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Measurement Article

Psychometric Characteristics of the Mutuality Scale in Stroke Patients and Caregivers

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Abstract

Purpose: The Mutuality Scale (MS) is composed of four theoretically derived factors (love, shared pleasurable activities, shared values, and reciprocity), but this structure has never been confirmed. Also, research involving the patient's perspective on the MS is limited. In this study, we tested the factorial structure of the MS and its reliability in stroke patients and caregivers.

Design and Method: Cross-sectional, with a follow-up after 15 days for test–retest reliability. A total of 248 stroke patients and 163 stroke caregivers completed the MS. Stroke patients and their caregivers were enrolled in 10 rehabilitation hospitals across Italy. MS factorial structure was analyzed using confirmatory factor analysis; internal consistency reliability was evaluated with Cronbach's α and model-based internal consistency index; test–retest reliability was evaluated with intraclass correlation coefficient.

Results: Confirmatory factor analysis supported the four-factor structure of MS in its patient and caregiver version (CFI = 0.94; RMSEA = 0.06, for both). Cronbach's αs and model-based internal consistency index were >0.90 and intraclass correlations ranged between 0.66 and 0.93 in MS patient and caregiver version.

Implication: This study tested the theoretical dimensions of the MS in stroke patients and their caregivers. From a scientific and clinical point of view, an assessment of stroke patient and caregiver mutuality would allow dyadic approaches to data analysis and care that account for the nonindependence between the stroke patient and the caregiver.

Keywords: Caregiver, Mutuality, Patient, Psychometrics, Reliability, Stroke, Validity

Despite global growth in chronic disease in the aging population, health care systems have not shown commensurate growth in services dedicated to these needs (World Health Organization, 2013). Consequently, patients with chronic diseases are more likely to remain in the community with the support of informal caregivers (Gibson & Houser, 2007; Oliva, Vilaplana, & Osuna, 2011). Currently, patient and caregiver relationships are receiving more attention due to the impact of this chronic care on the quality of life of both (Li & Loke, 2014; Yang, Liu, & Shyu, 2014). One aspect of the patient/caregiver relationship is mutuality.

The concept of mutuality was defined broadly by Barnhill (1979) as a sense of intimacy among people. Hirschfeld (1983), using grounded theory methods, added three subdomains to this early conceptualization by defining mutuality as the caregiver's ability to find gratification, meaning, and reciprocity in the relationship with the care receiver. The conceptualization of mutuality (Archbold, Stewart, Greenlick, & Harvath, 1990) was informed by Hirschfeld but defined more simply as "the positive quality of the relationship between caregiver and care-receiver" (p. 376) and inclusive of the subdomains of love, shared pleasurable activities, shared values, and reciprocity (Archbold, Stewart, Greenlick, & Harvath, 1992). However, the conceptual underpinnings remain weak, possibly due to the frequent use of mutuality as a subdomain in existing conceptual frameworks such as coping and stress theories, the family health cycle or family dynamics (Park & Schumacher, 2014; Simeone, Savini, Torino, Vellone, & Alvaro, 2014).

Studies measuring mutuality have shown interesting impact on patient and caregiver outcomes. High mutuality is associated with decreased caregiver's stress (Archbold et al., 1990; Godwin, Swank, Vaeth, & Ostwald, 2013; Lyons, Stewart, Archbold, & Carter, 2009), better preparation for caregiving (Schumacher, Stewart, & Archbold, 2007), positive care process outcomes (Schumacher et al., 2008), perception of greater reward for the care provided (Crist, Escandón, Stewart, & Archbold, 2008), and lower caregiver burden (Halm, Treat-Jacobson, Lindquist, & Savik, 2007). In stroke, our population of interest, caregivers' high mutuality was found to improve both stroke patients' and caregivers' physical and mental quality of life (Ostwald, Godwin, & Cron, 2009). When caregivers perceive higher mutuality with patients, patients perceive lower stroke-related stress (Ostwald, Bernal, Cron, & Godwin, 2009) and better mental health (Godwin et al., 2013). Similar findings have been reported in other comparable populations such as Parkinson's disease (Lyons et al., 2009; Tanji et al., 2008).

The Mutuality Scale (MS) was developed in the United States by Archbold et al. (1990) and tested in a U.S. sample of 78 caregivers of older adults. In the original study, the 15-item MS was administered to caregivers 6 weeks and 9 months after patient's hospital discharge. Factorial structure was not tested in this study, but a Cronbach's α of .91 was reported at both time points. Although the developers of the MS conceptualized four domains within the scale: love (3 items), shared pleasurable activities (4 items), shared values (2 items), and reciprocity (6 items) (Archbold et al., 1992; Crist et al., 2008), the literature does not support this; when tested, the factorial structure of the MS has proven to be variable (Hudson & Hayman-White, 2006; Kao, Lynn, & Crist, 2011). A second issue to advancing the study of mutuality is that, to our knowledge, only one study considered the patient's perspective on mutuality (Lyons, Sayer, Archbold, Hornbrook, & Stewart, 2007). Although mutuality can be defined as "reciprocal influence," "patient–caregiver congruence" (Fletcher, Miaskowski, Given, & Schumacher, 2012; Porter, Keefe, Garst, McBride, & Baucom, 2008; Yesilbalkan & Okgun, 2010), or "the positive quality of the relationship between the caregiver and the care-receiver" (Archbold et al., 1990), to date, the MS has been mainly used in caregiver populations. The conceptual ambiguity related to the number of dimensions and only one study that considered mutuality from patient perspective are important limitations in the ongoing study of mutuality. In addition, despite the use of MS in stroke caregivers (Godwin et al., 2013; Ostwald, Godwin, et al., 2009), its psychometric properties have never been tested in this population. Therefore, the purpose of this study was twofold: first, to test the psychometric characteristics (factorial structure and reliability) of the MS in its (new) patient version in a stroke patient population and second, to test the psychometric characteristics (factorial structure and reliability) of its (original) caregiver version in a stroke caregiver population.

Methods

Design

A cross-sectional design was used for this study with a follow-up at 2 weeks for test–retest reliability.

Materials

The MS (Archbold et al., 1990) is a 15-item instrument that measures mutuality from the caregiver perspective. Examples of items are: "How close do you feel to the person you care for?" or "How much do you confide in the person you care for?". Each item is scored on a 5-point Likert-type scale from 0 (*not at all*) to 4 (*a great deal*). The total scale score, a mean of all item scores, ranges from 0 to 4: higher scores means greater mutuality.

Prior to its use in our study, the MS underwent a rigorous translation process as was successfully done in prior studies (Pucciarelli et al., 2014; Vellone et al., 2015). Working with the scale developer, Dr Patricia Archbold, the MS was first translated from English into Italian by two nurses with expertise in stroke and fluency in English and Italian. Then the Italian version was back-translated into English by a bilingual English teacher with expertise in medical English. After that, the scale developer evaluated the back-translation version of the MS. The process was iterative until a consensus on the back-translation was achieved. After the Italian caregiver version of the MS was approved, it was then adapted for patient use by adding "the person that cares for you" (e.g., "How close do you feel to the person that care for you?" or "How much do you confide in the person that care for you?") to the end of each item. The MS was then administered to patients and caregivers at baseline and 2 weeks later to assess test–retest reliability.

Sociodemographic characteristics of patients and caregivers, including gender, age, marital status, education, relationship between patient and caregiver (e.g., spousal), and living condition were collected with a questionnaire developed by the research team. Patient clinical variables were abstracted from the medical record and included type and side of stroke comorbidities (e.g., hypertension, hypercholesterolemia, diabetes, and atrial fibrillation).

Sample, Settings, and Procedures

Stroke patients and their informal caregivers were recruited at discharge from 10 rehabilitation hospitals located in the central and southern cities in Italy: Viterbo, Tivoli, Rome, Grottaferrata, Potenza, Guidonia, Cosenza, Ragusa, Naples, and Taranto. Data were collected 3 months after discharge home. This time period was selected in order to assure the examination of mutuality post-stroke, over time in a real-life setting. Patient inclusion criteria were: (a) diagnosis of stroke confirmed by tomography or magnetic resonance; (b) willingness to participate and sign informed consent; and (c) discharge from a rehabilitation hospital to home. Patient exclusion criteria were: (a) preexisting psychiatric or physical/motor deficits (e.g., dementia and multiple sclerosis); (b) previous stroke, aphasia, or reduced level of consciousness; or (c) cancer or severe organ failure. Caregiver inclusion criteria were: (a) identification as the primary informal unpaid caregiver by the patient and (b) willingness to participate and sign informed consent. Caregiver exclusion criteria were patient refusal to be enrolled. All caregivers in this sample had a corresponding patient, but not all patients had a corresponding caregiver. Consequently, we enrolled more patients than caregivers in this study.

Data Collection

Patients and caregivers were enrolled by trained nurse research assistants who first identified potential participants based on the inclusion and exclusion criteria; then explained the study aims and obtained informed consent. Patients and caregivers were informed that data collection would take place 3 months after discharge from the rehabilitation hospital in the patient's house. Re-administration of the MS to assess test–retest reliability occurred 2 weeks after initial data collection via the telephone.

Ethical Considerations

The Institutional Review Boards of each rehabilitation center where patients and caregivers were enrolled approved the study. Patients and caregivers were fully informed about the study and only after signing the informed consent form data collection began.

Data Analysis

Sociodemographic variables (of patients and caregivers) and clinical variables (of patients) were analyzed with descriptive statistics including mean, standard deviation, and frequencies. MS items of patient and caregiver version were analyzed with descriptive statistics, including mean, standard deviation, skewness, and kurtosis. MS factorial structure was analyzed with confirmatory factor analysis (CFA) using a four-factor structure reflecting the theoretical dimensions underpinning the scale: love, shared pleasurable activities, shared values, and reciprocity. Due to the presence of some skewness, a robust maximum likelihood estimator was used (namely, the MLMV estimator of Mplus). To evaluate CFA solutions, based on Hoyle's (1995) recommendations, and according to a multifaceted approach to the assessment of the model fit (Hu & Bentler, 1998; Tanaka, 1993), the following fit indices were considered: (a) χ^2 test: nonsignificant values should be interpreted as supportive fit of the model, (b) comparative fit index (CFI; Bentler, 1990) and Tucker and Lewis incremental Index (TLI; Tucker & Lewis, 1973): values greater/equal to .90 or better than .95 support good fit; (c) root mean square error of approximation (RMSEA; Steiger, 1990): values lower than .06 are indicative of a good approximation of fit; and (d) standardized root mean square residual (SRMR; Jöreskog & Sörbom, 1993): values lower than .08 indicate a good fit.

Internal consistency reliability of the MS factors and the whole scale (for both patient and caregiver version) was evaluated by means of Cronbach's α and model-based internal consistency index (Bentler, 2009). The model-based internal consistency index is a reliability estimate that can be used in case of multidimensional or complex (with primary and second order factors) scales as it was hypothesized for the MS that is theoretically composed by four factors.

Test–retest reliability was evaluated with intraclass correlation coefficient (ICC) administering the scale with a 2-week interval. Analyses were conducted separately on the sample of patients and of caregivers. Statistical analysis was conducted using SPSS 19.0 and Mplus 7 software. A p level less than 0.05 was considered significant.

Results

Sociodemographic Characteristics of Stroke Patients and Their Caregivers

A sample of 248 stroke patients and 163 stroke caregivers was enrolled in the study. All caregivers in this sample had a corresponding patient, but 85 patients did not have an enrolled caregiver due to lack of time (n = 72) or interest (n = 13). The sociodemographic and clinical characteristics of stroke patients are reported in Table 1. On average, stroke patients were 69 years old and men (54.8%). About 61% of patients were married and 69.4%

Table 1. Patient (n = 248) and Caregiver (n = 163) Characteristics

	Patients (n = 248)	Caregivers (n = 163)
Characteristics	*M* (*SD*)	*M* (*SD*)
Age (Mean [*SD*])	69.1 (12.4)	53.7 (12.4)
	N (%)	*N* (%)
Gender		
Male	136 (54.8)	59 (36.2)
Female	112 (45.2)	104 (63.8)
Marital status		
Married	151 (60.9)	125 (76.7)
Widowed	60 (24.2)	4 (2.5)
Single	26 (10.5)	22 (13.5)
Divorced	11 (4.4)	12 (7.3)
Education		
Elementary school	101 (40.7)	26 (16.0)
Middle school	53 (21.4)	50 (30.7)
Professional school	18 (7.3)	22 (13.5)
High school	52 (21.0)	39 (23.9)
University degree	24 (9.7)	26 (15.9)
Relationship to patient		
Daughter		47 (28.8)
Son		30 (17.9)
Wife		45 (27.6)
Husband		22 (13.4)
Relatives/friends		19 (12.3)
Caregiver living with patient		90 (55.2)
Type of stroke		
Ischemic	199 (80.2)	
Hemorrhagic	39 (15.7)	
Micro-infarct	10 (4.1)	
Stroke side		
Right hemisphere	127 (51.2)	
Left hemisphere	100 (40.3)	
Widespread	21 (8.5)	
Comorbidities		
Hypertension	163 (65.7)	
Diabetes	88 (35.7)	
Hypercholesterolemia	82 (33.1)	
Atrial fibrillation	43 (17.3)	
Myocardial infarctions	27 (10.9)	
Periphery vascular disease	24 (9.7)	
Thyroid Disease	30 (12.1)	
Congestive Heart Failure	21 (8.5)	
COPD	18 (7.3)	
Other comorbidities	16 (7.1)	

Note: COPD = chronic obstructive pulmonary disease. Patients could suffer more than one condition.

were educated at less than high school level. Most stroke patients had an ischemic stroke (80.2%). Comorbidity was common in the sample with the most frequent comorbid conditions reported hypertension (65.7%), diabetes (35.7%), hypercholesterolemia (33.1%), and atrial fibrillation (17.3%).

Caregivers (Table 1) were 54 years old on average and women (63.8%). They were generally married (76.7%) and either the adult child or spouse of the patient (in 88.3% of cases). Over half (55.2%) of the caregivers lived with patient.

MS Item Descriptive Characteristics

Item analysis (means, standard deviations, kurtoses, and skewnesses) of the MS in its patient and caregiver version is presented in Table 2. Most items were normally distributed with no excessive skewness and kurtosis. In both patients and caregivers, the item with the highest score was "How much love do you feel for him her," whereas the item with the lowest score was "How often do the two of you laugh together".

Factorial Structure of the MS

Patients

A four-factor model was tested based on the theoretical conceptualization of the MS. The initial model showed an adequate fit as far as all fit indices. Fit indices were as follows: $\chi^2(86, N = 248) = 156.77$, $p < .001$; RMSEA = 0.058 (90% confidence interval [CI] = [.043, 0.072]; p(RMSEA < .05) = .18); CFI = 0.94; TLI = 0.93; SRMR = 0.048. This model was then compared with a baseline model where the four factors were posited as orthogonal: this model resulted in poor fit to the data, $\chi^2(92, N = 248) = 555$, $p < .001$; RMSEA = 0.142 (90% CI = [.131, 0.154]; p(RMSEA < .05) < .001); CFI = 0.60; TLI = 0.55; SRMR = 0.467, yielding a statistically significant χ^2 difference when its χ^2 was compared with the one of the correlated factors model, $\chi^2_{diff}(6) = 678$, $p < .001$.

The correlation matrix of the patients' factors revealed the presence of correlations above .80. Accordingly, a CFA solution with a second-order factor was tested (Figure 1) and the following fit indices were found: $\chi^2(91, N = 248) = 166.27$, $p < .001$; RMSEA = 0.06 (90% CI = [.044, 0.072]; p(RMSEA < .05) = .17); CFI = 0.94; TLI = 0.93; SRMR = 0.047.

The comparison of the second-order model with the correlated factor model yielded a slight statistical significant χ^2 difference, $\chi^2_{diff}(5) = 14.6$, $p < .05$; given that the second-order model is more parsimonious, it is preferable as far as the goodness of fit is concerned.

Caregivers

As with patients, a four-factor model was tested. The initial model showed marginal fit with fit indices as follows: $\chi^2(86, N = 163) = 157.04$, $p < .001$; RMSEA = 0.073 (90% CI = [.055, 0.091]; p(RMSEA < .05) = .02); CFI = 0.92; TLI = 0.90; SRMR = 0.053. Modification indices revealed that the partial misfit was a result of excessive covariance between items referring to help and support received by

Table 2. MS Item Descriptive Analyses

	Patients (n = 248)				Caregivers (n = 163)			
	M	*SD*	Skeweness	Kurtosis	*M*	*SD*	Skeweness	Kurtosis
Item 1. How often do the two of you see eye to eye?	2.87	.919	−.395	−.415	2.75	.919	−.349	−.655
Item 2. How often do you feel physically close to him or her?	3.16	.822	−.784	.337	3.23	.870	−.972	.228
Item 3. How often do you enjoy sharing past experiences with him or her?	2.94	.967	−.845	.426	2.88	.905	−.474	−.292
Item 4. How often does he or she express feelings of appreciation for you and the things you do?	2.96	.919	−.670	.130	2.93	.963	−.577	−.431
Item 5. How attached are you to him or her?	3.37	.742	−1.019	.915	3.35	.798	−1.085	.554
Item 6. How often does he or she helps you?	3.28	.764	−.857	.555	2.79	1.076	−.585	−.442
Item 7. How often do you like to sit and talk to him or her?	3.12	.862	−.954	.851	2.99	.962	−.691	−.448
Item 8. How much love do you feel for him or her?	3.46	.741	−1.288	1.428	3.40	.774	−1.071	.315
Item 9. To what extent do the two of you share the same values?	3.04	.896	−.631	−.106	3.01	.913	−.604	−.466
Item 10. When you really need it, how much does he or she comfort you?	3.16	.899	−.931	.278	2.87	1.045	−.744	−.336
Item 11. How often do the two of you laugh together?	2.75	1.059	−.570	−.331	2.52	1.068	−.550	−.361
Item 12. How often do you confide in him or her?	2.83	1.029	−.613	−.284	2.61	1.119	−.567	−.390
Item 13. How much emotional support does he or she give to you?	3.05	.871	−.650	−.085	2.61	1.096	−.464	−.618
Item 14. To what extent do you enjoy the time the two of you spend together?	3.18	.846	−1.002	.992	2.95	.942	−.575	−.555
Item 15. How often does he or she express feelings of warmth toward you?	3.04	.903	−.744	−.012	2.80	1.059	−.640	−.296

patient (items 6 and 10), enjoyment and self-disclosure with the patient (items 12 and 14), and agreement and closeness with the patient (items 1 and 2). To account for this excessive covariance in the model, we respecified the model by allowing residuals of these items to be correlated. The respecified model fitted the data well with the following fit indices: $\chi^2(81, N = 163) = 133.80$, $p < .01$; RMSEA = 0.063 (90% CI = [.043, 0.082]; p(RMSEA < .05) = .13); CFI = 0.94; TLI = 0.92; SRMR = 0.049. This analytic approach is consistent with Fornell (1983) and Bagozzi (1983) who note that it is reasonable to let measurement errors correlate when (a) these correlations are plausible from a theoretical or methodological point of view and (b) their specification does not alter the estimates of the other parameters in the model. Such is the case here. This final model was then compared with a baseline model where the four factors were posited as orthogonal: this model resulted in a very poor fit statistics, $\chi^2(88, N = 163) = 404$, $p < .001$; RMSEA = 0.148 (90% CI = [.134, 0.163]; p(RMSEA < .05) < .001); CFI = 0.65; TLI = 0.58; SRMR = 0.427, yielding a statistically significant χ^2 difference when its χ^2 was compared with the one of the correlated factors model, $\chi^2_{diff}(7) = 471$, $p < .001$.

The correlation matrix of the factors revealed the presence of correlations above .80, thus, a CFA solution with a second-order factor was tested, and the following fit indices were found: $\chi^2(84, N = 163) = 141.02$, $p < .001$; RMSEA = 0.065 (90% CI = [.045, 0.083]; p(RMSEA < .05) = .10); CFI = 0.94; TLI = 0.92; SRMR = 0.053. Figure 2 presents factor loadings estimates derived from Mplus as well as the modifications (double-headed arrows on the right hand side of the figure). All factor loadings were greater than 0.50. As in the case of patients, the comparison of the second-order model with the correlated factor model yielded a slight statistical significant χ^2 difference, $\chi^2_{diff}(3) = 10.7$, $p < .05$: once again, given that the second-order model is more parsimonious than the correlated factor model, the second is preferable as far as the goodness of fit is concerned.

MS Reliability and Item Analysis

Internal consistency reliability estimates for the first- and second-order factors of the MS were computed using Cronbach's α coefficients and model-based internal consistency index. Results presented in Table 3 attest that α was an adequate estimator of internal coherence, that is, high factor loadings, τ equivalence of indicators, and unidimensionality of the scale (Barbaranelli, Lee, Vellone, & Riegel, 2015; Raykov & Marcoulides, 2011). First, five different αs were computed for the factors derivable from CFA results and the whole scale in both patient and caregiver version of the MS. These αs are presented in Table 3 and attest to a high degree of internal consistency (Nunnally & Bernstein, 1994), including the 2-items factor *shared values*. Internal consistency for the second-order factor

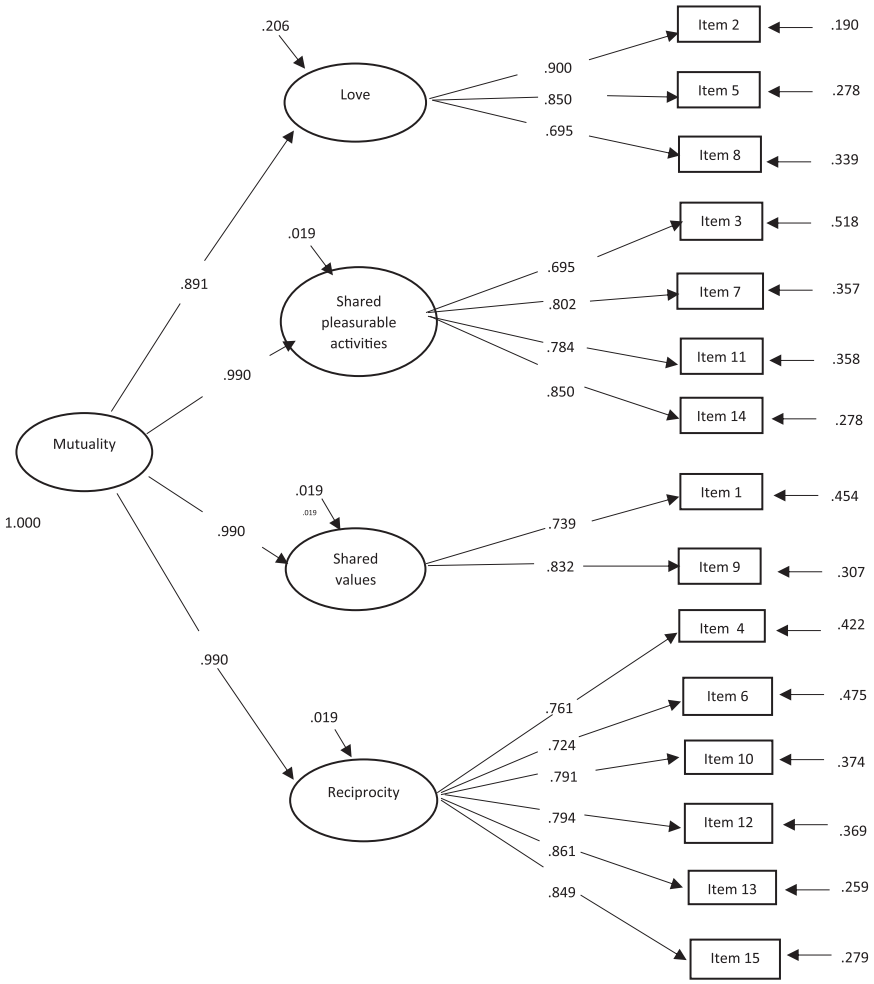

Figure 1. Confirmative factor analysis of MS patient version. MS = Mutuality Scale.

structure estimated with Bentler's model-based internal consistency index showed fairly high coefficients (greater than .90 in both patients and caregivers version of the MS; Table 3). This result supports the use of scores per each factor as well as per a combined score of the 15-items in both versions of the MS.

Test–retest reliability of the MS factors and total scale was assessed with examination of ICCs (Sacco, Stracci, Cerone, Ricci, & Carolei, 2011; Table 3). ICCs ranged from .880 to .935 for caregiver, except for the caregiver shared-valued dimension which was .667 and from .898 to .946 for patient version.

Corrected item total correlations ranged from .62 to .84 (mean of .73) for patients, whereas they ranged from .65 to .83 (mean of .73) for caregivers, thus demonstrating a very high internal consistency for the four factors of MS in both patients and caregivers.

Dyadic Statistics on the MS

Table 4 reports the dyadic statistics of the MS and its four factors for matched patient–caregiver samples (n = 163). With the exception of *love* factor, all factors and the total scale's scores were significantly higher in patients. This means that patients expressed a greater sense of mutuality than caregivers in the relationship. Correlations between factor scores and the total score were significant ($p < 0.001$ for all correlations) and moderately strong (from 0.52 to 0.65).

Discussion

To our knowledge, this is the first study that has specifically tested the theoretical dimensions of the MS. This is particularly important as mutuality is an ontologically dyadic concept and measuring mutuality in only one-partner results in a poorly understood and potentially misspecified concept.

Prior studies have provided evidence for the reliability of the MS (Archbold et al., 1990; Hudson & Hayman-White, 2006; Kao et al., 2011) in caregivers, however, none have examined the dimensionality of the MS as it was originally theorized. In fact, prior studies deleted items and reported dimensions different from the original work (Archbold et al., 1990). Hudson and Hayman-White (2006) tested the psychometric properties of the MS in 106 Australian cancer caregivers. Initially three components were extracted that

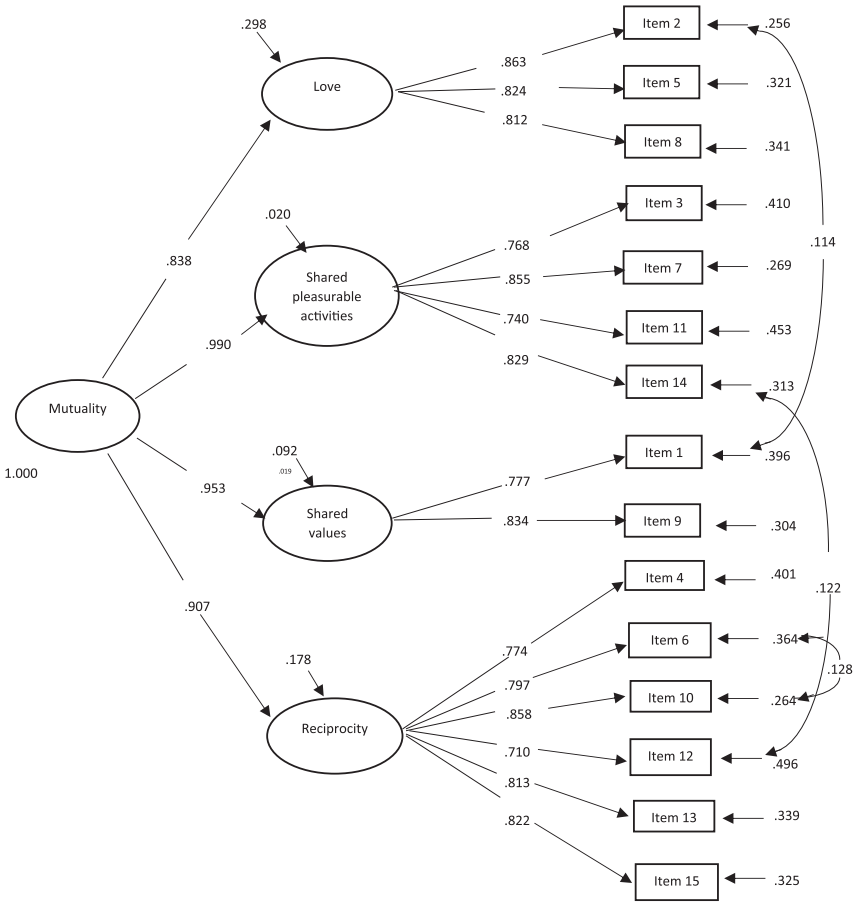

Figure 2. Confirmative factor analysis of the MS caregiver version. MS = Mutuality Scale.

had several cross-loading items. After two more iterations and item deletions, two dimensions (with a total of 7 items) were extracted that were named "devotion" (with items 2, 5, and 8) and "reciprocity" (with items 6, 10, 11, and 12). Internal consistency reliability tested with Cronbach's αs was acceptable at .83 for devotion and .93 for reciprocity. In a second study, Kao et al. (2011) tested the MS in 193 Latin American caregivers. Two factors were initially extracted and 6 items were excluded because of cross-loading. The two dimensions were named "interaction between the caregiving dyads" (with items 2, 3, 5, 7, 8, and 14) and "reaction from the care recipients" (with items 4, 13, and 15). Cronbach's α resulted with a coefficient of 0.87, and test–retest reliability of the above two factors resulted with an ICC between 0.93 and 0.94. Both of these studies and analyses resulted in more concerns about the MS than they allayed. They raised questions as to why the original factorial structure was not reproducible, why there were items cross-loading, and whether this was a valid scale. However, our theoretically driven approach, using CFA, successfully demonstrated that the four original dimensions of love, shared pleasurable activities, shared values, and reciprocity are latent dimensions of mutuality in stroke patients and caregivers. This finding is important for several reasons: first, it provides a starting point for future conceptual frameworks specifically focused on mutuality by suggesting potential predictors, outcomes, and testable hypotheses and, second, it provides evidence that in the setting of stroke with its well-known cognitive and communication limitations that dyads are still able to recognize and experience love, share pleasurable activities and values, and reciprocity. All of these factors support dyadic resilience and improve quality of life for both partners.

To our knowledge, research involving the patient's perspective on mutuality is limited (Lyons et al., 2007). Our study provides preliminary psychometric evidence for the patient version of the MS. The factorial structure of the patient version of the MS includes four reliable factors and one reliable second-order factor (mirroring the caregiver factorial structure). This is of importance because now that we can measure distinct dimensions of mutuality (e.g., reciprocity) and total mutuality in both patients and caregivers we are able to conduct dyadic analyses of mutuality. Investigators can use these instruments with greater confidence, given the findings from this study. In particular, future work could examine our interesting finding that patients expressed a greater sense of mutuality than the caregivers. This finding is similar to the study conducted by Lyons, Sayer, Archbold, Hornbrook, and Stewart (2007) who found that mutuality was higher in frail older adults than in their caregivers. This could reflect the patient's new physical dependence on the caregiver or could reflect

the stroke caregiver's perception that the relationship has changed and not for the better.

In addition, our study provides evidence that the Italian version of the MS (patient and caregiver version) has acceptable psychometric characteristics. The correct measurement of mutuality is vital, as higher mutuality is associated with lower caregiver stress and burden (Archbold et al., 1990; Godwin et al., 2013; Halm et al., 2007), better caregiver preparation (Schumacher et al., 2007), and better caregiver and patient physical quality of life (Carter, Lyons, Stewart, Archbold, & Scobee, 2010; Godwin et al., 2013; Ostwald, Godwin, et al., 2009).

In this study, we tested reliability both with "traditional" methods, such as Cronbach's α and ICC, as well as with a more innovative method, model-based internal consistency. Barbaranelli, Lee, Vellone, and Riegel (2014, 2015) suggest that with multidimensional scales such as the MS, Cronbach's α may not be the best method to test reliability. For the MS, Cronabch's α was a good estimate of reliability for each single factor but not for the total mulidimensional scale. Consequently, we used the model-based internal consistency index. By testing mutidimensional reliability using this method we found that it is psychomentrically appropriate to compute a total score for the MS.

Table 3. Reliability Indices of the MS Factors and Total Scale in Patient (n = 248) and Caregiver (n = 163) Version

	Patient	Caregiver
Cronbach's α		
Love	.889	.871
Shared pleasurable activities	.856	.866
Shared values	.766	.788
Reciprocity	.912	.914
Total scale	.958	.952
Model-based internal consistency index		
Total scale	.962	.961
Intraclass correlation coefficient		
Love	.898	.880
Shared pleasurable activities	.926	.896
Shared values	.906	.667
Reciprocity	.928	.935
Total scale	.946	.895

Note: MS = Mutuality Scale. Intraclass correlation coefficients were computed correlating MS factors' scores and total scale scores administered twice with a 2-week interval.

Limitations

This study has several limitations. The first limitation is the use of a convenience sample despite recruiting from multiple sites over a wide geographic area. A second limitation may be generalizing the factorial structure and reliability of the MS from an Italian sample to other populations, both in its patient and caregiver version. Caution should be taken in other countries and populations until further studies are conducted. A final limitation is the timing of our measurement. We tested the MS only 3 months from when the patient was discharged from a rehabilitation hospital. Stroke has a long recovery trajectory. It is unknown whether the factorial dimensions of the scale may change over time. Further studies are needed to test the stability of the psychometric characteristics of the MS along the stroke trajectory.

Implications

The availability of valid and reliable instruments to measure mutuality in patients and caregivers may have important scientific and clinical implications. From a scientific point of view, an assessment of mutuality in both patients and caregivers would allow, as we have already said, dyadic approaches to data analysis (e.g., multilevel analyses) that accounts for the nonindependence between the caregiver and the patient. Because of this potential impact, it is recommended that future stroke intervention studies examine the role of mutuality in both patients and caregivers. In fact, Lyons et al. (2007) found that mutuality changes in both caregivers and frail older adults were associated with changes in their own physical health and depression and changes in their partners' physical health and depression. Because of this potential impact, it is recommended that future stroke intervention studies examine the role of mutuality in both patients and caregivers. Because mutuality may not respond to an intervention, knowing the role of mutuality as a mediator or moderator between predictors and outcomes in stroke patients and caregivers (Savini et al., 2015) could identify other ways to improve outcomes.

From a clinical point of view, measuring mutuality in both patients and caregivers may help clinicians tailor

Table 4. Dyadic Statistics of the MS in the Matched Patient–Caregiver Samples (n = 163)

	Patient *M* (*SD*)	Caregiver *M* (*SD*)	*p*
Love	3.38 (0.66)	3.32 (0.73)	0.30
Shared pleasurable activities	3.05 (0.73)	2.83 (0.82)	<0.001
Shared Valued	3.02 (0.75)	2.88 (0.83)	0.02
Reciprocity	3.13 (0.67)	2.77 (0.88)	<0.001
Total scale	3.15 (0.65)	2.91 (0.75)	<0.001

Note: MS = Mutuality Scale.

interventions for stroke patients and caregivers. For example, in the case of low mutuality, clinicians may look for other resources, such as other family members, to help care for the patient or respite services (Rose, Noelker, & Kagan, 2015). Conversely, in cases of higher mutuality, clinicians could emphasize this aspect of the relationship to stimulate inner strength to cope with the stroke experience. Several studies (Bushnell et al., 2014; Ostwald, Bernal, et al., 2009; Simeone, Savini, Cohen, Alvaro, & Vellone, 2014) have shown that stroke can have consequences for both patients and caregivers. Moreover, these effects may impact the quality of life of both (Godwin et al., 2013; Olai, Borgquist, & Svärdsudd, 2015; van Mierlo et al., 2014). Having a tool that captures the degree of mutuality in the patient and caregiver's relationship is crucial because only through dyadic analysis will we be able to clearly measure and account for the real perceptions of mutuality in both and, consequently, adopt more specific interventions to improve quality of life.

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