



Development of a measure of relationship perception in schizophrenia

Mark J. Sergi^{a,b,*}, Alan P. Fiske^c, William P. Horan^{b,d}, Robert S. Kern^{b,d},
 Kimmy S. Kee^{b,d,e}, Kenneth L. Subotnik^d,
 Keith H. Nuechterlein^{d,f}, Michael F. Green^{b,d}

^a Department of Psychology, California State University, Northridge, CA, USA

^b Veterans Affairs Greater Los Angeles Healthcare System, Los Angeles, CA, USA

^c Department of Anthropology, Center for Culture, Brain and Development, and Center for Behavior, Evolution, and Culture, University of California, Los Angeles, CA, USA

^d Department of Psychiatry and Biobehavioral Sciences, Geffen School of Medicine at UCLA, Los Angeles, CA, USA

^e Psychology Program, California State University Channel Islands, Camarillo, CA, USA

^f Department of Psychology, University of California, Los Angeles, CA, USA

Received 10 January 2007; received in revised form 9 July 2007; accepted 11 March 2008

Abstract

Relationships Across Domains (RAD) is a new measure of competence in relationship perception that may be used to assess clinically stable persons with schizophrenia and healthy persons. The structure and content of the RAD are grounded in relational models theory, a well-validated theory of social relations. The 75-item RAD contains 25 vignettes and can be administered in approximately 35 min. The RAD requires participants to implicitly identify the relational model of a dyad described in a brief vignette and infer how the members of the dyad are likely to behave in three other social contexts. The RAD demonstrated good internal consistency in schizophrenia outpatients and healthy participants matched to the outpatients in age and education. The schizophrenia outpatients performed more poorly on the RAD than two healthy comparison groups, supporting the ability of the RAD to discriminate between clinical and non-clinical populations. The schizophrenia patients' performance on the RAD was moderately related to reading ability and several domains of community functioning.

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Keywords: Schizophrenia; Relationship perception; Relationships Across Domains; Social cognition; Relational models theory; Community functioning

1. Introduction

Social cognition, the ability to construct mental representations about others, oneself, and relations between others and oneself (Adolphs, 2001; Brothers, 1990), is impaired in persons with schizophrenia (Green et al., 2005). Relative to healthy persons, schizophrenia

* Corresponding author. Department of Psychology, California State University, 18111 Nordhoff Street, Northridge, CA 91330-8255, USA. Tel.: +1 818 677 7352; fax: +1 818 677 2829.

E-mail address: mark.sergi@csun.edu (M.J. Sergi).

37 patients display impairments in social cognitive domains
 38 such as emotion processing (Archer et al., 1994; Pollard
 39 et al., 1995), social perception (Corrigan and Green,
 40 1993; Toomey et al., 2002), theory of mind (Greig et al.,
 41 2004; Roncone et al., 2002), and social knowledge
 42 (Corrigan and Addis, 1995; Penn et al., 2002). Correla-
 43 tional and structural equation modeling analyses
 44 strongly suggest that social cognition mediates relations
 45 between neurocognition and community functioning in
 46 schizophrenia (e.g., Addington et al., 2006; Brekke et al.,
 47 2005; Sergi et al., 2006; Vauth et al., 2004). The
 48 investigators of the NIMH Initiative Measurement and
 49 Treatment Research to Improve Cognition in Schizo-
 50 phrenia (MATRICS) identified social cognition as one of
 51 seven domains that should be routinely assessed in
 52 clinical trial studies of schizophrenia (Green et al., 2004).

53 Relationship perception, an important aspect of social
 54 cognition, has not been studied in schizophrenia largely
 55 due to the absence of a measure of competence in
 56 relationship perception. Most measures of social cogni-
 57 tion assess how persons understand and make inferences
 58 about other individuals, typically by perceiving social
 59 cues such as facial expressions or gestures. However,
 60 social relationships also depend on relationship percep-
 61 tion — the ability to implicitly recognize the model that
 62 others are using to organize a given social interaction,
 63 and to understand the implications of using that
 64 particular relational model. Findings of impaired rela-
 65 tionship perception in schizophrenia would advance our
 66 understanding of social cognition in schizophrenia and
 67 likely explain variance in the functional status of persons
 68 with schizophrenia that is not explained by other aspects
 69 of social cognition. Hence, we developed a measure of
 70 competence in relationship perception that assesses
 71 one's capacity to implicitly recognize and make appro-
 72 priate inferences about relational models.

73 Relational models theory is a well-validated and
 74 widely applied theory of relationship perception (Fiske,
 75 1991, 2004). It posits that people construct, coordinate,
 76 and evaluate their social relationships using four implicit
 77 relational models (see Table 1). Communal sharing
 78 relationships are based on the sense that participants
 79 have something socially significant in common —
 80 usually something that differentiates them from others.
 81 Communal sharing relationships vary in intensity from
 82 deep love to team membership to community citizenship
 83 to ethnic or national identities. Authority ranking rela-
 84 tionships are linear hierarchies of prestige and legitimate
 85 authority, such as military seniority, corporate position, or,
 86 especially in traditional societies, age. In equality
 87 matching relationships, people keep track of additive
 88 differences in what they give and get, with reference to

Table 1		t1.1
The four relational models		t1.2
Communal sharing	• Members are equivalent and undifferentiated	t1.3
	• Members focus on commonality among persons in the relationship	t1.4
	• Members share resources without accounting	t1.5
Authority ranking	• Seen in healthy family and love relationships	t1.6
	• Members focus on asymmetric hierarchical ordering	t1.7
	• “Decision maker” takes initiative and accepts responsibility	t1.8
Equality matching	• “Follower” readily accepts and supports the decisions of the “decision maker”	t1.9
	• Seen in relations between military personnel and medical personnel of different rank	t1.10
	• Members focus on one-to-one correspondence regarding contributions and distributions	t1.11
Market pricing	• Members closely monitor effort and/or resource use and evaluate against a 50:50 baseline	t1.12
	• Reciprocity of like behaviors amongst members	t1.13
	• Seen in turn-taking among peers, car pools, and baby-sitting cooperatives	t1.14
Market pricing	• Members focus on proportionality	t1.15
	• Each member is entitled to a “fair rate of return” proportional to their contribution	t1.16
	• Relationships are organized by ratios and rates such as wages and cost-benefit calculations	t1.17
	• Seen in buyers and sellers, but need not involve money	t1.18

even balance. Examples include balanced, in-kind 89
 reciprocity such as exchanging party invitations; turn- 90
 taking; voting; and the rules of nearly all sports and 91
 games. Market pricing relationships are organized with 92
 reference to some socially meaningful ratio or rate, such 93
 as prices, wages, rents, taxes, interest. But relationships 94
 based on *rationality* need not involve money or even 95
 material barter; market pricing operates in cost/benefit 96
 analysis, military analysis based on kill-ratios, utilitarian 97
 moral reasoning, and standards of proportional justice 98
 (e.g., calculating just rewards or due punishments). 99

According to relational models theory, the four 100
 relational models govern social behavior across the 101
 many domains of social life (e.g., material transactions, 102
 distributions, contributions, organization of work, mean- 103
 ing of places and things, social decision-making, moral 104
 judgment, normative aggression) (Fiske, 1991). Persons 105
 in any given group or dyadic relationship may use 106
 different relational models in different situations. For 107
 example, although Mary acts as Joe's boss in the office 108
 (characteristic of the authority ranking relational model), 109
 they may play tennis after work as equals (characteristic 110
 of the equality matching relational model). However, a 111
 given dyad typically has a default or preferred model that 112
 they tend to use to coordinate most of their interactions 113
 (Haslam and Fiske, 1999). 114

115 Considerable evidence suggests that the relational
116 models correspond to persons' implicit organization of
117 relationships. The relational models organize memory
118 for acquaintances (e.g., recall of acquaintances tends to
119 be organized by the relational model most characteristic
120 of the relationship with the acquaintance) (Fiske, 1995).
121 The relational models also account for both intentional
122 and inadvertent substitutions of people in naming,
123 memory, and action (e.g., attempting to telephone Ben,
124 you actually dial Mike because most of your interactions
125 with both Ben and Mike are communal sharing
126 experiences) (Fiske, 1995; Fiske et al., 1991; Fiske and
127 Haslam, 1997). Taxometric studies support the theory's
128 contention that the relational models are discrete
129 categories (Haslam, 1994), and cross-cultural research
130 indicates that the relational models are present in diverse
131 societies (Fiske, 1990, 1993).

132 Inflexible or aberrant use of the relational models is
133 connected to vulnerability to depression, bipolar dis-
134 order, psychosis, and personality disorders (Allen et al.,
135 2005; Haslam, 2004; Haslam et al., 2002). While people
136 typically perceive their family relations as based
137 primarily on communal sharing and authority ranking,
138 vulnerability to dysthymia is correlated with unusually
139 extreme perceptions of communal sharing and authority
140 ranking in family relations (Allen et al., 2005).
141 Hypomania is associated with higher than average
142 perceptions of communal sharing and authority ranking
143 in close friendships, and atypically high perceptions of
144 communal sharing and equality matching in relation-
145 ships that most people perceive as hierarchical. Psycho-
146 sis proneness is associated with low perceptions of
147 communal sharing and equality matching, along with
148 high perceptions of authority ranking (Allen et al., 2005).
149 Most personality disorders are associated with a unique
150 pattern of motivation to engage in, frequency of
151 engagement in, and reported frustration in different
152 relational models. For example, in both non-clinical and
153 clinical samples, schizoid PD is associated with low
154 investment in communal sharing relationships, low
155 implementation (or construal) of equality matching re-
156 lationships, and lack of reported difficulties in relation-
157 ships organized according to any type of relational model
158 (Haslam et al., 2002; Haslam, 2004).

159 However, these studies of psychopathology and nearly
160 all previous quantitative research on relational models
161 theory have been limited to studying how people perceive
162 their relationships, their motivations or preferences for
163 each relational model, or their difficulties with each
164 relational model. No previous research has explored
165 *competence* in using relational models. Competence may
166 vary across individuals — and since people use relational

models to generate, comprehend, coordinate, and evaluate
their relationships, deficient competence is likely to have
substantial **affects** on social functioning, and more
generally on subjective and objective well being. Hence,
we developed the RAD (*Relationships Across Domains*),
the first measure of competence in recognizing the four
relational models and making inferences from one
interaction to others.

The first step in creating a measure of competence in
relationship perception and inference was to generate a
pool of sentences describing social interactions between
varied male–female dyads. The originator of relational
models theory, Dr. Alan Fiske, assessed the construct
validity of each sentence. Each social interaction was
consistent with one of the four relational models and a
specific domain of social life. Preferred sentences were
used to create test items (see Materials and methods
section and Table 2 for more details regarding test items).

Table 2	t2.1
Sample items from Relationships Across Domains (RAD)	t2.2
<hr/>	
I. Information about Alan and Patty	t2.3
Alan and Patty buy gifts for each other whenever they see something they think the other would like, just because they like to make each other happy. They recently had to decide where to locate their restaurant. Alan and Patty thought about how each potential location would affect their relationship with each other. They picked a site that they thought would allow them to spend the most time together. Alan and Patty in other situations	t2.4 t2.5
Using what you now know about this pair, circle yes or no to indicate whether the pair would act or think in the way described in each of the following statements.	t2.6
1. Alan keeps track of the time he spends with Patty relative to the time he spends with other people. (Yes) (No)	t2.7
2. Patty brings home all the money she earns and turns it over to Alan; whenever she needs spending money, she asks Alan and he gives her some. (Yes) (No)	t2.8
3. Alan and Patty feel like they've always been together, and always will be. (Yes) (No)	t2.9
II. Information about Jerry and Karen	t2.10
Karen often thinks about whether her association with Jerry is a good use of her time. Jerry and Karen recently had to decide where to locate their office. Jerry got a cost estimate for the location he wanted and Karen got a cost estimate for the location she wanted. They selected the location with the lowest costs. Jerry and Karen in other situations	t2.11 t2.12
Using what you now know about this pair, circle "yes" or "no" to indicate whether the pair would act or think in the way described in each of the following statements.	t2.13
4. Karen is careful not to interrupt Jerry when he is speaking, but he interrupts her sometimes. (Yes) (No)	t2.14
5. Jerry and Karen had to make an important decision yesterday. They made offers and counter offers to each other, and then signed a contract that states what each of them needs to do. (Yes) (No)	t2.15
6. Jerry won an award earlier this year. Karen figured that Jerry had earned it and that Jerry's tremendous investment of time and energy had finally paid off. (Yes) (No)	t2.16

t3.1 Table 3
t3.2 Comparison of the three groups

t3.3	Undergraduates	Schizophrenia patients	Healthy comparison	<i>t</i> -test UG/SZ		<i>t</i> -test SZ/HC	
	(<i>n</i> = 140)	(<i>n</i> = 48)	(<i>n</i> = 34)	<i>t</i>	<i>P</i>	<i>t</i>	<i>P</i>
t3.4							
t3.5	Gender (male: female)	37: 103	30: 18	23: 11			
t3.6		Mean (S.D.)	Mean (S.D.)	Mean (S.D.)			
t3.7	Age (years)	19.2 (1.6)	33.9 (7.7)	32.1 (5.2)			
t3.8	Education (years)	12.9 (1.0)	14.0 (1.6)	14.0 (1.5)			
t3.9	SAPS (mean global rating)		1.0 (0.8)				
t3.10	SANS (mean global rating)		1.8 (1.0)				
t3.11	WTAR ^a (percent correct)		76.6 (18.6)	85.0 (13.3)		2.11	<0.05
t3.12	RAD (percent correct)						
t3.13	Total score	74.7 (7.7)	68.3 (9.3)	77.6 (7.3)	4.78	<0.001	4.83 <0.001
t3.14	CS — vignette	84.4 (10.7)	76.9 (13.7)	86.6 (7.5)	3.89	<0.001	3.76 <0.001
t3.15	AR — vignette	80.0 (10.8)	70.3 (14.5)	80.0 (14.9)	4.93	<0.001	2.96 <0.005
t3.16	EM — vignette	65.9 (11.3)	59.3 (12.3)	69.1 (9.8)	3.45	<0.005	3.89 <0.001
t3.17	MP — vignette	63.5 (13.2)	65.6 (12.8)	69.8 (13.1)	-0.95	NS	1.47 NS
t3.18	CS — statement	71.8 (10.2)	66.3 (10.8)	74.6 (12.4)	3.16	<0.005	3.21 <0.005
t3.19	AR — statement	79.0 (11.0)	73.7 (15.1)	85.7 (9.6)	2.61	<0.01	4.06 <0.001
t3.20	EM — statement	84.2 (11.6)	74.0 (14.6)	80.3 (11.8)	4.03	<0.001	2.07 <0.05
t3.21	MP — statement	61.8 (12.7)	57.6 (11.6)	62.8 (11.7)	2.03	<0.05	2.01 <0.05
t3.22	RFS ^b						
t3.23	Work productivity		3.1 (1.8)				
t3.24	Independent living		4.9 (1.4)				
t3.25	Family relationships		5.8 (1.2)				
t3.26	Social relationships		4.5 (1.8)				

t3.27 All *t*-tests were two-tailed.

SZ, schizophrenia outpatients; UG, undergraduates; HC, healthy comparison participants; SAPS, Scale for the Assessment of Positive Symptoms; SANS, Scale for the Assessment of Negative Symptoms; RAD, Relationships Across Domains; CS, Communal Sharing; AR, Authority Ranking; EM, Equality Matching; MP, Market Pricing; WTAR, Wechsler Test of Adult Reading; RFS, Role Functioning Scale.

t3.28 ^a 45 schizophrenia outpatients and 29 healthy comparison participants completed the WTAR.

t3.29 ^b 46 schizophrenia outpatients completed the RFS.

t3.30

185 The “beta version” of Relationships Across Domains
186 (RAD) consisted of 40 vignettes with 3 questions per
187 vignette, a total of 120 questions. This draft was ad-
188 ministered to 109 undergraduates with the intention of
189 “pruning” items to increase internal consistency. The 25
190 vignettes with the highest average item-total correlations
191 were retained, yielding a 75 question measure with ade-
192 quate internal consistency ($\alpha = .78$).

193 The present paper reports on the psychometric
194 properties and discriminative validity of the 25-vign-
195 ette/75-item RAD. Our first aim was to assess the in-
196 ternal consistency of the RAD in three samples:
197 outpatients with schizophrenia; healthy persons similar
198 to the outpatients in age, education, and gender; and
199 undergraduate students. A second aim was to establish
200 that the RAD could detect different levels of competence
201 in relationship perception between schizophrenia out-
202 patients and healthy persons. As persons with schizo-
203 phrenia show impairment on most measures of social
204 cognition, we hypothesized that the outpatients would
205 perform less well on the RAD than both comparison
206 groups. The third aim was to examine the relationship

between performance on the RAD and reading skill (an
estimate of premorbid verbal intelligence). As the RAD
involves written vignettes, we hypothesized that the
RAD and the Wechsler Test of Adult Reading would be
somewhat correlated in schizophrenia outpatients and
healthy persons. The fourth aim was to examine the
relationship between performance on the RAD and
community functioning. As relational models theory
argues that social functioning depends on an implicit
understanding of the relational models, we hypothesized
that performance on the RAD and performance on the
Role Functioning Scale would be correlated in schizo-
phrenia outpatients.

2. Materials and methods

2.1. Participants

The present study involved three groups of partici-
pants: 48 schizophrenia outpatients, 34 healthy compar-
ison participants who were similar to the outpatients in
age and education, and 140 undergraduate students. This

study was carried out in accordance with the Declaration of Helsinki. All persons participated in the study after providing their written informed consent. The students participated in the study to satisfy a requirement of a lower division psychology course. They were informed of alternatives for meeting the requirement, such as writing a paper. The students had to have seven years of English-based education to participate in the study. The schizophrenia outpatients and the healthy comparison participants were part of a larger study of multiple aspects of social cognition in schizophrenia titled “Social Cognition: Interpersonal and Emotional Processes” (M. F. Green, Project P.I.) within the UCLA Center for Neurocognition and Emotion in Schizophrenia (K. H. Nuechterlein, Center P.I.). All outpatients met criteria for schizophrenia based on interview with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID; First et al., 1997). All potential healthy control participants were administered the SCID and selected sections of the Structured Clinical Interview for DSM-IV Axis II Disorders (SCID-II; First et al., 1996). Potential healthy comparison participants were excluded if they had a history of any psychotic disorder, recurrent depression, bipolar disorder, substance dependence, or if they met criteria for any of the following personality disorders: Avoidant, Paranoid, Schizoid, and Schizotypal. Potential control participants were also excluded if they had a first-degree relative with a psychotic disorder. The psychiatric symptoms of the outpatients were assessed with the Scale for the Assessment of Positive Symptoms (SAPS; Andreasen, 1986) and the Scale for the Assessment of Negative Symptoms (SANS; Andreasen, 1984; Andreasen and Grove, 1986). These measures contain anchored items that are rated from 0 (symptom absent) to 5 (symptom severe). SAPS and SANS raters, trained to use these measures in the UCLA Center for Neurocognition and Emotion in Schizophrenia, demonstrated agreement between their ratings and the consensus ratings of the expert diagnosticians (minimum intraclass coefficient = .75). The SAPS and SANS ratings (Table 3) indicate that the outpatients’ symptoms were mild at the time of their participation. The age, education, and gender distribution of the participants are displayed in Table 3. The outpatients and the healthy comparison participants did not differ in age, $t(80) = 1.14$, $P = .26$, or education, $t(80) = 0.12$, $P = .90$. The majority female undergraduate sample reflects the gender distribution of those enrolled in lower division psychology courses at California State University, Northridge (CSUN).

The study protocol for the undergraduate students was approved by the human subjects protection committee of CSUN. The study protocol for the schizophrenia patients and the healthy control participants was approved by the

human subjects protection committee of UCLA. The human subjects protection committees of both UCLA and CSUN approved the publication of the respective data sets in a single report.

2.2. Procedures

The undergraduate students completed the RAD in groups of 4 to 12 participants. The schizophrenia outpatients and the healthy comparison participants completed the RAD and Wechsler Test of Adult Reading individually. The outpatients with schizophrenia completed the Role Functioning Scale individually. All participants were asked to read the RAD silently as the tester read it aloud.

2.3. Measures

2.3.1. Relationship perception

Relationships Across Domains (RAD) is a 75-item paper and pencil measure of competence in relationship perception. The content and format of the RAD are based on relational models theory (Fiske, 1991, 2004). The content of the RAD’s vignettes and items reflects the theory’s contention that four relational models (communal sharing, authority ranking, equality matching, market pricing; see Table 1) govern social behavior across many domains of social life (e.g., material transactions, distributions, contributions, organization of work, meaning of things, social decision-making, moral judgment). The RAD reflects the theory’s assertion that persons use their implicit knowledge of the four relational models to understand social relationships and make inferences about the behavior of social partners in future interactions.

The RAD contains 25 two to four sentence vignettes, each involving a differently named male–female dyad whose interpersonal behaviors are consistent with one of the four relational models (see Table 2). Each vignette is followed by three statements that describe the dyad’s interpersonal behavior in domains of social life different from that of the vignette. Each of the three statements is consistent with one of the relational models. The order of relational models of the vignettes was varied throughout the RAD so that practice or fatigue effects during administration would not affect performance on items of any one relational model. Participants are asked to use what they learned about the dyad from the vignette to indicate whether the behaviors described in the three statements are likely or unlikely to occur by answering “yes” or “no.” Thus, participants use their implicit knowledge of the relational models to correctly answer the items of the RAD. The number of items per vignette

with correct “yes” responses (range 0–3) was intentionally varied to reduce response expectations in participants. Of the 25 vignettes of the RAD, eight involve communal sharing content, six involve authority ranking content, six involve equality matching content, and five involve market pricing content. Of the 75 items of the RAD, 25 involve a communal sharing statement, 25 involve an authority ranking statement, 14 involve an equality matching statement, and 11 involve a market pricing statement. The total number of correct responses on the measure provides an index of competence in relationship perception. The reading level of the RAD was estimated at the ninth grade using the Flesch–Kincaid algorithm of Microsoft Word. Administration of the RAD typically required about 35 min for participants in all groups.

2.3.2. Reading ability

The Wechsler Test of Adult Reading (WTAR; Psychological Corporation, 2001) is a measure of reading ability that is often used as an estimate of premorbid intellectual ability in persons with cognitively impairing disorders. Participants are asked to read aloud 50 phonetically irregular words of increasing difficulty. Reading ability is estimated by the number of words correctly pronounced. Administration of the WTAR required about 3 min. The WTAR was administered only to the schizophrenia outpatients and the matched comparison participants.

2.3.3. Psychosocial status

The Role Functioning Scale (RFS; McPheeters, 1984) measures four domains of functioning in everyday life: work productivity, independent living/self-care, relationships with family and spouse, and relationships with friends. Each domain is rated on specific anchor points ranging from 1 (severely limited functioning) to 7 (optimal functioning). The RFS has sound psychometric properties (Goodman et al., 1993) and has been widely used in service outcome studies in schizophrenia (e.g., Brekke et al., 1997; Brekke and Long, 2000; Green and Gracely, 1987). Interviewers for the RFS were masters and doctoral level persons, who were trained in the Functional Outcomes Core of the UCLA Center for Neurocognitive and Emotion in Schizophrenia (John Brekke, Ph.D. Core Director). The RFS was rated after a 30–45 min semi-structured interview with each schizophrenia patient.

2.4. Data analyses

The internal consistency of the RAD was estimated with Cronbach’s (1951) α . Independent samples

t -tests and ANCOVAs were employed to examine group differences between the schizophrenia outpatients and the comparison participants on the RAD and WTAR. Pearson r coefficients were calculated to assess the relationship between the RAD, the WTAR, and the RFS for select groups.

3. Results

The RAD demonstrated good internal consistency for the schizophrenia outpatients ($\alpha = .85$) and matched comparison participants ($\alpha = .86$), and somewhat lower internal consistency for the undergraduate students ($\alpha = .68$).

Performance on the Wechsler Test of Adult Reading (WTAR) is displayed in Table 3. The schizophrenia outpatients performed more poorly than the healthy control participants on the WTAR, $t(72) = 2.11$, $P < .05$. As anticipated, performance on the RAD (total score) was related to performance on the WTAR in the schizophrenia outpatients, $r(45) = 0.49$, $P < .01$. However, performance on the RAD (total score) was not related to performance on the WTAR in the healthy comparison participants, $r(29) = 0.19$, $P = .33$.

Performance on the RAD for each group is displayed in Table 3. The schizophrenia outpatients performed more poorly on the RAD (total score) than both the healthy comparison participants, $t(80) = 4.83$, $P < .001$, and the undergraduate students, $t(193) = 4.78$, $P < .001$. The difference between outpatients and healthy comparison subjects on the RAD remained significant when the effects of reading ability (WTAR) were accounted for, $F(1, 77) = 5.33$, $P < .05$. To examine group differences in understanding of individual relational models, statements (items) were identified as belonging to a specific relational model in two ways: by the relational model of the vignette preceding the statement or by the relational model of the statement itself. In general, the schizophrenia outpatients performed significantly more poorly than the healthy comparison participants and the undergraduates on the four relational models, identified by vignette or statement. Only market pricing identified by vignette did not evidence group differences.

Performance on the Role Functioning Scale is displayed in Table 3. The performance of the schizophrenia patients on the RAD (total score) was related to independent living/self-care, $r(45) = 0.34$, $P < .05$, relationships with family and spouse, $r(45) = 0.36$, $P < .05$, relationships with friends, $r(45) = 0.31$, $P < .05$, but not to work productivity, $r(45) = 0.12$, $P = .44$. When the influence of reading ability/premorbid intellectual ability (WTAR) was statistically controlled, the patients’

performance on the RAD (total score) continued to be associated with independent living/self-care, $r(39)=0.33$, $P<.05$, and relationships with family and spouse, $r(39)=0.40$, $P<.05$.

Performance on the RAD was not associated with age in any of the samples (schizophrenia patients, $r(47)=-0.21$, $P=.16$; healthy comparison participants, $r(34)=-0.20$, $P=.26$; undergraduate students, $r(144)=-0.12$, $P=.14$). Gender differences in performance on the RAD were not observed in any sample (schizophrenia patients, $t(45)=-1.15$, $P=.26$; healthy comparison participants, $t(32)=-0.20$, $P=.84$; undergraduate students, $t(138)=-0.77$, $P=.44$). Performance on the RAD was related to the schizophrenia patients' positive symptoms (RAD and total of the global ratings on the SAPS, $r(47)=-0.36$, $P<.05$), but not their negative symptoms (RAD and total of the global ratings on the SANS, $r(47)=-0.27$, $P=.07$).

4. Discussion

Relationships Across Domains (RAD) is a new measure of relationship perception that is appropriate for use with clinically stable persons with schizophrenia and healthy persons. The RAD demonstrated good internal consistency in schizophrenia outpatients and matched comparison participants. The internal consistency of the measure was somewhat lower in university undergraduates. The RAD detected differences in relationship perception between the schizophrenia outpatients and the two healthy samples, showing that the patients were impaired in their overall competence in relationship perception as well as their understanding of the individual relational models. The RAD's associations with family relations, friend relations, and independent living/self-care support the relationship between competence in relationship perception and community functioning in schizophrenia.

In general, the schizophrenia outpatients performed significantly more poorly than the healthy comparison participants and the undergraduates on the four relational models, identified by vignette or statement. Only market pricing identified by vignette did not evidence group differences. The lack of a group difference in market pricing is not consistent with relational model theory's contention that market pricing is the last relational model to develop in persons. The most likely explanation is psychometric: market pricing vignettes were fewer in number than the vignettes of the other relational models; affording for lesser statistical power and likely resulting in the observed lack of group differences. Another possibility is that the writing of the market pricing

vignettes made them difficult to comprehend for all participants. Contrary to this argument, the percent correct for market pricing vignettes – averaged across all groups – were actually greater than the percent correct for equality matching vignettes.

The relationship perception skill of the schizophrenia patients was related to independent living/self-care, relationships with family and spouse, and relationships with friends, but not to work productivity. The associations observed support the link between social cognition and functional status in schizophrenia. Relationship perception, the ability to understand and make inferences about relations between others, appears to impact the schizophrenia patient's ability to get along with friends and family. While relationship perception did not correlate with work productivity, largely assessed by days and hours of paid or volunteer work, the findings suggest that relationship perception may impact the patient's ability to get along with employers and co-workers — a skill that is essential for maintaining employment.

The development of the content of the RAD occurred through our close collaboration with an expert in relational models theory (Dr. Alan Fiske). For this reason, we consider it to have acceptable content validity. Our close collaboration with Dr. Fiske also affected the structure of the RAD. Performance on the RAD requires an implicit appreciation of the relational models and anticipation of the social actions of persons based on their past social behaviors, reflecting the theory's contention that persons use their implicit knowledge of the relational models to understand and evaluate social relationships, to generate their own social action, and to anticipate the actions of others.

One limitation of the RAD is that it is somewhat language-dependent. Performance on the WTAR, an estimate of reading ability and premorbid verbal intelligence, was related to performance on the RAD in the patient sample. This association with verbal ability will need to be considered when the RAD is used with chronic psychiatric patients. However, the RAD revealed differences in relationship perception between schizophrenia outpatients and healthy comparison participants even when reading ability was controlled statistically. Importantly, two of the three associations between the RAD and aspects of community functioning remained significant even when reading ability was controlled statistically.

The RAD was developed to complement the measures of social cognition currently used to study schizophrenia and other mental disorders. Whereas other measures of social cognition assess person perception (e.g., emotion recognition from facial expressions), the RAD assesses

526 implicit relationship recognition and inference. The
 527 development of the RAD stems from a collaboration
 528 between basic social scientists and clinical researchers,
 529 working together to try to identify the determinants of
 530 functional outcome in schizophrenia patients. In the next
 531 phase of this program, we will more extensively assess the
 532 ecological validity of the RAD and other measures of
 533 social cognition in schizophrenia patients across different
 534 stages of the illness.

5. Uncited reference

Fiske and Haslam, 1996



Acknowledgements

538 This research was supported by the National Institute
 539 of Mental Health Translational Research Center
 540 (MH66286; Keith H. Nuechterlein, Director), Dr. Green's
 541 grants from the National Institute of Mental Health
 542 (MH43292 and MH65707), and the Department of
 543 Veterans Affairs VISN-22 Mental Illness Research Educa-
 544 tion Clinical Center. The authors thank Jim Mintz, Ph.D.
 545 of the UCLA Semel Neuropsychiatric Institute Biostatistical
 546 Core for his consultation regarding the construction of
 547 Relationships Across Domains. The authors thank Nicho-
 548 las Haslam, Ph.D. for his advice on the development of the
 549 RAD and his comments on an earlier version of this paper.
 550 The authors also thank Karen Cornelius, Psy.D.; Shauna
 551 Davidson, M.A.; Mark McGee, B.A.; and Poorang Nori,
 552 B.A.; for their assistance with the recruitment of
 553 participants and/or the collection and coding of data.

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