Further analysis of a doctor–patient nonverbal communication instrument

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Abstract

This study examines the reliability and validity of the relational communication scale for observational measurement (RCS-O) using a random sample of 80 videotaped interactions of medical students interviewing standardized patients (SPs). The RCS-O is a 34-item instrument designed to measure the nonverbal communication of physicians interacting with patients. The instrument was applied and examined in two different interview scenarios. In the first scenario (year 1), the medical student's interview objective is to demonstrate patient-centered interviewing skills as the SP presents with a psychosocial concern. In the second scenario (year 3), the student's interview objective is to demonstrate both doctor-centered and patient-centered skills as the SP presents with a case common in primary care. In the year 1 scenario, 19 of the 34 RCS-O items met acceptable levels of inter-rater agreement and reliability. In the year 3 scenario, 26 items met acceptable levels of inter-rater agreement and reliability. Factor analysis indicated that in both scenarios each of the four primary relational communication dimensions was salient: intimacy, composure, formality, and dominance. Measures of correlation and differences involving the RCS-O dimensions and structural features of the interviews (e.g., number of questions asked by the medical student) are examined.
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1. Introduction

The relational communication scale for observational measurement (RCS-O) comprises 34-items designed to measure four nonverbal communication dimensions of doctor–patient interactions: intimacy, composure, formality and dominance. The first published analysis of the RCS-O showed acceptable levels of reliability and validity for most of the items [1]. However, results were based on a relatively small ($n = 20$) non-probability sample, making generalizability of the findings somewhat problematic. The present study eliminates that concern by using a probability sample of 80 videotaped interactions among 40 students. Each student was observed once in year 1 of medical school and once in year 3 of medical school, allowing an examina-

tion of the RCS-O in two different interview scenarios – one patient-centered by design and one primarily doctor-centered by design. Additionally, sample size is adequate to allow for factor analysis of the items. We also measured interview structure characteristics, such as doctor speaking time, in order to gauge whether and to what extent the interview scenarios (i.e., patient-centered versus doctor-centered) differ as expected. We then use these same measures to gauge the meaning (validity) of the RCS-O.

2. Relational communication

Our research is based on a model specifying that acts of interpersonal communication contain both a *content* component and a *relational* component [2]. The content component carries the subject matter expressed in verbal language, whereas the relational component conveys

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socioemotional information regarding how interlocutors feel about each other and their relationship. The relational component is communicated mostly through nonverbal channels (e.g., smiling) and serves as the socioemotional *framework* within which the content is evaluated [3]. Doctor–patient interactions, being acts of interpersonal communication, can be understood within this general model. For example, the amount of interest a doctor expresses (e.g., body lean, eye contact, and tone of voice) in a patient's symptom report (the content) indicates to the patient the value the physician places on that information. This in turn may affect whether and how the patient reports symptoms in the future. The RCS-O is an instrument for measuring the relational component of doctor–patient interactions.

Because relational communication is handled primarily through nonverbal channels it is often mistakenly assigned only an auxiliary or supportive role. But according to Burgoon, "nonverbal expressions become a central part of the content and therefore should not be viewed as only augmenting the verbal stream but as making meaningful statements in their own right" ([3], p. 290). This proves especially true in the doctor–patient relationship because the very reason for that relationship is some sort of physiological or psychosocial problem that likely concerns the patient. The inherently personal content of the interaction amplifies the salience of the nonverbal framework in defining the meaning of the content, with real and measurable consequences for the doctor–patient relationship and its success. The research literature bears this out. Research has shown that interpersonal skills and clinical competence are interdependent [4,5], and that the nonverbal and emotional component of a doctors' communication are related to patient satisfaction, patient understanding and recall of information, compliance with keeping appointments and medical regimens, emotional distress, and symptom resolution [6–15]. Yet, the nonverbal component of doctor–patient

Table 1
RCS-O item inter-rater agreement results

Item no.[a]	The physician	Rater agreement of 40 interviews	
		Year 1	Year 3
1IA	...was intensely involved in the conversation with the patient	16	20
2IA	...did not want a deeper relationship with the patient.[b]	5	12
3IA	...was not attracted to the patient.[b]	3	32
4IA	...found the conversation stimulating.	14	21
5IA	...communicated coldness rather than warmth.[b]	24	27
6IA	...created a sense of distance between he/she and the patient.[b]	19	14
7IA	...acted as if she/he was bored.[b]	33	34
8IA	...was interested in talking to the patient.	18	31
9IA	...showed enthusiasm while talking with the patient.	15	22
1SD	...made the patient feel that they were similar to he/she.	12	21
2SD	...tried to move the conversation to a deeper level.	3	16
3SD	...acted like she/he and the patient were good friends.	27	15
4SD	...seemed to desire further communication with the patient.	14	19
5SD	...seemed to care if the patient liked him/her or not.	7	17
1RT	...was sincere.	34	39
2RT	...was interested in talking with the patient.	21	28
3RT	...wanted the patient to trust him/her.	13	39
4RT	...was willing to listen to the patient.	39	40
5RT	...was open to the patient's ideas.	26	27
6RT	...was honest in communicating with the patient.	37	38
1C	...felt very tense talking with the patient.[b]	25	25
2C	...was calm and poised with the patient.	33	37
3C	...felt very relaxed talking with the patient.	26	25
4C	...seemed nervous.[b]	24	21
5C	...was comfortable interacting with the patient.	29	29
1F	...made the interaction very formal.	19	20
2F	...wanted the discussion to be casual.[b]	19	28
3F	...wanted the discussion to be informal.[b]	16	22
1D	...attempted to persuade the patient.	19	34
2D	...didn't attempt to influence the patient.[b]	19	34
3D	...tried to control the interaction.	23	36
4D	...tried to gain the approval of the patient.	6	25
5D	...didn't try to win the patient's favor.[b]	8	4
6D	...had the upper hand in the conversation.	19	35

Note 1: Items should be sequenced in a random order before administering the instrument. *Note 2:* Response categories are: strongly disagree, disagree, disagree somewhat, neutral/unsure, agree somewhat, agree, strongly agree.

[a] IA – immediacy/affection; SD – similarity/depth; RT – receptivity/trust; C – composure; F – formality; D – dominance.

[b] Item must be reverse coded before analysis.

communication is understudied and undeveloped with regard to assessment instruments [16,17]. The present study contributes to the further development of one such instrument.

2.1. The RCS-O

The RCS-O is an adaptation, for third-party observers of doctor–patient interaction, of Burgoon and Hale's relational communication scale (RCS) [18]. The RCS-O comprises 34 items rated on a 7-point Likert scale ranging from "strongly disagree" to "strongly agree." As such, the RCS-O represents a *global measure* of relational message cues. For example, one item, "The physician was willing to listen to the patient," requires the observer to make a global assessment of the physician's degree of attentiveness to the patient's story rather than rating specific behavioral indicators. The development of this instrument, with its foundation in specific nonverbal cues, is described below.

The RCS is the product of a series of investigations beginning with Burgoon and Hale's exhaustive review of relational message themes [19]. Although the authors identified 12 distinct themes, six fell within the major theme of intimacy. They also identified dominance-submission, composure and formality as distinct themes.

In a second paper, Burgoon and Hale [20] developed the RCS and tested the instrument's validity (against actual nonverbal cues) and reliability in a series of three experimental studies. The results support the existence of seven relational themes, four of which show a high degree of non-independence (immediacy/affection, similarity/depth, and receptivity/trust, and composure). Additional research [21] confirmed the grouping of the three themes of immediacy/affection, similarity/depth, and receptivity/trust into the supra-dimension of intimacy. In that same study, the intimacy dimensions and composure are highly correlated, yet independent of dominance and formality which are orthogonal to each other as well.

In a fourth experimental study, Burgoon and LaPoire [22] examined in detail the nonverbal cues of these four primary message themes. They observed that intimacy, composure, and dominance messages are determined by similar nonverbal cues of involvement and pleasantness, whereas formality is indicated by *reductions* in these: "nonverbal cues related to the superordinate percepts of involvement and pleasantness are highly interrelated (and presumably substitutable) in communicating relational themes" (p. 121). However, regression models showed that, whereas predictive models of relational dominance were based almost exclusively on kinesic nonverbal cues, predictive models for the other three dimensions showed greater variations in predictor variables (e.g., kinesic involvement, vocal pleasantness and relaxation, gaze, and smiling) [22]. The predictor variables for these three dimensions were also highly similar.

The RCS-O has six dimensions: *immediacy/affection* (IA) – the degree to which closeness or distance is expressed;

similarity/depth (SD) – the degree to which the interactants feel alike or different; *receptivity/trust* (RT) – the degree to which interest and concern or lack of interest and disregard are expressed; *composure* (C) – the degree to which one is calm or anxious; *formality* (F) – the degree to which interaction is formal or relaxed; *dominance* (D) – the degree to which power is shared or unequal (see Table 1 for items). Hereafter the three dimensions IA, SD, and RT will be referred to collectively as the "intimacy dimensions."

3. Interview scenarios and medical school assessments

The medical school that provided participants for the present study educates students about the doctor–patient relationship using a biopsychosocial training model. This model integrates a patient-centered interviewing approach, emphasizing the psychosocial aspects of care, with a doctor-centered interviewing approach, emphasizing the biomedical aspects of care [23,24]. Students gain experience interacting with standardized patients through clinical skills assessments beginning in the second term of year 1 and culminating in a 16-station comprehensive clinical skills exam at the end of year 3.

The year 1 interview represents the culmination of a 9-week (27 h) course on medical interviewing. This course introduces students to the patient–physician relationship and develops students' interviewing skills which include empathic communication and clinical data gathering. The year 1 scenario involves a patient who presents with a psychosocially-based problem (e.g., sexual harassment on the job). Students must demonstrate competency in patient-centered interviewing techniques by taking a *nondirective role* and listening with empathy, sensitivity, and respect as the patient takes the lead in telling their story and conveying their concerns.

The year 3 interview represents one of 16 standardized patient cases administered as a cumulative clinical skills assessment in a single day. These interviews represent a comprehensive examination of students' interviewing and clinical skills, the culminating event of three years of course work and clerkships on medical interviewing, clinical reasoning and physical exam skills. The year 3 scenario involves a patient who presents with any one of 100 cases common to primary care. Students must demonstrate competency in doctor-centered interviewing techniques, while also attending to the patient's agenda through patient-centered interviewing. This involves primarily taking a *directive role* to elicit specific data about the patient's present illness, medical history, health risk factors, and so on.

We include the medical school's own assessments in examining the validity of the RCS-O. Interviewing skills in year 1 are assessed using the interview rating scale (IRS). The IRS has been in use for 25 years and was developed to incorporate the fundamental elements of listening skills

models by Benjamin [25], Carkhuff [26] and Ivey [27]. In year 3, communication skills are assessed using the Clinical Interview Rating Scale (CIRS). The CIRS has been in use for 13 years and is based on items from the Arizona Clinical Interview Rating Scale (ACIRS) [28]. Six years ago a clinical skills committee reviewed and modified the ACIRS into a condensed version that met the specific pedagogical goals of the year 3 assessments. For this study, we also applied the IRS to the year 3 interviews. Both the IRS and CIRS utilize 5-point Likert scales to rate interviewing skills such as opening and closing the interview, appropriate use of questions, and conveying interest in and understanding of the patient. In year 3, the standardized patient also evaluates the student's performance using the CIRS.

4. Interview feature measures

Variables to establish the extent to which the year 1 scenario is patient-centered and the year 3 scenario is doctor-centered are included. We measure doctor and patient speaking time, questions, and back-channels. In year 1, where the patient contributes most of the content, the patient will speak more. Conversely, in year 3, where the doctor contributes most of the content, the doctor will speak more. The number of questions the doctor asks will also be related to the interview focus. Questions are primarily a form of controlling the direction of a conversation. Given that in the year 3 scenario the physician's objective is to take a directive role in eliciting information, the number of questions asked by the doctor will be greater in year 3 than in the patient-centered focus in year 1, where the student takes a non-directive role in supporting the patient's telling of their story.

Back-channels are clearly patient-centered interview features. Back-channels are verbal signals such as "uh-huh" and "ok" that express support for the speaker's story and encourage them to continue talking. The doctor is expected to display more back-channels in the year 1 scenario relative to the year 3 scenario.

5. Hypotheses

We make five sets of hypotheses based on the foregoing discussion. First, we expect to observe positive associations among the intimacy dimensions and composure, and negative associations between these two dimensions and formality. Second, we expect to observe medical students speaking more and asking more questions in year 3 compared to year 1, and exhibiting fewer back-channels in year 3 compared to year 1. Third, relational dominance and relational formality are expected to be greater in year 3 than in year 1. Fourth, the medical school assessments should be positively associated with relational intimacy, composure and dominance, and negatively associated with formality. Fifth, males are expected to exhibit greater dominance

whereas females are expected to exhibit greater intimacy [29,30]. Additional analyses involving associations between the RCS-O scales and the structural features of the interviews, and assessments of within-person associations of RCS-O items over time are explored.

6. Methods

6.1. Participants

The sample of 40 medical students (19 females, 21 males) was determined using simple random sampling, within gender and race, from the 110 students of the 2002 graduating class. Race has the following distribution: 8 African Americans, 16 Indians (descent from India), and 16 whites. Each student is observed twice, once interacting with a standardized patient (SP) in year 1 of medical school, and once interacting with an SP in year 3 of medical school. Thus, a total of 80 videotaped interactions were observed and measured.

SPs are selected from a pool of over 300 persons ranging in age from five to 85 years, with average experience as an SP of five or more years. SPs have been trained to accurately and reliably portray an individual with either a psychosocial problem as in year 1, or a physical or mental condition as in year 3. Training involves reviewing scripts and videotaped demonstrations of the standard performance, as well as participating in trial role playing with training and feedback from an experienced SP Eductor/Trainer.

Students interview SPs in a state-of-the-art clinical performance center. This facility houses 16 patient examination rooms. Each room includes the standard equipment of an actual medical office or clinic exam room as well as the latest audiovisual technology. The year 1 and year 3 interviews last approximately 15 and 18 min, respectively.

6.2. Procedures

Measuring relational communication using the RCS-O was carried out by six trained observers (three undergraduate and three graduate students). All observers had prior experience with some form of data collection (e.g., telephone surveys). None of the observers had any prior experience with the form of data collection in this study. The observers received 2.5 h of training in the protocol for viewing and coding the videotaped interactions. This included discussing the nature of relational communication, the history of the development of the instrument, and practice in viewing and coding three taped interviews. Observers were informed they would be rating medical student interactions with standardized patients who would be simulating primary care cases. Year 1 raters were also told that all cases were psychosocial in nature.

Three observers each were assigned to rate the year 1 tapes and year 3 tapes, respectively. Each group included

two females and one male. Rating the 40 interactions in each group was completed over a 5-day period with between eight and 10 interviews coded each day. Most interviews lasted between 15 and 18 min. Each day of coding lasted approximately 3 h. Observers took a 10-min break for every three interactions observed. Interviews were viewed once through only. Raters were not informed about the year 1 and year 3 differences in the medical students' interview objectives. Final RCS-O item scores are derived by computing the average of the three raters' scores.

IRS and CIRS assessments were conducted by trained medical school faculty. From each assessment a single score is derived reflecting the student's overall skill level. Ratings take place while interviews are in progress. SPs in year 3 are also trained in the application of the CIRS. In this case, the CIRS is completed immediately following the interview.

Total and individual specific speaking time was measured using stop watches. Number of questions and back-channels were recorded with pencil and paper.

6.3. Data analysis

In step one of this study, we analyzed each of the 34 RCS-O items for inter-rater agreement using a chance-adjusted measure of agreement called kappa (κ) [31]. The formula for kappa is:

$$\kappa = \frac{O - E}{T - E}$$

where O equals the observed frequency of agreement, E equals the expected frequency of agreement due to chance alone, and T equals the total number of observations. For each of the 80 observed interactions there were three ratings for each of the 34 RCS-O items – one rating per observer. In this first step, we gauged the extent to which all three raters agreed uniformly (selecting any of the following – strongly agree, agree or agree somewhat) or disagreed uniformly (selecting any of the following – strongly disagree, disagree or disagree somewhat). In other words, we collapsed the 7-point scale into three sections: agree (having three choices), neutral/unsure, and disagree (having three choices). Thus, high kappa values indicate items wherein raters showed uniformity in this truncated scale. A neutral/unsure rating was counted as failure to agree. The calculation for computing the expected frequency of observations due to chance alone (E) is:

$$E = \left[\left(\frac{3}{7} \right)^3 \times 2 \right] 40 = 6.3$$

where '3' represents the number of possible choices for agreeing or disagreeing, '7' represents the total number of choices on the 7-point Likert scale, exponent 3 represents the number of raters, 2 represents the two sides of the altered scale (agree and disagree), 40 represents the number of

observed interviews per scenario. Thus, the expected frequency of agreement due to chance alone (E) is 6.3.

We retained items demonstrating at least a moderate degree of agreement as defined by Landis and Koch [32] as 0.40 or greater. Thus, rater agreement on at least 20 of 40 interviews meets that threshold:

$$\kappa = \frac{20 - 6.3}{40 - 6.3} = 0.406$$

In step two, we conducted a factor analysis under the components model for the purpose of scale construction. This was done separately for the two scenarios. The scales were then analyzed for internal consistency using Cronbach's alpha-coefficient (α). The final scales were then analyzed for inter-rater agreement (κ), inter-rater reliability using α, intra-rater agreement using (κ), and intra-rater reliability (α).

Lastly, construct validity was determined by examining the relationships between the scales and the various structural measures of the interviews, including gender, as well as the medical school's own interview evaluations.

7. Results

7.1. Measures of agreement

Table 1 lists each RCS-O item and the number of interviews raters were in agreement. In year 1, 14 items meet the inclusion criterion of perfect agreement on 20 or more interviews. These include eight intimacy items, all five composure items, and one dominance item. However, for six other items we observe agreement on 19 interviews, which corresponds to $\kappa = 0.38$. These include one intimacy item, two formality items, and three dominance items. We decided to retain these six items because they fall under our preferred minimum by only 1 and represent two of four dimensions.

In year 3, 27 items meet the inclusion criterion. These include 14 intimacy items, all five composure items, all three formality items, and five of six dominance items.

7.2. Factor analysis and scale construction

Exploratory factor analysis with varimax rotation was carried out separately for the two interview years. For year 1, five factors had eigenvalues of 1 or more; however, the scree plot indicated a six-factor model that explained 76% of the variance in the data. Using a factor loading minimum of 0.500, the factor loadings indicated the following scales: Factor 1 composure (1C, 2C, 3C, 4C, 5C); Factor 2 dominance (1D, 2D, 3D, 6D); Factor 3 formality (6IA, 3SD, 1F, 2F); Factor 4 intimacy I (1RT, 2RT, 6RT); Factor 5 intimacy II (7IA, 4RT, 5RT); Factor 6 Intimacy III (5IA). The 5 scales have the following internal consistency values (α): compo-

Table 2
Measures of inter-rater and intra-rater agreement (κ) and reliability (α) for year 1 interviews

Dimension (no. of items)	Inter-rater		Rater 1		Rater 2		Rater 3	
	κ	α	κ	α	κ	α	κ	α
Intimacy I (3)	0.72	0.50	0.70	0.82	0.97	0.67	0.64	0.60
Intimacy II (3)	0.78	0.36	0.94	−0.20	0.53	0.48	0.94	0.69
Intimacy III (1)	0.55	0.15	na	na	na	na	na	na
Composure (5)	0.63	0.71	0.97	0.99	0.79	0.92	0.56	0.91
Formality (4)[a]	0.43/0.37	0.65/0.61	0.17/0.73	0.87/0.89	0.00/0.79	0.51/0.68	0.14/0.58	0.74/0.72
Dominance (4)	0.41	0.07	0.71	0.94	0.57	0.13	0.76	0.85

[a] Second value excludes 3 SD.

sure 0.97; dominance 0.84; formality 0.83; intimacy I 0.77; intimacy II 0.52.

In year 3, six factors had eigenvalues of 1 or more. The scree plot also indicated a six-factor model that explained 72% of the variance in the data. Using a factor loading minimum of 0.500, the factor loadings indicated the following scales: Factor 1 intimacy-dominance (1IA, 4IA, 5IA, 7IA, 8IA, 9IA, 2RT, 3D, 4D, 6D); Factor 2 composure (1C, 2C, 3C, 4C, 5C); Factor 3 formality (1F, 2F, 3F, 3IA, 1SD); Factor 4 intimacy I (1RT, 3RT, 6RT); Factor 5 dominance (1D, 2D); Factor 6 intimacy II (4RT, 5RT). The 6 scales have the following internal consistency values (α): intimacy-dominance 0.89; composure 0.97; formality 0.87; intimacy I 0.70; dominance 0.83; intimacy II 0.66.

The year-to-year similarities in the factor structures are greater than the differences. Among the following five factors (intimacy I, intimacy II, composure, formality and dominance), 13 of 19 items load on the same factors: composure (5 of 5); intimacy I (2 of 3); intimacy II (2 of 3); formality (2 of 5); dominance (2 of 4). Thus, for these five factors, 68% (13/19) of the respective indicators are identical from year-to-year. The differences in the factor structures are due primarily to two factors: the single-item indicator intimacy III in year 1 and the 10-item indicator intimacy/dominance in year 3.

7.3. Measures of agreement and reliability of scales

Tables 2 and 3 contain measures of inter-rater and intra-rater agreement and reliability for the scales derived from the factor analyses. In year 1 (Table 2) all κ measures meet

the minimum acceptable level of agreement (0.40) with the exception of formality (0.37). Note that for formality we present two values. The first value in each column is based on the original four items while the second is based on three items. Item 3SD "The physician acted like she/he and the patient were good friends" showed poor agreement with the other 3 formality items for the within-rater assessments. Thus, the item was dropped. Measures of internal consistency are more varied. Fourteen α values fall above the minimal acceptable level of 0.60 and six α values fall below 0.60. Some of these values are low due to restriction in the range of ratings [33]. For example, the α value of 0.36 for intimacy II is the consequence of 94% of raters values falling between 5 and 7. This conclusion is supported by the fact that 52% of the time the three observers provide identical ratings.

Similar results are observed in year 3 as well (Table 3). Twenty-two of 24 measures of κ fall above 0.40, while 17 of 24 measures of α fall above 0.60. Examination of α values less than 0.40 revealed that in each case, the range of rater values was restricted.

7.4. Interview scenario structural differences

Table 4 contains measures of the interview structure. Interview length is a measure of time from the opening statement (e.g., "Hello, my name is...") to the closing statement (e.g., "It was good to meet you"). The year 1 interviews lasted an average of 14.5 min whereas the year 3 interviews lasted an average of 16.25 min. These values were largely determined by the constraints of the testing

Table 3
Measures of inter-rater and intra-rater agreement (κ) and reliability (α) for year 3 interviews

Dimension (no. of items)	Inter-rater		Rater 1		Rater 2		Rater 3	
	κ	α	κ	α	κ	α	κ	α
Intimacy I (2)	0.81	0.38	0.96	0.33	0.65	0.62	0.85	0.66
Intimacy II (3)	0.96	0.07	0.94	0.39	1.00	0.74	0.97	0.80
Intimacy/Dom III (10)	0.64	0.65	0.61	0.82	0.47	0.83	0.29	0.91
Composure (5)	0.63	0.60	0.56	0.94	0.87	0.95	0.90	0.92
Formality (5)[a]	0.54/0.49	0.71/0.68	0.00/0.58	0.84/0.85	0.02/0.67	0.83/0.91	0.11/0.38	0.85/0.84
Dominance (2)	0.81	0.38	0.94	0.21	0.88	0.89	0.97	0.71

[a] Second value excludes 3IA.

Table 4
Interview scenario variables and pair-samples *t*-test

Variable	Mean (S.D.)		*t*-test (*P*-value)
	Year 1	Year 3	
Interview Length	14.50 (1.15)	16.25 (2.71)	−4.03 (0.000)
Doctor talk-time	4.11 (1.69)	9.65 (2.31)	−12.34 (0.000)
Patient Talk-time	9.83 (2.17)	2.29 (1.45)	19.65 (0.000)
Doctor talk-time as proportion of total	0.29 (0.12)	0.61 (0.16)	−10.18 (0.000)
Patient talk-time as proportion of total	0.68 (0.13)	0.14 (0.08)	24.34 (0.000)
Doctor–patient talk-time ratio	0.51 (0.52)	6.63 (5.39)	−7.40 (0.000)
Questions	12.78 (6.31)	40.15 (17.29)	−9.13 (0.000)
Back-channels	35.28 (22.53)	3.03 (5.55)	9.14 (0.000)

environment to restrict the year 1 interview to 15 min or less and the year 3 interviews to 18 min or less. The t-tests for variables other than interview length were weighted by interview length to remove its influence.

All five measures of speaking time are in the expected directions and are highly statistically significant. Patients speak more than doctors in year 1 whereas doctors speak more in year 3. The three additional measures of interview structure are also consistent with expectations. Doctors asked more questions in year 3 and expressed more back-channels in year 1. These differences are also highly statistically significant. These results are consistent with the curricular design of the two scenarios as one with an essentially patient-centered focus and one with an essentially doctor-centered focus.

7.5. Measures of association among the RCS-O scales

Tables 5 and 6 present Pearson correlation coefficients among the RCS-O measures of relational communication. In year 1 (Table 5), the positive associations among the intimacy and composure dimensions are consistent with expectations. The negative associations involving formality are consistent with expectations. The only statistically significant association involving dominance is with intimacy I.

In year 3 (Table 6), intimacy I is associated with all measures except dominance. The negative associations involving formality are consistent with expectations. Dominance and composure are negatively associated.

Table 5
Correlation coefficients among RCS-O scales in year 1

	Int I	Int II	Int III	Comp	Form	Dom
Int I	1.00					
Int II	0.72**	1.00				
Int III	0.62**	0.37*	1.00			
Comp	0.67**	0.78**	0.33*	1.00		
Form	−0.78**	−0.71**	−0.58**	−0.67**	1.00	
Dom	0.45**	0.23	0.13	0.25	−0.30	1.00

  * $P < 0.05$.
 ** $P < 0.01$.

Table 6
Correlation coefficients among RCS-O scales in year 3

	Int I	Int II	Int/Dom	Comp	Form	Dom
Int I	1.00					
Int II	0.71**	1.00				
Int/Dom	0.56**	0.20	1.00			
Comp	0.34*	0.09	−0.04	1.00		
Form	−0.67**	−0.39*	−0.54**	0.05	1.00	
Dom	−0.02	0.01	−0.11	−0.47**	0.03	1.00

  * $P < 0.05$.
 ** $P < 0.01$.

7.6. Measures of correlation and difference

Table 7 shows the relationship between the relational communication measures and interview structure variables. In this table, we identify all association that are statistically significant at the 0.10 level. In year 1, four of the six relational communication measures demonstrate statistically significant associations. Intimacy I, comprised of three receptivity items indicating sincerity, honesty and an interest in talking with the patient (1RT, 2RT, and 6RT), is positively related to the doctor's talk-time, the talk-time ratio, number of questions, and number of back-channels. It is negatively related to patient talk-time. Intimacy II, which measures a willingness to listen to the patient, being open to the patient's ideas, and not acting bored (4RT, 5RT, and 7IA) is positively related to questions. Relational composure is positively related to questions and back-channels. And relational dominance is positively related to doctor talk-time, the talk-time ratio, and doctor questions, and negatively related to patient-talk-time. Both the single-item indicator of intimacy (5IA) and relational formality are unrelated to any of the structural measures.

In year 3, intimacy I, comprised of three receptivity items indicating sincerity, honesty and wanting patient trust (1RT, 3RT, and 6RT), is positively related to doctor talk-time and the talk-time ratio. Intimacy II, comprised of two receptivity items indicating a willingness to listen to the patient and being open to the patient's ideas (4RT and 5RT), is positively related to patient talk-time and negatively related to the talk-time ratio. Relational formality shows a negative association with doctor talk-time. None of the other three measures demonstrate statistically significant associations.

Table 7

Measures of Association between RCS-O Scales and Structural Measures of the Interviews

Scale	Year 1				
	Doctor talk-time proportion	Patient talk-time proportion	Talk-time ratio	Questions	Back-channels
Int I	0.39**	−0.31*	0.41**	0.41**	0.26*
Int II	0.19	−0.15	0.16	0.29*	0.24
Int III	−0.07	0.09	−0.15	−0.11	0.22
Comp	−0.21	0.26	−0.21	0.37**	0.43***
Form	0.02	−0.05	0.06	−0.09	−0.23
Dom	0.47***	−0.50***	0.41***	0.32**	0.02
	Year 3				
Int I	0.50***	−0.12	0.32*	−0.08	−0.19
Int II	0.03	0.40***	−0.33**	0.01	0.18
Int/Dom	0.21	−0.10	0.08	0.03	−0.09
Comp	−0.10	−0.15	0.10	0.21	−0.06
Form	−0.26*	0.01	−0.23	0.20	−0.00
Dom	0.14	0.14	−0.06	−0.22	0.18

* $P < 0.10$.
** $P < 0.05$.
*** $P < 0.01$.

In year 1, the only statistically significant association observed between the medical school measure IRS and the RCS-O scales involves composure ($r = 0.380$, $P = 0.02$). In year 3, none of the associations involving the IRS or CIRS is statistically significant. However, three of the six associations in year 3 involving the SP's evaluation are significant: those involving intimacy I ($r = 0.273$, $P = 0.09$), intimacy II ($r = 0.453$, $P = 0.003$), and formality ($r = −0.334$, $P = 0.035$).

Finally, we examined the relationship between gender and the RCS-O scales. In year 1, we observe one statistically significant difference with regard to relational dominance. Males exhibited an average dominance value of 2.95 (S.D. = 0.58), whereas females exhibited an average of 2.56 (S.D. = 0.52); $t = 2.22$ ($P = 0.03$). We did not observe sex differences in year 3.

Table 8

Year-to-year item difference and association (r)

Item no.	Year 1 mean	Year 3 mean	t-test (P)	r (P)
5IA	5.53	5.38	0.90 (0.397)	0.128 (0.433)
7IA	5.63	5.93	−2.65 (0.011)	0.129 (0.429)
1RT	5.75	5.99	−3.20 (0.003)	0.286 (0.074)
2RT	5.05	5.57	−3.34 (0.002)	0.043 (0.793)
4RT	6.08	5.97	1.43 (0.161)	−0.003 (0.988)
5RT	5.57	5.49	0.67 (0.505)	−0.135 (0.407)
6RT	5.79	6.03	−2.91 (0.006)	−0.026 (0.874)
1C	5.14	5.36	−1.22 (0.228)	0.496 (0.001)
2C	5.42	5.66	−1.45 (0.156)	0.372 (0.018)
3C	4.90	5.12	−1.25 (0.218)	0.518 (0.001)
4C	5.02	5.03	−0.04 (0.970)	0.283 (0.077)
5C	5.27	5.24	0.21 (0.836)	0.549 (0.000)
1F	2.85	3.36	−2.56 (0.014)	−0.041 (0.803)
2F	3.07	3.15	−0.45 (0.652)	0.117 (0.471)
1D	2.81	5.72	−20.59 (0.000)	0.083 (0.610)
2D	2.98	5.60	−16.36 (0.000)	−0.232 (0.151)
3D	2.61	5.73	−26.58 (0.000)	0.296 (0.063)
6D	2.67	5.76	−25.74 (0.000)	0.222 (0.168)

7.7. Year-to-year analysis of the RCS-O items

We examined year-to-year differences and associations for all RCS-O items that met the inclusion criteria for both years. Results are presented in Table 8. Four of the seven intimacy items increase by a statistically significant degree, whereas none of the composure items do so. One of the two formality items increases by a statistically significant degree. All four dominance items increase by a statistically significant degree.

Finally, we examined within-person correlations to explore whether any of the items that met the inclusion criteria for both years (18 items) demonstrated a trait-like characteristic. The observation of a statistically significant positive correlation involving the same item from year-to-year would be evidence of this. Since composure is the one scale comprised of the same items in both years, we examined this scale first. The results were: $r = 0.437$, $P = 0.009$. Next, we examined the five items comprising composure and observe four statistically significant associations ($P < 0.02$) (Table 8). The coefficients ranged in value from 0.372 to 0.549. None of the other items show statistically significant associations.

8. Discussion

The present findings indicate that the RCS-O has promise as a measure of the relational component of a doctor's communication with his/her patients. First, measures of agreement and reliability were adequate in most cases and might be improved with additional training. For example, the range restriction that caused low reliability values might be mitigated by extending the training time of raters to include more detailed attention to the meaning of the items

with respect to the entire 7-point scale. A second possibility would be to introduce more sensitivity to the scale by increasing the scale from seven to nine or 11 positions.

Second, each of the four RCS-O dimensions emerged as salient features in two very different interview scenarios. This suggests that the RCS-O measures the nonverbal component common to both primarily patient-centered and primarily doctor-centered interviews.

Third, consistent with expectations, we observed substantial increases in dominance from year 1 to year 3. We also observed males exhibiting more dominance in year 1 but found no sex difference in year 3. Contrary to expectations, however, we found no statistically significant sex difference for intimacy. We did observe a statistically significant increase on one of two formality items.

Fourth, associations involving structural measures of the interviews are encouraging. In year 1, we found that intimacy I, indicating sincerity, honesty and an interest in talking with the patient, was *positively* related to the doctor's talk-time, the doctor–patient talk-time ratio, number of questions the doctor asked, and back-channels. Relational dominance showed the same pattern of associations. These findings are consistent with Burgoon and LaPoire's conclusion that relational intimacy and dominance are communicated through nonverbal cues of involvement and pleasantness [22]. Talk-time, questions, and back-channels are indicators of the physician's level of involvement. A similar result was observed for intimacy I in year 3. Both intimacy measures have 2 items in common: conveying sincerity and honesty in communicating with the patient.

In year 3 intimacy II, a clearly patient-centered measure as indicated by the items comprising it (a willingness to listen and being open to the patient's ideas), was positively associated with patient talk-time and negatively related to the talk-time ratio.

Finally, the analysis of relational composure suggests it is more a trait than situational variable for several reasons. First, the five composure items emerged together as a unique factor in both scenarios. Second, composure was the only relational dimension for which no items showed any change from year 1 to year 3. Third, composure was the only dimension for which items were correlated over time (4 of 5 items). Thus, while the evidence presented here clearly shows the situational nature of relational intimacy, formality, and dominance, it also strongly supports the hypothesis that relational composure is a trait variable.

9. Conclusion

The RCS-O has been developed to measure the relational communication component of doctor–patient interaction. The findings of the present study are encouraging and suggest that the RCS-O may help meet a key issue described by Roter ([34], p. 8): "the primary methodological challenge to the field is the transition from the conceptual under-pinnings of relationship-centered care to operational indicators that are observable and measurable elements of communication." Additionally, the scale is practical to administer and could lend itself for use in formative evaluations of medical students and physicians.

The next step in our research program will be to compare the RCS-O to the Roter Interaction Analysis System (RIAS) [35,36]. The RIAS has been in development for more than 20 years and is the most widely used method for evaluating doctor–patient interactions. The RIAS compares quite well to other like methods [17]. A comparison with the RIAS would provide a measure of convergent validity of the RCS-O.

9.1. Practice implications

The RCS-O is based on a communication model that is relevant to a basic challenge in medical education: training and evaluating students' ability to comprehend and integrate two seemingly disparate dimensions of medical interviews (i.e., the psychosocial and the biomedical) to form a more complete story of a patient's illness [23,37]. This challenge often intensifies during the clinical years of medical school when the curricula focuses students' attention even more squarely on learning the biomedical and biotechnical aspects of medicine with typically less attention to developing psychosocial sensitivity and interpersonal communication skills. In recent years medical schools have grown increasingly aware of the need to infuse a biopsychosocial training model and medical interviewing courses focused on communication skills into their curricula [37,38]. The present research supports the RCS-O as one potentially useful tool for evaluating medical students' nonverbal interpersonal communication skills in the context of such curricular innovations.

Acknowledgements

References

[1] Gallagher TJ, Hartung PJ, Gregory SW. Assessment of a measure of relational communication for doctor–patient interactions. Patient Educ Couns 2001;45:211–8.

[2] Parks MR. Relational communication: theory and research. Hum Commun Res 1977;3:372–81.

[3] Burgoon JK, Buller DB, Woodall WG. Nonverbal communication: the unspoken dialogue. New York: Harper & Row; 1989.

[4] Colliver JA, Swartz MH, Robbs RS, Cohen DS. Relationship between clinical competence and interpersonal and communication skills in standardized-patient assessment. Acad Med 1999;74: 271–4.

[5] Hodges B, Turnbull J, Cohen R, Bienenstock A, Norman G. Evaluating communication skills in the objective structured clinical examination format: reliability and generalizability. Med Educ 1996;30:38–43.

[6] Buller MK, Buller DB. Physicians' communication style and patient satisfaction. J Health Soc Behav 1987;28:375–88.

[7] DiMatteo MR, Taranta A, Friedman HS, Prince LM. Predicting patient satisfaction from physicians' nonverbal communication skills. Med Care 1980;18:376–87.

[8] DiMatteo MR, Hays RD, Prince LM. Relationship of physicians' nonverbal communication skill to patient satisfaction, appointment noncompliance and physician workload. Health Psychol 1986;5:581–94.

[9] Hall JA, Roter DL, Rand CS. Communication of affect between patient and physician. J Health Soc Behav 1981;22:18–30.

[10] Larsen KM, Smith CK. Assessment of non-verbal communication in the patient–physician interview. J Fam Pract 1981;12:481–8.

[11] Roter DL, Hall JA, Kern DE, Barker LR, Cole KA, Roca RP. Improving physicians' interviewing skills and reducing patients' emotional distress: a randomized clinical trial. Arch Intern Med 1995;155:1877–84.

[12] Ong LML, DeHaes JCJM, Hoos AM, Lammes FB. Doctor–patient communication: a review of the literature. Soc Sci Med 1995;40:903–18.

[13] Orth JE, Stiles WB, Scherwitz L. Interviews and hypertensive patients' blood pressure control. Health Psychol 1987;6:29–42.

[14] Squier RW. A model of empathic understanding and adherence to treatment regimens in practitioner-patient relationships. Soc Sci Med 1990;30:325–39.

[15] Ben-Sira Z. Affective and instrumental components in the physician-patient relationship: An additional dimension of interaction theory. J Health Soc Behav 1980;21(2):170–80.

[16] Hall JA. Affective and nonverbal aspects of the medical visit. In: Carroll JG, Frankel RM, Keller A, Klein T, Williams PK, editors. In: In the medical interview: clinical care, education, and research. New York: Springer-Verlag; 1995. p. 495–503.

[17] Boon H, Stewart M. Patient–physician communication assessment instruments: 1986 to 1996 in review. Patient Educ Couns 1998;35:161–76.

[18] Graham EE. Relational communication scale. In: Rubin RB, Palmgreen P, Sypher HE, editors. In: Communication research measures: a sourcebook. New York: Guilford Press; 1994. p. 308–13.

[19] Burgoon JK, Hale JL. The fundamental topoi of relational communication. Commun Monogr 1984;51:193–214.

[20] Burgoon JK, Hale JL. Validation and measurement of the fundamental themes of relational communication. Commun Monogr 1987;54:19–41.

[21] Burgoon JK, Dilman L. Gender, immediacy, and nonverbal communication. In: Kalbfleisch PJ, Cody MJ, editors. In: Gender, Power, and Communication in Human Relationships. New Jersey: Lawrence Elrbaum Assoc; 1995. p. 63–81.

[22] Burgoon JK, Le Poire BA. Nonverbal cues and interpersonal judgments: participant and observer perceptions of intimacy, dominance, composure, and formality. Commun Monogr 1999;66:105–24.

[23] Smith RC. The patient's story: integrated patient-doctor interviewing. Boston: Little, Brown & Co.; 1996.

[24] Smith RC, Hoppe RB. The Patient's story: integrating the patient- and physician-centered approaches to interviewing. Ann Intern Med 1991;115:470–7.

[25] Benjamin A. The helping interview. first ed. Boston: Houghton-Mifflin; 1969.

[26] Carkhuff RR. Helping and human relations, vol 1. New York: Holt, Rinehart, and Winston; 1969.

[27] Ivey A. Microcounseling: innovations in interviewing training. Springfield, IL: Charles C. Thomas; 1974.

[28] Stillman PA, Brown DR, Redfield DL, Sabers DL. Construct validation of the Arizona Clinical Interview Rating Scale. Educ Psychol Meas 1977;37:1031–8.

[29] Hall JA, Irish JT, Roter DL, Ehrlich CM, Miller LH. Gender in medical encounters: an analysis of physician and patient communication in a primary care setting. Health Psychol 1994;13:384–92.

[30] Elderkin-Thompson V, Waitzkin H. Difference in clinical communication by gender. J Gen Intern Med 1999;14:112–21.

[31] Cohen J. A coefficient of agreement for nominal scales. Educ Psychol Meas 1960;20:37–46.

[32] Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159–74.

[33] Tinsley HEA, Weiss DJ. Inter-rater reliability and agreement of subjective judgments. J Couns Psychol 1975;22:358–76.

[34] Roter DL. The enduring and evolving nature of the patient–physician relationship. Patient Educ Couns 2000;39:5–15.

[35] Roter D. The Roter method of interaction process analysis. Debra Roter; 2002.

[36] Roter D, Larson S. The Roter interaction analysis system (RIAS): utility and flexibility for analysis of medical interactions. Patient Educ Couns 2002;46:243–51.

[37] Coulehan JL, Block MR. The medical interview: mastering skills for clinical practice. fourth ed. Philadelphia, PA: F.A. Davis; 2001.

[38] Feighny KM, Arnold L, Monaca M, Munro JS, Earl B. In pursuit of empathy and its relation to physician communication skills multi-dimensional empathy training for medical students. Ann Behav Sci Med Educ 1998;5:13–21.