysis. To the trend of Malay ingroup judgements appearing to have smaller perceiver, expressor, and dyadic effects than those of Chinese, we speculate that emotion may be less central to Malay participants judging the expressions of other Malays,[1] or that the presence of a cultural outgroup experimenter may have created a homogenising effect on judgements. Across genders the effect also appeared relatively robust. Whereas other-sex judgements showed reliable dyadic effects, the magnitude for dyadic effects in same-sex judgements exceeded Kenny's (1994) 5% threshold but did not reach significance. Participants might make greater distinctions when judging facial cues from the opposite sex.

What would cause a dyadic effect? There are two primary mechanisms (Kenny, 1994; Metts, 1998). First, some perceivers can have prior acquaintance or unique information about particular targets. However, in this study, all participants were previously unacquainted and viewed the same set of stimulus materials verbatim. Alternatively, *compositional* effects can emerge when perceivers have access to the same information but differ in opinions about how to interpret cues (Kenny, 1994). In the current case, such an effect could occur if individuals express themselves using subtly different styles, and if judges vary in their familiarity with and method of interpreting these styles. Future research should be directed at exploring the potential processes that could produce such effects. One direction would be similarity in nonverbal style. For example, facial expressions could be coded in terms of their muscle movements using a method, such as the Facial Action Coding System (FACS; Ekman & Friesen, 1978), to determine whether similarity in expressive style predicts enhanced mutual accuracy.

The current research design may be a worthwhile model for future studies of interpersonal judgements. It was uniquely optimised around estimating dyadic effects—including many participants per round and many judgement replications per dyad. Previous research did not test dyadic effects in emotion judgements, likely due to the greatly increased data collection required to separate such effects from measurement error. One related study—in the area of empathic accuracy (Ickes et al., 2000)—found no dyadic effects, using 4 rather than 24 individuals per group. The null finding could have resulted from this decrease in power or, alternately, from other differences in the research designs.

These same features also increased the reliability to estimate perceiver and expressor effects, which may explain its new findings on perceiver effects. This is the first reported evidence for interpretable individual differences in the ability to perceive emotional categories not to rely on stimuli prescreened to be highly recognisable, which are used in standardised instruments designed to measure emotion recognition accuracy (ERA), discussed above. Similar designs could free researchers from this methodological constraint that may limit the examination of naturalistic expressions, which are less obvious and intense.

[1] We thank an anonymous reviewer for this suggestion.

Important limitations in the research design qualify these preliminary results. As with many newly documented research findings, this study may ask as many questions as it answers. Chief among the limitations is the imprecision emotional expression protocol. Participants were asked to use mental imagery with the goal to provide semi-spontaneous poses. However, voluntary control of expressions is limited (e.g., Kappas, Bherer, & Thériault, 2000) and participants likely varied in the extent to which the resulting expressions used differing spontaneous vs. voluntary pathways (Rinn, 1984). The protocol did not control for either the presumed or implicit audience of the original emotional experience or the actual impact of the research assistant collecting the photographs (Fridlund, 1991; Hess, Banse, & Kappas, 1995). Further, dynamic facial expressions and emotion expressed via other nonverbal channels, such as vocal tone and body movement, should be sampled. These are major limitations to be addressed.

Participants were also previously unacquainted. After the mechanism for the dyadic effect among unacquainted dyads is established, further work could examine effects among participants who have existing relationships and mutual influence outside of the laboratory, and to capture the truly dynamic interactive components of communicating in the context of interpersonal relationships. One speculated mechanism for the relationship effect—subtle variations in emotional expressive style with which perceivers are varyingly familiar—would suggest the likelihood of learning over time in terms of interpreting these subtle stylistic differences. It would be valuable to examine differences in the degree of dyadic effects for acquainted vs. unacquainted participants, and the possibility of instructing participants to learn how better to understand certain idiosyncratic styles of emotional expression.

The current results have implications for the developing fields of emotional intelligence and affective social competence, in which skill in communicating emotion has been central (for reviews, see Elfenbein, Marsh, & Ambady, 2002; Halberstadt, Denham, & Dunsmore, 2001; Matthews et al., 2002). First, individual differences in emotional expression ability were generally three times as large as those in perception, whereas it is the latter component most commonly tested (e.g., Mayer, Salovey, & Caruso, 2002). Second, it is important to be mindful of the limitations inherent in considering emotional skill as an individual intelligence. Dyads may also be ‘‘emotionally intelligent’’. These findings provide evidence for the complexity and multifaceted nature of emotional skills. With the temptation to score individuals to be studied, hired, promoted, and trained based on their stable traits and abilities, comes the risk of overlooking drivers of social judgement accuracy that may emerge beyond the individual level.

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REFERENCES

Bond, C. F., & Lashley, B. R. (1996). Round-robin analysis of social interaction: Exact and estimated standard errors. *Psychometrika*, *61*, 303–311.

Coats, E. J., & Feldman, R. S. (1996). Gender differences in nonverbal correlates of social status. *Personality and Social Psychology Bulletin*, *22*, 1014–1022.

Ekman, P. (1993). Facial expression and emotion. *American Psychologist*, *48*, 384–392.

Ekman, P., & Friesen, W. V. (1978). *Facial action coding system: A technique for the measurement of facial movement.* Palo Alto, CA: Consulting Psychologists Press.

Ekman, P., O'Sullivan, M., & Frank, M. G. (1999). A few can catch a liar. *Psychological Science*, *10*, 263–266.

Elfenbein, H. A., & Ambady, N. (2003). Universals and cultural differences in recognizing emotions. *Current Directions in Psychological Science*, *12*, 159–164.

Elfenbein, H. A., Marsh, A., & Ambady, N. (2002). Emotional Intelligence and the recognition of emotion from the face. In L. F. Barrett & P. Salovey (Eds.), *The wisdom of feelings: Processes underlying emotional intelligence* (pp. 37–59). New York: Guilford Press.

Fridlund, A. J. (1991). Sociality of social smiling: Potentiation by an implicit audience. *Journal of Personality and Social Psychology*, *60*, 229–240.

Friedman, H. S., & Riggio, R. E. (1999). Individual differences in the ability to encode complex affects. *Personality and Individual Differences*, *27*, 181–194.

Halberstadt, A. G., Denham, S. A., & Dunsmore, J. C. (2001). Affective social competence. *Social Development*, *10*, 79–119.

Hall, J. A. (1978). Gender effects in decoding nonverbal cues. *Psychological Bulletin*, *85*, 845–857.

Hall, J. A., Halberstadt, A. G., & O'Brien, C. E. (1997). ''Subordination'' and Nonverbal Sensitivity: a study and synthesis of findings based on trait measures. *Sex Roles*, *37*, 295–317.

Hess, U., Banse, R., & Kappas, A. (1995). The intensity of facial expression is determined by underlying affective state and social situation. *Journal of Personality and Social Psychology*, *69*, 280–288.

Ickes, W., Buysse, A., Pham, H., Rivers, K., Erickson, J. R., Hancock, M., Kelleher, J., & Gesn, P. R. (2000). On the difficulty of distinguishing ''good'' and ''poor'' perceivers: A social relations analysis of empathic accuracy data. *Personal Relationships*, *7*, 219–234.

Kappas, A., Bherer, F.,& Thériault, M. (2000). Inhibiting facial expressions: Limitations to the voluntary control of facial expressions of emotion. *Motivation and Emotion*, *24*, 259–270.

Kenny, D. A. (1994). *Interpersonal perception: A social relations analysis.* New York: Guilford Press.

Kenny, D. A. (1998). SOREMO [Computer program]. http://nw3.nai.net/~dakenny/kenny.htm

Kenny, D. A., & La Voie. (1984). The Social Relations Model. *Advances in Experimental Social Psychology*, *18*, 141–182.

Lashley, B. R., & Bond, C. F. (1997). Significance testing for round robin data. *Psychological Methods*, *2*, 278–291.

Lashley, B. R., & Kenny, D. A. (1998). Power estimation in social relations analyses. *Psychological Methods*, *3*, 328–338.

Lee, K. Y. (2000). *From third world to first: The Singapore story 1965–2000*. Singapore: Singapore Press Holdings.

Matsumoto, D., LeRoux, J. A., Wilson-Cohn, C., Raroque, J., Kooken, K., Ekman, P., Yrizarry, N., Loewinger, S., Uchida, H., Yee, A., Amo, L., & Goh, A. (2000). A new test to measure emotion recognition ability: Matsumoto and Ekman's Japanese and Caucasian Brief Affect Recognition Test (JACBART). *Journal of Nonverbal Behavior*, *24*, 179–209.

Matthews, G., Zeidner, M., & Roberts, R. D. (2002). *Emotional intelligence: Science and myth.* Cambridge, MA: MIT Press.

Mayer, J. D., Salovey, P., & Caruso, D. R. (2002). *Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) User's Manual.* Toronto: MHS Publishers.

Mesquita, B., & Frijda, N. H. (1992). Cultural variations in Emotions: A Review. *Psychological Bulletin*, *112*, 197–204.

Metts, S. (1998). ''But I thought that we were more than error variance'': Application of the Social Relations Model to personal relationships. In R. L. Conville & L. E. Rogers (Eds.), *The meaning of ''relationship'' in interpersonal communication*. Westport, CT: Praeger.

Nowicki, S., Jr., & Duke, M. P. (2001). Nonverbal receptivity: The diagnostic analysis of nonverbal accuracy (DANVA). In. J. A. Hall, & F. J. Bernieri (Eds.), *Interpersonal sensitivity theory and measurement* (pp. 183–198). Mahwah, NJ: Erlbaum.

Rinn, W. E. (1984). The neuropsychology of facial expression: A review of the neurological and psychological mechanisms for producing facial expressions. *Psychological Bulletin*, *95*, 52–77.

Rosenthal, R., Hall, J. A., DiMatteo, M. R., Rogers, P. L., & Archer, D. (1979). *Sensitivity to nonverbal communication: The PONS test.* Baltimore: Johns Hopkins University Press.

Sabatelli, R. M., Buck, R., & Kenny. D. A. (1986). A Social Relations Analysis of nonverbal communication accuracy in married couples. *Journal of Personality*, *54*, 513–527.

Singapore Housing and Development Board (2003). http://www.hdb.gov.sg. Accessed April 6, 2003.

Wallbott, H. G., & Scherer, K. R. (1986). Cues and channels in emotion recognition. *Journal of Personality and Social Psychology*, *51*, 690–699.

Wang, L., & Markham, R. (1999). The development of a series of photographs of Chinese facial expressions of emotion. *Journal of Cross-Cultural Psychology*, *30*, 397–410.