Towards the Measurement of Postural Congruence in Social Interaction[1]

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A review of the literature suggests the proposition that response matching in social interaction tends to coincide with feelings of positive affect and perceived similarity. In particular it is suggested that postural congruence is related to liking, similarity and self-disclosure. A method of measuring postural congruence is proposed and tested using regression techniques to predict liking, similarity and self disclosure. A significant relationship was found between very similar postures in the upper half of the body and rated self-disclosure among dyads during an initial meeting. In subsequent meetings no significant relationships were found between postural congruence and the measures of liking, similarity and self-disclosure. Measures of congruence using the lower half of the body were not found to be useful. Gender differences in postural congruence are also discussed.

Introduction

Are Those Who Like, Alike?

The process of acquaintanceship or getting to know someone involves the development of a common knowledge of each other through the sharing of ideas and feelings, Levinger and Snoek (1972) and Duck (1978).

A number of factors appear to be important in the development of acquaintanceship that arise from this sharing of feelings, such things as attraction, liking, pereceived similarity, enjoyment and degree of self-disclosure.

Smith (1979) carried out an experiment designed to monitor the development of acquaintanceship in an experimental setting. Dyads, who were initially strangers to each other, met over a period of 10 successive weeks and their initial feelings were evaluated weekly by means of rating scales. She found that subjects' ratings of liking, perceived similarity, enjoyment and self-disclosure significantly increased over the experimental period.

Much of the recent research in the development of acquaintanceship suggests that many of these variables are interrelated. Murstein (1976) reviews a number of studies supporting the proposition that liking is positively related to perceived similarity. Berscheid and Walster (1978) describe the importance of perceived attraction in the development of acquaintanceship and review studies showing the positive relationship between interpersonal attraction and similarity.

Smith (1979) found that there was a positive relationship between rated similarity to the partner, whether the interaction was enjoyable and whether the subject was attracted to the other person.

The question of why similarity is rewarding and similar people attractive (Cook & McHenry, 1978), has not yet been answered but it is clear that these factors

are highly related and important in the development of acquaintanceship.

The research on self-disclosure demonstrates that individuals tend to match the level of self-disclosure when interacting with each other. This recurring pattern in social interaction has been referred to as "self-disclosure reciprocity" (Tognoli, 1969) or the "dyadic effect" (Jourard, 1964). Derlega and Chaikin (1975) have suggested that this matching of self-disclosure may mediate perceived similarity.

At a more simplistic level it can be suggested that perceived similarity involves not only the sharing of feelings but also similar behaviour. Feilding (1972) postulated that the matching of behaviour or "response matching" would occur in a positive interaction and some studies of non-verbal behaviour lend support to this postulate of matching. Mutual gaze increases as ratings of intimacy increase (Argyle and Cook, 1976). Response matching has also been reported for such non-verbal behaviours as length of utterances, interruptions and silences, kinds of utterances, smiling and head nods (Argyle, 1969). In an earlier unreported experiment we found that the amount of looking (as distinct from mutual looking) increased over time and the looking, speaking rates, amount of smiling, and the number of gestures of each interactor altered over sessions to become more similar.

The importance of posture in impression formation during social interaction has long been recognised. Mehrabian (1972) in his theory of affiliation used a measure of immediacy which included forward lean and orientation of the body, and openness of posture. The posture of interactors is also a contributing factor in the judgement of attitudes such as warmth, coldness, dominance, submission (Argyle, 1975).

Changes in posture during the course of an interaction have been analysed from film using a frame-by-frame analysis. Condon and Ogston (1966) examined a film of a therapist-patient interaction and noted that the flow of movement in the listener was rhythmically co-ordinated with the flow of speech in the speaker. They labelled this "interactional synchrony" and attempted to relate the magnitude and timing of changes in movement to the magnitude and timing of changes in speech. In particular, they noted that changes in the posture of patients did not coincide with the timing of speech, and concluded that interactional synchrony may be an important variable in differentiating between normal and pathological behaviour.

Kendon (1972) analysed a 90-minute sequence filmed in the lounge bar of an English pub when a speaker was addressing a group of people. Using the technique of frame-by-frame analysis he showed that a listener frequently matched or mirrored the posture of the speaker. He also found that the magnitude of change in the posture was related to the amount of change in the speech sequence, e.g. head forward at beginning of speech; palm opening and a phrase.

Scheflen (1964) noted similarity in posture between a therapist and patient and used the terms congruence and non-congruence to describe this. He suggested that a congruent posture was more common when the therapist had a positive attitude towards the patient, although he failed to report empirical data to support his contention.

Postural congruence or similarity in posture has been suggested as important as an indicator of positive affect by several authors (Birdwhistell, 1971, La France & Mayo, 1978, Scheflen, 1964). Postural congruence includes both the matching of posture and the mirror image of posture. There is however no clear empirical evidence of a relationship between postural congruence and person perception variables. The speculative evidence reviewed most frequently suggests that congruence is associated with liking and similarity. These two variables are themselves correlated (Murstein, 1976) and are also highly related to self-disclosure (Derlega & Chaikin, 1975). Our own impressions suggest that postural congruence is more likely to occur at the points in an interaction when similar feelings and attitudes are being disclosed. The hypothesis alluded to, that there is a relationship between postural congruence and a similarity in feelings and attitudes needs to be tested. Testing such a hypothesis

depends on developing a satisfactory method for measuring postural congruence.

Measuring Postural Congruence

Several systems exist for defining and describing posture using frame by frame analysis of a single subject. Such techniques were adapted by Harvey (1976) to provide an on-line scoring system of a filmed sequence. He defined postural congruence as "All configurations in which the subject's posture matches, is a mirror image of, or is identical with that of the other" (cf. Charney, 1966). However the actual measurement of congruence in Harvey's study did not produce a single score but instead he derived separate scores for the head, the trunk, the legs and the arms. The scores themselves did not necessarily reflect an identity of posture as they were based on whether both subjects had been classified in the same category of a limited set of possible postures. His categories were:

Head: upright, tilted to left, tilted to right.

Trunk: upright, leaning back touching chair, leaning forward touching chair, tilt to left, tilt to right.

Legs: crossed or uncrossed.

Arms: crossed or uncrossed.

Harvey reported that the head movements were determined by the direction of gaze. He also reports considerable difficulty classifying leg and arm positions. In his data the only clear result was an association between congruent trunk positions and similar attitudes and he suggested the need to further refine measures of postural congruence.

Thus the question of the degree of congruence that has signal value among the variety of potential arm, leg and trunk movements of the two interactors needs to be clarified by further research.

Design

In this particular study we decided to adopt a rather different classification system from that used by Harvey. Our pilot work showed that using Harvey's classification led to counting as congruent, postures that appeared different, e.g. there are many ways in which legs can be crossed.

A further difficulty in using a system which depends on the analysis of distinct body parts is that the scores for the different parts of the body could not be readily recombined to give a single score of a congruent versus a non-congruent posture. It seems important that any objective measurement made of congruence should reflect a commonsense judgement that the postures are the same; otherwise it seems improbable that the measure will reflect behaviour that has cue value in social interaction.

Harvey (1976) found that his measure of congruence of head position was confounded with direction of gaze, therefore we omitted the head position in our scoring system.

As a result of pilot work it was decided to make the judgements about the upper half of the body, above the waist, separately from the lower part of the body. There were two main reasons for this; firstly it was easy to scan each half of the body in a single glance and record it as the interaction proceeded; secondly, the measurement of only two parts of the body made it relatively easy to analyse the measures separately or as a combined measure. Furthermore pilot work suggested that highly reliable judgements could be made of the amount of the congruence in the upper and lower halves which correspond exactly with a commonsense judgement that the postures were the same.

One final problem was that of deciding how similar the postures must be, before the similarity is judged to be an example of congruence. Is one person holding his/her wrist while the other is holding his/her forearm, an instance of congruence? We decided to determine this issue empirically by seeing which criteria showed the closest relationship to person perception variables. Thus we defined two categories as follows:

(a) Complete congruence where there is virtual identity in all parts of the body either above ("complete upper") or below the waist ("complete lower").

(b) Partial congruence where there is virtual identity except that one part of the body is in a slightly different position. Again the decision is made either for the body above the waist ("partial upper") or below the waist ("partial lower"). The measure of

"partial" congruence could then be added to the complete measure to provide a less stringent measure.

Considering the suggestions made by the literature, our own observations of congruence and the critique of the measurement problems, the following questions seem to be at issue.

1. Is it possible to measure postural congruence reliably throughout an interaction in the upper and lower halves of the body?

2. Will the proposed measures of congruence produce a variable which relates to judged similarity, liking and self-disclosure?

3. If there is a relationship between congruence and person perception is the relationship stronger with congruence in the upper half of the body or with congruence in the lower half of the body? It is also possible that both halves of the body need to be congruent for there to be an effect on person perception or alternatively it may be only necessary that one or other part of the body needs to be congruent. Therefore not only do the upper and lower measures need to be compared, but also various combined measures should be tested.

4. If there is a relationship between congruence and person perception, is that relationship stronger when a very stringent criteria of congruence is adopted or a less stringent criterion? In other words how does the proposed "complete" congruence definition compare with a combined measure derived from the proposed definition of "partial" congruence together with "complete" congruence.

Because the questions mainly relate to developing a satisfactory methodology for the measurement of congruence, it was decided to reanalyse the data collected by Smith (1979) on rated liking, similarity and self-disclosure, and her videotapes of the interactions. A further advantage in using this data was that it was possible to examine two additional questions:

5. Is congruence more frequent in male/male, male/female, or female/female dyads?

6. Is congruence more likely to affect person perception in the interactions between strangers or between those who are already acquainted?

Methodology

Subjects

The subjects were 24 volunteer students, 12 males and 12 females aged 17 to 21 (mean = 18.6) recruited through Stage I Psychology laboratory classes. The major criterion for participation in the experiment was that the subjects would be available and willing to engage in a 20-minute interaction once a week for 10 weeks.

The subjects were assigned to a single partner of either the same sex or the opposite sex for the duration of the experiment. The subjects were paired so that each pair was similar on at least three of the following criteria: age, subjects studied, hometown, interests and extra-curricular activities. Within these limitations subjects were assigned randomly to same sex or opposite sex partners. Pairing for similarity was done in order to ensure that subjects would have sufficient in common to make the experimental procedure feasible.

Equipment

The interactions took place in a room furnished like a comfortable living-room with armchairs, a coffee table, pot plants and pictures, which helped to create a relaxed atmosphere.

A small surveillance camera, with wide angle lens, was mounted inconspicuously in the set of shelves in the room and it was linked to a 23″ monitor and VTR in an adjacent room.

Procedure

Each pair of subjects came to the laboratory once a week for 10 weeks, entering separately. During each session they met for 20 minutes over a cup of coffee. The purpose of the experiment was explained as a study in the development of acquaintanceship.

At the completion of every session, a number of measures were taken including 7-point rating scales on liking, similarity and self-disclosure as indicated below:

I like X a lot   1 2 3 4 5 6 7   I dislike X a lot

X seems dissimilar to me   1 2 3 4 5 6 7   X seems similar to me

I felt I disclosed a lot   1 2 3 4 5 6 7   I disclosed very little

In order to relate the person-perception scores to congruence (a dyadic measure) it was necessary to obtain a dyadic measure of person perception from the individual ratings. This was done by calculating the mean score for the two individuals in the dyad on each of the three scales. Also the scoring was reversed for liking and disclosure so that a high score corresponded in all cases to more of the variable. Postural congruence was measured for sessions 1, 5 and 10.

Measurement of Postural Congruence

Postural congruency was defined as the matching or mirroring of the postures of two interacting individuals, i.e. a similar configuration or an opposite configuration of posture.

In developing the operational definition of "complete" congruence it was decided to refer decisions to a criterion question: "Do the subjects seem to be sitting in the same posture?" Similarly the definition of "partial" congruence was decided by referring to a criterion question: "Do the subjects seem to be sitting in *almost* the same posture?" After using these questions in making the judgements, it was possible to provide the more objective description of the measures as follows:

Complete upper congruence was judged to be present when both subjects showed an identity of posture, either matched or mirrored in both arms and the trunk above the waist. A discrepancy of up to 15 centimetres was allowed between the same parts of the body of the two subjects, e.g. lower arms.

Complete lower congruence was judged to be present on the same criteria as complete upper except that only those parts of the body below the waist were considered.

Partial upper congruence was judged to be present when there was complete upper congruence (using the above definitions) in all but one part of the arms or trunk above the waist. However the one part of the body which was discrepant by at least 15 centimetres could not be more than 30 centimetres different in the two subjects, e.g. hand on forearm and hand on hand.

Partial lower congruence was judged to be present on the same criteria as partial upper except that only those parts of the body below the waist were considered.

At all other times the subjects were judged to be non-congruent.

Congruence was assessed continuously by two student assistants who had practised using the procedure on similar videotaped interactions and demonstrated high reliability. The raters recorded their results by pressing buttons whenever they observed congruence. Each rater had four buttons, one for "complete upper", "complete lower", "partial upper" and "partial lower" congruence. The buttons were sampled every 0.64 seconds by an electromechanical papertape punch which then recorded a hole on the appropriate channel on a papertape (Dingwall, Hartley & Maxwell, 1975). The paper tapes were read and analysed by computer which converted the data to scores which were a percentage of total time (approximately 20 minutes per interaction). The mean percentage score for the two raters was used as the basic congruence score in subsequent analyses.

For each dyad, four independent measures of congruence were initially available, "complete upper", "complete lower", "partial upper" and "partial lower". The following scores were then calculated:

Any upper congruence: the sum of the time each dyad was in complete upper or partial congruence. This gives a less stringent measure of congruence than the "complete upper" measure.

Any lower congruence: the sum of the time each dyad was in complete lower or partial lower congruence. This is a less stringent measure than "complete lower" congruence.

Any complete congruence: the percentage time that the dyad displayed *either* "complete upper" *or* "complete lower" congruence. Note that this measure is not a simple sum of complete upper and complete lower as both could occur together. The measure thus represents the time when at least one half of the body showed complete congruence.

Any congruence at all is the percentage time the dyad displayed either any upper *or* any lower congruence. Again this measure is not the result of simply summing the any upper and any lower measures. It represents the time when there was some congruence present in at least some part of the body excluding the head.

Total complete congruence. It was originally intended to calculate an additional measure which reflected the amount of time that all parts of the body showed complete congruence. However this was not practicable as almost all the dyads scored zero and thus no usable measurement could be obtained.

Results

Reliability of the two raters who independently measured postural congruency was assessed by calculating a concordance ratio using the formula below.

$$r_c = \frac{AB}{A + B - AB}$$

where AB = no. of occasions on which both A and B judged that the behaviour occurred

A = no. of occasions on which A judged that the behaviour occurred

B = no. of occasions on which B judged that the behaviour occurred

Table 1 shows the mean reliabilities on each measure. Thus overall mean reliability was .86 with rather more agreement on the "lower" measures due to the fact that people changed leg positions less frequently.

In seven dyads, reliabilities in the upper half measures were less than .70 which considerably reduced the mean reliability.

However in each of the seven dyads, the raters showed 92% agreement on the amount of congruence that was occurring although they did not coincide to this degree in recording it as having occurred at exactly the same time.

Table 1
Reliability of Measurement of Congruency

	Complete upper	Partial upper	Complete lower	Partial lower	Total
Mean Reliability	.83	.80	.98	.94	.86
s.d. of reliability measures	11.4	10.7	2.8	6.6	7.3
Number of tapes*	33	36	13	17	99

* Note the Ns vary as on some tapes there was a zero incidence of the measure. These tapes have not been included in the reliability data.

The frequency of occurrence of the various measures of congruence is shown in Table 2. The table shows that "complete" congruence in the upper part of the body occurred less than 8% of the time on average but that all the other defined categories occurred at least 10% of the time on average. There is evidence of congruence in at least one part of the body (i.e. any at all) 35% of the time on average. All the measures are normally distributed.

Inspection of the data showed clearly that smaller correlations between congruence measures and the independent variables of liking, similarity and self-disclosure were obtained when "partial" congruence was added to "complete" congruence. Thus it seemed clear that, at least in this data set, the more stringent measures of congruence

Table 2
Total of Occurrence of Measures of Congruency
(on 12 dyads on 3 occasions)

	Complete upper	Partial upper	Any upper	Complete lower	Partial lower	Any lower	Any complete	Any at all
Mean percentage occurrences	7.94	11.18	19.12	12.46	6.86	17.10	19.06	34.75
s.d.	6.62	6.99	8.55	24.21	12.64	27.58	23.42	25.89
Skew:	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

(namely "complete upper", "complete lower" and "any complete") were the only ones that would potentially account for the variance in impression formation.

Therefore step-down multiple regression analyses (Wilson, 1978) were performed attempting to predict each of the three "complete" congruence measures in turn at each of the three points in time (i.e. when the dyads were strangers, had met five times and had met 10 times). The results (Table 3) show that only with "complete upper" congruence on the first session is there a significant step-down regression equation (p < .01) and that the only variable that predicts a significant portion of the variance on this occasion is rated self-disclosure.

It is notable that a larger portion of variance in the "complete" congruence measures is accounted for in session 1 than in sessions 5 and 10 (Table 3). This suggests that other factors in the previous history of the interaction may well be affecting the impressions on these occasions.

Table 4 shows the intercorrelations between the three "complete measures of congruence. These are very low and there is an insignificant correlation (r = .12) between the "complete upper" and "complete lower" measures suggesting that the two are measuring very different things. The correlation matrix also draws attention to an important consequence of combining the two measures in a simple additive fashion. Because there is a larger mean and a much larger standard deviation for the "complete lower" measure than for the "complete upper" measure, inevitably the "any complete" measure is more heavily weighted by the "complete lower". Hence the correlation of .97 between "complete lower" and "any complete" which is almost three times the correlation between "complete upper" and "any complete".

The two most useful congruence measures (that is "complete upper" and "complete lower") were tested for significance of differences as a function of gender of dyad and the number of sessions using a 3 x 3 analysis of variance in a repeated measures design. Means and standard deviations are given in Table 5.

There are no significant differences in "complete upper" congruence as a function of either gender of dyad or number of sessions. There is no significant interaction effect although congruence tends to be less in the mixed sex pairs and to decrease over sessions. It is worth noting that the incidence of congruence seems to be relatively stable

Table 3
Regression Analysis Using Three Independent Variables:
Liking, Similarity, and Self-disclosure

Measure of Congruence	Session 1			Session 2			Session 3		
	r	% variance	p	r	% variance	p	r	% variance	p
Complete upper	.75	56%	.08	.48	23%	n.s.	.38	15%	n.s.
Complete lower	.61	37%	n.s.	.56	32%	n.s.	.47	22%	n.s.
Any complete	.56	31%	n.s.	.60	36%	n.s.	.54	29%	n.s.

Step-down regression equation for "complete upper" in session one = −1.52 + 3.89 Self-disclosure r = .70 50% of variance accounted for p < .01.

Table 4
Correlations Between "Complete" Measures of Congruence

	Complete upper	Complete lower	Any complete
Complete upper	X	.12	.33
Complete lower		X	.97
Any complete			X

regardless of how often the members of the dyad have met, except for the female dyads. In the "complete lower" measure there are differences both as a function of gender of the dyad (p < .08). Furthermore the variance differs significantly as a function of gender of dyad (p < .001). The female/female dyads show significantly more "complete lower" congruence and are significantly more variable than either the male/male or male/female dyads. These differences are particularly pronounced in the first session and decrease over sessions (p < .01 for session differences in FF dyads).

It is also noteworthy that the incidence of "complete lower" is so low in the dyads involving males that it is doubtful whether this measure could be effectively used as a variable in studies involving males.

Discussion

The main problem addressed by this study has been that of developing a method of measuring postural congruence which is reliable, which relates to a commonsense appraisal of whether the dyad appears to be assuming the same postures, and which may predict impressions people form of each other during interaction.

The results show that global measures of the extent of similarity in posture can be made with high reliability. They also show that measurement can be made continuously throughout an interaction to give scores which can be used as measures of congruence in parts of the body separately, or recombined to give a whole body score.

The results from this study do not provide clear information about the relationship between person perception and congruence, nor do they show which method of measuring congruence is likely to be the most powerful in predicting person perception variables. The equivocal nature of the results comes partly from the small sample size of 12 dyads and partly from the measures of person perception. Seven point rating scales do not provide a robust method of measuring person perception. In addition, the use of a dyadic score to be comparable with measures of congruence, undoubtedly increased the error in measurement. Some dyads obtained a moderate mean because both individuals gave a moderate rating while other dyads obtained a moderate rating because one member gave a high rating and the other a low rating.

The study shows that there is less predictive power if a less stringent measure of

Table 5
Means and Standard Deviations of Percentages of Complete Upper Congruence as a Function of Gender of Dyad and Session Number

Session No.:	Male/female x	Male/female s.d.	Male/male x	Male/male s.d.	Female/female x	Female/female s.d.	Total x	Total s.d.
1	6.7		12.0		11.2		10.0	5.2
5	3.1		7.2		11.2		7.2	9.1
10	5.9		8.2		5.9		6.7	5.9
Total	5.2	6.0	9.2	4.5	9.5	8.2	7.9	6.6

Means and Standard Deviations of Percentages of Complete Lower Congruency as a Function of Gender of Dyad and Session Number

Session No.:	Male/female x	Male/female s.d.	Male/male x	Male/male s.d.	Female/female x	Female/female s.d.	Total x	Total s.d.
1	.005		1.7		53.4		18.4	21.0
5	.00		.4		39.7		13.3	18.8
10	.00		6.7		10.4		5.7	10.4
Total	0.002	.001	2.9	5.9	34.5	27.6	12.5	24.2

congruence is used. A more useful measure was obtained by defining congruence as occurring only when the two postures appeared identical.

This measurement of the amount of "complete" congruence was made separately for the upper part of the body and the lower part. The possible simultaneous occurrence of "complete" upper congruence and "complete" lower congruence was investigated but was found to be too low to provide a useful additional measure. The incidence of "any complete congruence, i.e. congruence in *either* the upper *or* the lower half of the body, did occur sufficiently frequently to provide a useful measure. It was found that the means and variances were larger in the lower half measure which resulted in the simple combined measure being very similar to the "complete lower" measure alone.

The "complete lower" measure alone proved to be of limited usefulness with this data. It did not show any significant relationship with the person perception variables and it varied as a function of gender of the members of the dyad. In dyads involving males (either same sex or opposite sex dyads) there was almost no "complete lower" congruence. There was, however, a significantly greater amount of congruence on the female/female dyads. The reason for this gender difference may be the effect of wearing skirts, together with the social training of females to maintain decorous "legs together" positions. This may limit the range of possible leg positions assumed by females and hence increase the probability that congruent lower half postures will occur by chance. This explanation also relates to the finding that female dyads show less lower half congruence over sessions or times of meeting. As they became acquainted there may be a decrease in the social inhibitions that limit the range of leg positions and hence the chances of congruence in the lower half of the body would decrease over time.

The data showed that there was virtually no correlation between the upper half and the lower half measures. Furthermore, gaze direction in social interaction tends to concentrate on the upper half of the body (Exline, *et al.,* 1968). Therefore if there is any relationship between congruence and person perception it would be more likely to occur when the upper parts of the body are in congruence.

Indeed, the only statistically significant regression equation was found with the "complete upper" congruence measure in the first session. The significant predictor variable was rated self-disclosure and no significant additional power was obtained from variables of liking and perceived similarity. Given that nine regression equations were calculated, the finding could be due to chance, however, it is perhaps surprising to obtain any strong results in such a small scale study. Therefore, these results are worth following up using more robust person perception measures and perhaps only the "complete upper" measure of congruence.

The failure to find significant results on later meetings could well be due to other variables in the previous history of the relationship accounting for much of the variance in impressions formed. It is possible that congruence may only show a significant relationship with person perception when the pair are strangers, or when other factors in the history of the relationship are held constant.

In summary this study has clarified many of the issues in measurement that have previously made it difficult to test adequately the proposition that person perception is affected by or affects postural congruence. We suggest that the measurement of relatively complete congruence in the upper half of the body holds the most promise for future research. Reliable and more sensitive measures of person perception variables need to be developed. In addition, further research in this area, should control for the history of the interaction.

Although at present, the nature of any relationship between postural congruence and variables important in person perception is unknown, this study has provided a reliable measure of postural congruence that takes us closer to clarifying this issue.

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