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Development and Initial Validation of the Multidimensional Quality of Relationship Scale (M-QoRS)

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ABSTRACT

This study presents the initial validation of the Multidimensional Quality of Relationship Scale (M-QoRS), which was designed to capture the dynamic nature of both unidimensional and multidimensional intimate relationship quality. Confirmatory Factor Analyses of online survey data from 745 people tested a series of models, ultimately revealing a bi-factor solution as the best fitting structure. This final model includes a Relationship quality general factor and four domain-specific latent variables, namely Quality of communication, Conflict management, Feeling connected, and Overall happiness with one's relationship, all explaining variability in 17 manifest variables. An originally included Sex and Intimacy factor was dropped as a result of model respecifications. The M-QoRS also shows optimal reliability as well as criterion, construct, and known-groups validity. Cross-validation tests also confirm that this structure could be replicated in other samples. Being designed within the context of mobile health (mHealth) apps and digital wellbeing promotion, the scale can be a useful instrument for evaluating online relationships programs and interventions.

KEYWORDS

Bi-factor analysis; couple relationship; digital interventions; mHealth; relationship quality scale

Introduction

Enjoying a good relationship with one's partner has long been acknowledged as one of the main aspects of people's personal well-being and happiness (Gustavson et al., 2016; Linton et al., 2016; Proulx et al., 2007; Russell & Wells, 1994). In the past decades, the scholarly literature has

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developed several constructs with the aim of capturing people's feeling that they are in a good relationship. These include, yet are not limited to, marital satisfaction, stability, adjustment, happiness and subjective well-being (Heyman et al., 1994; Urbano-Contreras et al., 2018). However, some of these terms have sometimes been found problematic, or obsolete, or incapable of capturing in full the complexity of the state of a couple's relationship. For example, it has been pointed out that marital satisfaction fails to "…accurately reflect the diverse array of romantic relationship types that are the subject of study in modern relationship research." (Graham et al., 2011, p. 40).

Recently, the literature has proposed to understand people's assessment of their relationship in terms of "relationship quality" or "quality of relationship" (Farooqi, 2014; Fincham & Rogge, 2010). In its broadest sense, relationship quality has been defined as "how positive or negative individuals feel about their relationship" (Morry et al., 2010, p. 372). Beyond this very broad definition, relationship quality is a construct that covers a great variety of complex facets that characterize people's romantic or intimate relationships. For example, according to Fincham and Rogge (2010), relationship quality combines both the relationship or interpersonal approach (e.g., companionship, conflict, and communication) with the intrapersonal approach that focuses on individual judgments (e.g., happiness and satisfaction).

In the past, the literature has theorized relationship quality mainly as a unidimensional construct (Norton, 1983). In fact, the most commonly used measures in this field of study, such as the Kansas Marital Satisfaction Scale (KMS) (Nichols et al., 1983; Schumm et al., 1986) and the Relationship Assessment Scale (RAS) (Hendrick, 1988) have been built on a single latent variable tapping into a set of manifest variables (for a review see Chonody et al., 2018; Graham et al., 2011; Vaughn & Baier, 1999).

Conversely, recent investigations have argued that it is preferable to treat relationship quality as a multidimensional construct. For instance, Hassebrauck and Fehr (2002) have empirically identified through principal component analysis four dimensions of relationship quality (i.e., intimacy, agreement, independence, and sexuality), concluding that "relationship quality is a multidimensional construct; a unidimensional measure may not always capture changes in relationships or differences between partners" (p. 268). Yet, in the same vein, Fletcher et al. (2000) demonstrated through confirmatory factor analysis that most of the main relationship quality domains (i.e., satisfaction, commitment, intimacy, trust, passion, and love) are interdependent and they are all better explained by an overarching relationship quality construct.

In response to this, the literature has produced some instruments to measure the multidimensionality of quality of relationship (Wayment &

Campbell, 2000). For instance, the Relationship Evaluation Process scale (Buckingham et al., 2019) relies on processes people use to evaluate their relationships, such as personal/ideal standards and social comparisons, whereas the Relationship Flourishing Scale focuses on the eudemonic dimensions of relationships, such as goal sharing, personal growth, and meaning (Fowers et al., 2016).

Although we do not deny the value of those tools, their approach has been to discard the unidimensional nature of the quality of relationship in favor of its multidimensionality. We think that both the unidimensional and multidimensional aspects of relational quality are equally important.

In this study, we therefore propose a new tool that is capable of capturing both the multidimensional and unidimensional dynamic nature of relationship quality.

Multidimensional Quality of Relationship Scale domains and items development

In order to operationalize the quality of relationship as a unidimensional and multidimensional construct, we used a set of variables originally developed in a previous empirical study on long-term relationships (Gabb et al., 2013; Gabb & Fink, 2015a). This earlier research included the development of the Relationship Maintenance Scale (RMS), designed to measure relationship quality among enduring couples (Chonody et al., 2018).

The present study is, in turn, part of a larger mHealth evaluation project examining couples use of a digital app called "Paired", which was developed to enhance relationship quality (Aicken et al., 2025; Gabb et al., 2023; Witney et al., 2024). For ease of use, our online study synthesizes some items from the RMS scale and includes additional items on sex and intimacy that were marginal to the original survey design. These map onto key relationship "growth areas" that structure the Paired app's content.

Based on these principles, we developed the Multidimensional Quality of Relationship Scale (M-QoRS). The M-QoRS rests on the assumption that relationship quality is underpinned by the following five main domains: Quality of communication, Conflict management, Feeling connected, Sex and intimacy, and Overall happiness with one's relationship. These are detailed below.

Quality of communication

Quality of communication pertains to the degree to which individuals can openly speak to their partner about a multitude of topics, to the capacity to find time to talk daily, and to the sense that their partner is able to capture both verbal and non-verbal communication. The quality of communication between partners has been highlighted as a key determinant

of relationship quality (Thibaut & Kelley, 1959) and features in a range of studies of relationship quality in couples across several cultures and settings (Barton et al., 2017; Lawrence et al., 2011; Ruark et al., 2017) regardless of partners' sexual orientations (Kurdek, 1991).

Conflict management

The capacity to manage conflicts within a relationship is measured by the ability to discuss and resolve disagreements, being able to accept one's partner's different perspective, and the sense that dealing with issues within one's relationship is an opportunity to grow stronger together. Couples' approach to handling conflicts has been associated with relationship quality in numerous studies (Finkel et al., 2013; Gottman, 1994; Hanzal & Segrin, 2009; Hee et al., 2019; Schneewind & Gerhard, 2002).

Feeling connected

The sense of connectedness within a relationship refers to how much one enjoys a positive emotional relationship with one's partner, shares mutual support, has one's needs acknowledged, and knows one's partner. Romantic partners can be an important source of social support in adulthood, and studies have revealed connections between couples' support behaviors and relationship functioning (Bradbury et al., 2000; Chow & Ruhl, 2018; Reis & Shaver, 1988).

Sex and intimacy

Enjoying a mutually satisfying sexual and intimate life with one's partner depends on the capacity to openly discuss sex, the importance attributed to the latter, and the level of affection and closeness experienced within the relationship. Feeling satisfied with a sexual relationship has been highlighted as a key aspect of relationship quality in a number of studies (Lawrence et al., 2011; Ruark et al., 2017).

Overall happiness with relationship

Being happy in an intimate relationship refers to how happy (or unhappy) one declares to be both with one's partner and with the relationship overall. Satisfaction with one's relationship has been identified as one of the key components of relationship quality (Farooqi, 2014). Moreover, feeling happy within one's relationship has often been associated with individuals' overall happiness with their life and subjective well-being across several life and

romantic relationship stages (Carr et al., 2014; Coleman et al., 2013; Demir, 2008).

The above domains were underpinned by the principles of systemic psychotherapy wherein emotions are seen as relational, embodied, and culturally determined (Bertrando & Gilli, 2008) rather than located within individuals. Likewise, coupledom is situated within dynamic and intersecting micro-and-macro networks of relations (Burkitt, 2014) through everyday relationship practices (Gabb et al., 2013; Gabb & Fink, 2015b).

The domains were also chosen to maximize the content validity of the scale. In fact, in line with Fincham and Rogge's model (2010), the M-QoRS combined relationship or interpersonal domains (i.e., quality of communication, capacity to handle conflicts, sense of connection, and sex and intimacy) with individual judgments (e.g., overall happiness with relationship). This is also reflected in the selection of items, which were chosen for their capacity to capture different aspects of every domain of quality of relationship.

Lastly, the items composing the M-QoRS were developed in the context of the evaluation of a digital intervention. In fact, the items comprising the M-QoRS were designed to fit within a smartphone screen, contributing to easy online administration of the instrument.

Method

Context

The M-QoRS was developed within the context of the evaluation of the "Paired app" (Gabb et al., 2021).[1] The Paired app has been developed by the start-up tech company "Better Half", in collaboration with relationship research experts, psychologists, and clinicians. It is designed to improve relationship quality through daily prompts that aim to establish positive behavioral change. Launched in October 2020, it has already achieved critical acclaim, winning the "personal growth" category in the 2020 Google Play award and Apple "apps we love". Paired has been rated as the global #1 relationship app with over one million monthly active users as of November 2024.

Participants

A convenience sample of 745 Paired users aged 18 and over, took part in the study. Participants' demographic characteristics are described in Table 1. The sample was diverse by age (range 18–69 years), sexual orientation, relationship characteristics and parenthood (measured as whether or not the participant was currently living with (a) child(ren) aged under 18). Around two-thirds of participants were women, reflecting previously

Table 1. Descriptive statistics of sample demographics.

Demographics	Values
Gender	
Female	67.1%
Male	31.5%
Other (e.g., non-binary, genderfluid, genderfae*)	1.3%
Age, years (mean, [standard deviation])	29.7 [9.6]
Sexual orientation	
Heterosexual	74.3%
LGBQ+, of which:	25.7%
Gay/lesbian	5.1%
Bisexual	18.1%
Other (e.g., pansexual, queer, grey-asexual*)	2.4%
Country of residence	
US	44.8%
UK	34.9%
Other countries	20.3%
Employment status	
Working/employed full-time	53.1%
Working/employed part-time	14.9%
On a government-sponsored training scheme (e.g., apprenticeship)	0.7%
Self-employed or freelance	10.6%
Doing any other kind of paid work	1.7%
In full-time education	15.8%
Away from work (e.g., sick leave, maternity/parental leave, temporarily laid off, furloughed)	5.5%
Unemployed	7.6%
Full-time caring responsibilities	3.5%
Other (e.g., retired, disabled, student*)	3.4%
Relationship duration (at the time of the survey)	
>6 months	4.7%
6 months to 1 year	15.6%
1–5 years	50.1%
6–10 years	15.8%
11–15 years	7.7%
16–20 years	3.4%
More than 20 years	2.8%
Relationship type	
Casual relationship, not living together	1.5%
Steady relationship, not living together	33.0%
Cohabiting (living together as a couple)	30.7%
Civil partnership/union	1.3%
Married	32.0%
Other (e.g., separated, would be married if it weren't for covid-19 moving wedding, engaged, it's complicated*)	1.5%
Presence of children in the household (aged under 18)	
Yes, 1 or more children	29.7%
No	70.3%
n	745

*Examples of free-text responses.

encountered gendered patterns in research participation in the area of relationship research (Gabb et al., 2013).

The sample was multinational, although participants were predominantly residing in English-speaking countries (reflecting that Paired was available only in English, at the time of the study). Amongst them, the majority of participants were residents in the US (44.8%), followed by the UK (34.9%), and then people living in the rest of the world (20.3%).

Procedures

Paired users were invited to complete a 30-item online survey, which was hosted on the JISC Online Surveys platform. The survey was available between 15th and 30th December 2020 and was promoted via three in-app messages during this period (Gabb et al., 2021).

To incentivize participation, users were informed that, after completing the survey, they could enter a prize draw with the chance to win a £100 voucher (or equivalent value). The survey was presented in three parts: the first included demographic questions, the second part included a set of statements to measure relationship quality, and the third part focused on the effectiveness and impact of the Paired app. In accordance with the purpose of this study, we will focus only on the first and second parts of the survey.

The second part of the survey included 18 statements addressing five main areas of relationship quality. Four of these statements were taken from the Enduring Love? study (Gabb et al., 2013). Each statement asks respondents to rate their level of agreement on a 5-point Likert scale ranging from "Strongly agree" to "Strongly disagree". Participants could access the survey after indicating informed consent to research participation. Data were checked to ensure eligibility (age 18 and above). During the phase of data analyses, the items were then reversed in positive, ranging from "Strongly disagree" to "Strongly agree" thereby facilitating the interpretation of the results.

Materials and analysis code for this study are available by emailing the corresponding author.

Data analysis

Data were analyzed through a series of Confirmatory Factor Analyses (CFA) by means of the lavaan (Rosseel, 2012) and semTools packages (Jorgensen et al., 2018) both available in the R software (see correlation matrix in Appendix A). Given that all manifest variables were categorical in nature (see Table 2), we relied on the Diagonally Weighted Least Squares (DWLS) estimator, which performs better than weighted least squares–mean and variance adjusted (WLSMV) in the presence of fewer categories (see DiStefano & Morgan, 2014).

To assess model fit, the literature recommends the following cut-off values (Hu & Bentler, 1999): Chi-square test <.05; Tucker–Lewis Index (TLI) and Comparative Fit Index (CFI) >.95; Root Mean Square Error of Approximation (RMSEA) <.05, and Standardized Root Mean Square Residual (SRMR) <.08. However, the statistical significance of the absolute Chi-Square test for model fit and the Chi-square difference test for nested

Table 2. Frequencies and percentages of manifest variables.

Categories/manifest variables	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Missing
We communicate openly with each other (item1)	11 (1.5%)	54 (7.2%)	57 (7.7%)	325 (43.6%)	295 (39.6%)	3 (.4%)
We make time in our daily routine for talking together (item2)	23 (3.1%)	53 (7.1%)	91 (12.2%)	290 (38.9%)	284 (38.1%)	4 (.5%)
We talk to each other about everything (item3)	12 (1.6%)	71 (9.5%)	90 (12.1%)	270 (36.2%)	298 (40%)	4 (.5%)
My partner understands my non-verbal communication (item4)	44 (5.9%)	107 (14.4%)	114 (15.3%)	280 (37.6%)	197 (26.4%)	3 (.4%)
We are able to discuss and resolve conflict (item5)	11 (1.5%)	65 (8.7%)	88 (11.8%)	339 (45.5%)	239 (32.1%)	3 (.4%)
We can agree to disagree (item6)	7 (.9%)	89 (11.9%)	148 (19.9%)	327 (43.9%)	171 (23%)	3 (.4%)
We argue over money (item7)	223 (29.9%)	243 (32.6%)	121 (16.2%)	121 (16.2%)	33 (4.4%)	4 (.5%)
Dealing with difficult issues together makes our relationship stronger (item8)	12 (1.6%)	21 (2.8%)	107 (14.4%)	270 (36.2%)	332 (44.6%)	3 (.4%)
How happy or unhappy are you with your relationship, overall? (item9)	8 (1.1%)	37 (5%)	74 (9.9%)	328 (44%)	297 (39.9%)	1 (.1%)
How happy or unhappy are you with your partner, overall? (item10)	3 (.4%)	32 (4.3%)	69 (9.3%)	295 (39.6%)	345 (46.3%)	1 (.1%)
We enjoy a positive emotional connection (item11)	6 (.8%)	23 (3.1%)	49 (6.6%)	222 (29.8%)	442 (59.3%)	3 (.4%)
My partner is usually aware of my needs (item12)	13 (1.7%)	78 (10.5%)	102 (13.7%)	297 (39.9%)	252 (33.8%)	3 (.4%)
We are always there for each other (item13)	6 (.8%)	26 (3.5%)	46 (6.2%)	284 (38.1%)	380 (51%)	3 (.4%)
We know each other well (item14)	4 (.5%)	6 (.8%)	46 (6.2%)	279 (37.4%)	407 (54.6%)	3 (.4%)
We are comfortable discussing our sex life with each other (item15)	21 (2.8%)	67 (9%)	89 (11.9%)	224 (30.1%)	340 (45.6%)	4 (.5%)
Sex is an important part of our relationship (item16)	15 (2%)	48 (6.4%)	121 (16.2%)	268 (36%)	290 (38.9%)	3 (.4%)
We are physically affectionate with each other (item17)	14 (1.9%)	46 (6.2%)	67 (9%)	208 (27.9%)	407 (54.6%)	3 (.4%)
My partner regularly gives me a hug (item18)	18 (2.4%)	54 (7.2%)	61 (8.2%)	166 (22.3%)	443 (59.5%)	3 (.4%)

models is often influenced by increases in sample size (Bentler & Bonett, 1980; Brannick, 1995; Fornell & Larcker, 1981) therefore we relied on differences in CFI, Gamma Hat, and McDonald's Non-Centrality Index (NCI) to test for alternative structures of the M-QoRS. In this case, Cheung and Rensvold (2002) recommend choosing the nesting model if the difference with the nested model in CFI is ≥ .01, Gamma Hat is ≥ .001, and McDonald's NCI is ≥.02.

Missing data were treated with listwise deletion, which caused a minimal loss of cases, bringing the final sample from 745 to 738 cases in the last model (Model3). Power analyses based on the RMSEA test of model close fit show that with 99 degrees of freedom, a minimum sample of about 133 observations is sufficient to reach a recommended power of .80. In our case, with 738 cases in the final sample, we reach a power of 1, and therefore we can be confident that our results did not incur into a Type II error.

Results

As recommended in the structural equation modeling literature (Kline, 2016), we started building the simplest model, which included all variables of interest, to then test a series of models with increasing complexity (see Table 3).

The first model (Model1), a 5 Factors correlated-traits, included 18 congeneric exogenous variables and 5 endogenous variables (e.g., Quality of communication, Conflict management, Feeling connected, Sex and intimacy, and Overall happiness with one's relationship). The model provided very good fit to the data: $\chi^2_{(125)} = 284.565$, $p < 0.001$, CFI = 0.998, TLI = 0.997, RMSEA = 0.04, 90% CI [.035, .048], SRMR = .039. However, an inspection of standardized parameter estimates revealed that item7 "We argue over money", showed a relatively small loading onto its corresponding factor "Conflict management" ($\lambda = -.23$). As Brown (2006) reminds us, only factor loadings ≥.30 or .40 can be considered as salient in applied research (p. 30). One possible explanation for these results is that arguing over money is a very specific type of conflict—which can be often associated with financial hardship—and therefore it is an issue with the other general statements that were used to explain this latent variable. Based on these considerations, a decision was made to drop this item from further analyses. From a statistical point of view, this choice did not significantly affect the scale's comprehensiveness. In fact, the next model (Model2), which now included 17 congeneric exogenous variables and the same 5 endogenous variables, provided very similar fit to the data: $\chi^2_{(109)} = 269.869$, $p < 0.001$, CFI = 0.998, TLI = 0.997, RMSEA = 0.045, 90% CI [.038, .0571], SRMR = .04.

Table 3. Model fit indices and model comparisons of alternative M-QoRS structures.

Model/indices	Model1 5 factors correlated-traits (18 variables)	Model2 5 factors correlated-traits (17 variables)	Model3 bi-factor	Model4 2nd order	Model5 one-factor
$\chi^2_{(df)*}$	$284.565_{(125)}$	$269.869_{(109)}$	$157.158_{(99)}$	$305.146_{(114)}$	$999.601_{(119)}$
CFI/TLI	.998/.997	.998/.997	.999/.999	.997/.997	.987/.985
RMSEA (90% CI)	.042 (.035, .048)	.045 (.038, .051)	.028 (.020, .036)	.048 (.041, .054)	.100 (.095, .106)
SRMR	.039	.040	.030	.041	.071
Gamma Hat	.976	.974	.990	.970	.87
NCI	.897	.897	.961	.878	.550
N	737	738	738	738	738
Model indices difference			Model3 *vs.* Model2	Model3 *vs.* Model4	Model3 *vs.* Model5
ΔCFI			.001	.002	.012
ΔGamma Hat			.016	.02	.12
ΔNCI			.064	.083	.441

Note. All values are significant at .01% alpha level.

In the next model, we carried out an orthogonal bi-factor CFA (Model3), to test the hypothesis that a general factor, namely "Quality of relationship," could explain variability in all the items of the M-QoRS, in addition to the domain-specific factors found in the previous model. This choice is consistent with the above-mentioned intention of treating relationship quality as both a unidimensional and multidimensional construct.

The bi-factor model (Model3) presented excellent fit to the data, $\chi^2_{(136)} = 22218.690$, $p < 0.001$, CFI = 1, TLI = 0.99, RMSEA = 0.02, 90% CI [.005, .029], SRMR = .027. However, in this model, the factor "Sex and Intimacy" was responsible for problems in the identification of the factor "Feeling connected" and a series of non-significant correlations between several domain-specific factors. Therefore, a decision was made to respecify the model by allowing the manifest variables that previously loaded onto "Sex and intimacy" to load only onto the general factor. A second respecification of the model was made after inspecting residuals and modification indices, which showed a large mis-specified zero-order correlation between the error terms of item17 "We are physically affectionate with each other" and item18 "My partner regularly gives me a hug".

Following the above changes, the respecified Model3 retained excellent fit to the data: $\chi^2_{(99)} = 157.158$, $p < .001$, CFI = .99, TLI = .99, RMSEA = .02, 90% CI [.020, .036], SRMR = .03. This was further supported by an inspection of the residual correlation matrix, which did not show any absolute correlation residual >.10.

The fit of Model3 also represents a substantial improvement compared to competing nested Models. In fact, Model3 was first compared to the 5-factors correlated-traits solution (Model2), and despite a low difference in CFI = .001, other model comparison indices strongly supported the bi-factor solution (ΔGamma Hat = .016, ΔNCI = .064). Additionally, Model3 was compared against a nested 2nd order solution (Model4), in which a

higher order factor accounts for the variability in the 5 factors obtained in Model2 (see Table 3). Once more, despite a low difference in CFI = .002, the substantial difference in Gamma Hat = .02, and even larger difference in NCI = .083, suggests favoring the bi-factor solution. Lastly, Model3 was compared to a nested one-factor solution (Model5), with all 17 items loading onto a single factor. In this last case, a high difference in all model comparison indices (ΔCFI = .012, ΔGamma Hat = .12, ΔNCI = .441), confirms the bi-factor solution as the best fit to the data.

Model3 showed significant factor loadings at the .01% alpha level, and adequate inter-item reliability for nearly all items (see Table 4 and Figure 1), with the highest value for item9 "How happy or unhappy are you with your relationship, overall?" ($R^2 = .94$), and the lowest value for item16 "Sex is an important part of our relationship" ($R^2 = .32$). In terms of reliability coefficients, a high value of hierarchical omega was found for the general factor "Quality of relationship" ($\omega_H = .89$). High values of the omega coefficient for domain specific factors (omegaS)—which represents the estimate of reliability for a subscale after controlling for the general factor (Reise et al., 2013)—were also found for "Quality of communication" ($\omega_S = .88$), "Conflict management" ($\omega_S = .81$), "Overall happiness with relationship" ($\omega_S = .94$), and "Feeling connected ($\omega_S = .90$).

Lastly, the bi-factor structure of the scale was also assessed in terms of unidimensionality through the Percentage of Uncontaminated Correlations (PUC). According to Bonifay et al. (2015), when PUC is above .80, relative bias is <5%. In our case, PUC = .882, a result that strongly supports the presence of the unidimensional general factor "Quality of relationship", in addition to the four domain-specific factors.

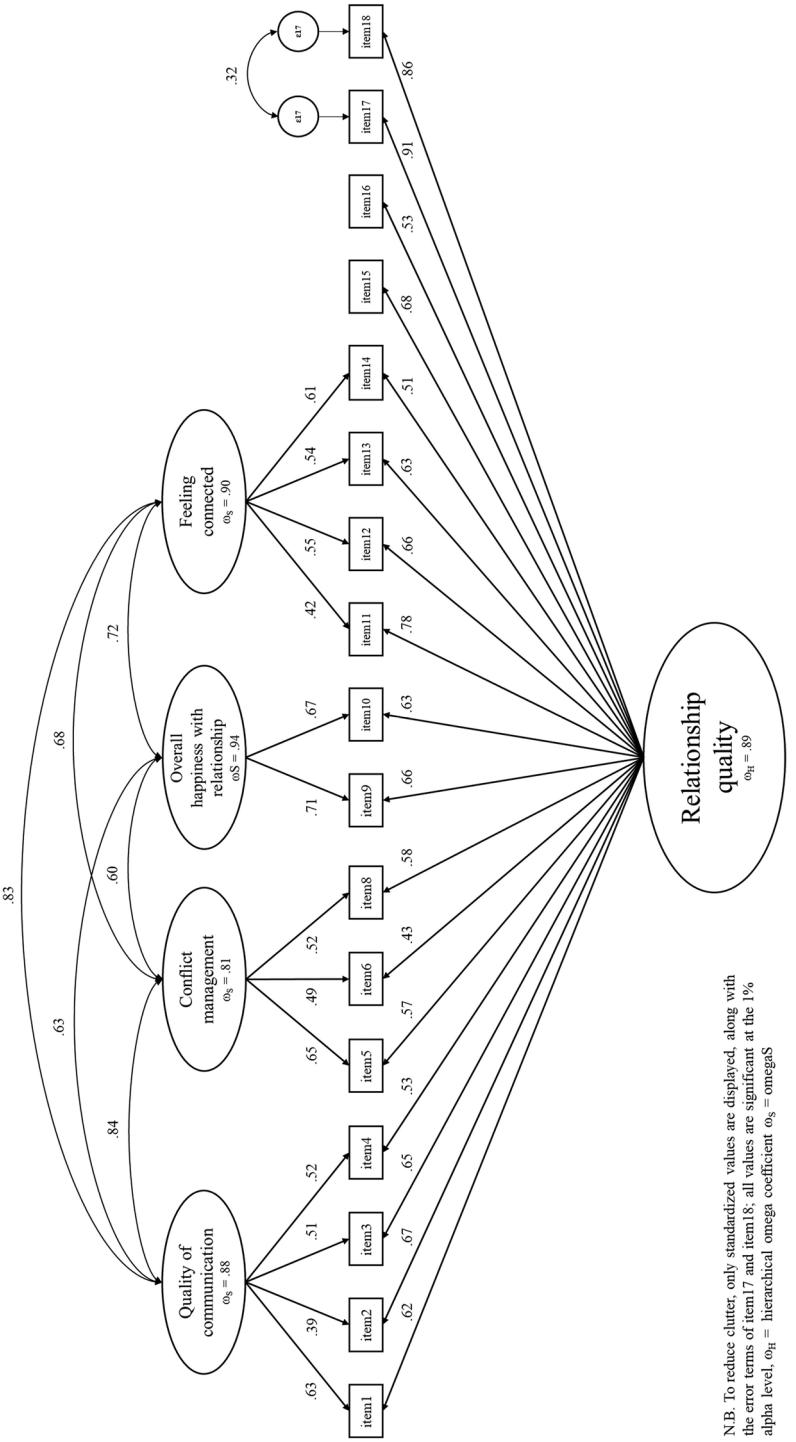
Known-groups and intervention validity

Having established the final structure of the M-QoRS, we decided to further assess the construct validity of the M-QoRS by testing its known-group and intervention validity. Regarding the former, we regressed the general quality of relationship factor onto a binary variable, which was derived from asking people "Are there any children (aged under 18 years) living in your household?" with a Yes/No response option. This follows a previously tested strategy (see Chonody et al., 2018), which is based on the evidence that parents tend to report lower relationship quality than non-parents (Twenge et al., 2003).

Results from a Multiple Indicators Multiple Causes (MIMIC) model demonstrated highly significant different scores on the general factor of the M-QoRS between those reporting having children aged under 18 and those without them, $\beta = .28$, $p < .001$, 95% CI [0.20, 0.36], pointing toward the presence of known-groups validity in the M-QoRS.

Table 4. M-QoRS bi-factor structure: unstandardized/standardized parameter estimates, 95% confidence intervals, and inter-item reliability.

	General factor	Domain-specific factors					
Manifest variables	Quality of relationship	Quality of communication	Conflict management	Overall happiness with relationship	Feeling connected	Sex and intimacy	Inter-item reliability (R^2)
	Unstandardized/standardized parameter estimates (95% confidence intervals)						
Item1	1/.62 (.56, .68)	1/.63 (.57, .69)					.78
Item2	1.09 (.99, 1.19)/.67 (.62, .73)	.62 (.51, .72)/.39 (.32, .45)					.61
Item3	1.05 (.96, 1.13)/.65 (.60, .70)	.81 (.71, .92)/.51 (.45, .58)					.69
Item4	0.85 (.75, .95)/.53 (.46, .59)	.82 (.71, .94)/.52 (.46, .58)					.56
Item5	0.91 (.83, 1)/.57 (.51, .63)		1/.65 (.58, .71)				.74
Item6	0.70 (.598, .81)/.43 (.36, .51)		.76 (.64, .89)/.49 (.42, .57)				.43
Item8	0.93 (.82, 1.04)/.58 (.51, .64)		.81 (.69, .93)/.52 (.46, .59)				.61
Item9	1.06 (.96, 1.16)/.66 (.60, .71)			1/.71 (.65, .77)			.94
Item10	1.01 (.91, 1.12)/.63 (.57, .69)			.94 (.85, .104)/.67 (.61, .73)			.85
Item11	1.26 (1.15, 1.37)/.78 (.74, .82)				1/.42 (.38, .48)		.79
Item12	1.06 (.96, 1.15)/.66 (.61, .71)				1.31 (1.11, 1.52)/.55 (.49, .61)		.74
Item13	1.02 (.92, 1.12)/.63 (.57, .69)				1.30 (1.08, 1.52)/.54 (.48, .61)		.70
Item14	0.82 (.72, .93)/.51 (.44, .58)				1.44 (1.18, 1.71)/.61 (.53, .68)		.63
Item15	1.09 (.96, 1.23)/.68 (.62, .74)					NA	.51
Item16	0.85 (.72, .98)/.53 (.46, .59)					NA	.32
Item17	1.47 (1.33, 1.61)/.91 (.88, .94)					NA	.84
Item18	1.38 (1.24, 1.52)/.86 (.81, .90)					NA	.74



N.B. To reduce clutter, only standardized values are displayed, along with the error terms of item17 and item18; all values are significant at the 1% alpha level, ω_H = hierarchical omega coefficient ω_S = omegaS

Figure 1. Multidimensional Couple Quality of Relationship Scale (M-QoRS) bi-factor structure.

Additionally, we evaluated the instrument's sensitivity to change as part of its intervention validity (see for example Elliott et al., 2008). As we demonstrated elsewhere (Aicken et al., 2025), all the domains of quality of relationship measured by the M-QoRS were found to be amenable to

enhancement during an mHealth intervention, which was based on the frequency of use of the Paired app. Among these domains, the most pronounced improvement was observed in the quality of communication. This finding is consistent with our results, which indicate the latter to be one of the domains most strongly associated with overall relationship quality.

Cross-validation

To test whether Model3 could be replicated in other samples, we adopted a split-sample cross-validation approach, which is a recommended option in SEM to overcome the restraints of collecting a second set of data (see Schumacker & Lomax, 2004). Following Gana and Broc's (2019) advice, we randomly split the main sample into a calibration sample and a validation sample. Due to deleted missing cases, the two samples were equally reduced to 369 observations. Since we used categorical manifest variables, we adopted Wu and Estabrook's (2016) model identification and delta parameterization. Thus, a series of nested models with increasing constraints (threshold, factor loadings) were compared through the chi-square difference test and expected cross-validation index (ECVI) with smaller values favoring more constrained models (Browne & Cudeck, 1989). Models comparison results can be examined in Table 5.

The configural model showed excellent model fit not dissimilar to Model3, $\chi^2_{(198)} = 213.469$, $p = 0.21$, CFI = 1, TLI = 1, RMSEA = 0.015, 90% CI [.0, .02], SRMR = .035. Similarly, the model with constrained threshold showed excellent model fit, $\chi^2_{(232)} = 227.994$, $p = 0.56$, CFI = 1, TLI = 1, RMSEA = 0.00, 90% CI [.0, .02], SRMR = .035. Model comparisons results revealed no significant difference between the baseline model and the model with constrained thresholds, $\Delta\chi^2_{(34)} = 29.931$, $p = .66$. Lastly, the model with constrained thresholds and factor loadings showed excellent model fit, $\chi^2_{(257)} = 249.917$, $p = 0.21$, CFI = 1, TLI = 1, RMSEA = 0.00, 90% CI [.0, .019], SRMR = .036. Once more no significant difference was found between this model and the one with only constrained thresholds, $\Delta\chi^2_{(25)} = 20.177$, $p = .73$. These findings suggest that the Multidimensional Couple Quality of Relationship Scale could be generalized to other possible independent data sets.

Table 5. M-QoRS cross-validation models comparison.

Model/indices	Baseline model	Constrained thresholds	Constrained thresholds and loadings
ECVI	.86	.78	.75
χ^2 Difference test			
$\chi^2_{(df)*}$	$213.469_{(198)}$	$227.994_{(232)}$	$249.917_{(257)}$
p-Value	.21	.56	.61
$\Delta\chi^2$		29.931	20.177
Δdf		34	25
Δp-Value		.66	.73
N	369	369	369

M-QoRS scoring

Although the M-QoRS was not intended for diagnostic purposes, we are aware that there might be instances in which this scale could be useful to assess quality of relationship in individual cases. Therefore, we built a Microsoft excel-based calculator of relationship quality (see Supplemental Material). The calculator computes a weighted average of each of the M-QoRS item's factor scores of the general factor, by multiplying them by their corresponding standardized parameter estimate, using the formula:

$$\overline{x} = \frac{\sum_{i=1}^{n} \left(x_i \cdot w_i \right)}{\sum_{i=1}^{n} w_i}$$

where x_i = each item' score of the M-QoRS and w_i = the standardized parameter estimates derived for the first order factor analysis. For example, any value between 1 and 5 that is given to item 1, is multiplied by the corresponding standardized parameter estimate of .62 (see Table 4).

Lastly, to help the users to interpret the results, the calculator applies min-max normalization through the formula:

$$x' = \frac{x - x_{\min}}{x_{\max} - x_{\min}}$$

where x = each final weighted average M-QoRS score, and $x_{\min}$ and $x_{\max}$ = the weighted average M-QoRS minimum and maximum values, respectively. This converts the final M-QoRS score in the range of 0 and 100, with higher scores indicating higher relationship quality.

When tested against the responses collected for the M-QoRS validation study, the calculator computes normalized weighted averaged M-QoRS scores that are highly and significantly correlated to the factor scores generated through CFA ($r = .97$, $p < .001$).

Discussion

The findings presented in this study offer evidence that it is possible to measure couple relationship quality with a novel tool, namely the Multidimensional Quality of Relationship scale (M-QoRS) that acknowledges both its unidimensional and multidimensional dynamic nature.

In its final structure, the M-QoRS builds on a bi-factor model, with a general factor, namely Quality of relationship, and four domain-specific factors, namely Quality of communication, Conflict management, Feeling connected, and Overall happiness with one's relationship, all explaining

variability in 17 manifest variables. Both the general factor and the domain-specific factors showed high values on omega hierarchical and omegaS respectively, providing strong evidence toward construct validity. This was further supported by the presence of know-group validity, after the general factor "Quality of relationship" was found to be significantly related to having or not having underage children within one's household. Lastly, results from cross-validation suggest that the bi-factor structure used for the M-QoRS could be replicated in other samples.

At the item level, we noticed that the 17 manifest variables used to validate the M-QoRS presented relatively high factor loadings and inter-item reliability. Amongst them, the item "Sex is an important part of our relationship," showed the lowest inter-item reliability ($R^2 = .32$). In a similar fashion, the items originally designed to account for the "Sex and Intimacy" factor were found to load only onto the general factor "Quality of relationship". There are several possible explanations for these results. First, our sample may include asexual people, those in a celibate relationship, and couples who choose not to engage in pre-marital sex. In addition, we should be aware that the developers of the M-QoRS considered sex and intimacy as two aspects of the same domain, whereas Hassebrauck and Fehr (2002) treated them separately, and reached the conclusion that intimacy contributes most, and sexuality least, to overall relationship satisfaction. This could also explain the necessity to correlate the error terms of item17 "We are physically affectionate with each other" and item18 "My partner regularly gives me a hug", as these two items specifically refer to intimacy as a distinct domain of relationship quality. Therefore, future developments of the scale should consider the possibility of adding more items to build a "Satisfaction with sexual life" domain and a separate "Intimacy domain."

One final possible explanation should not be discarded, since it relates to the exceptional circumstances people faced when our survey was administered. In fact, a systematic review conducted by Estlein et al. (2022) has highlighted that the way romantic relationships were affected by the pandemic significantly varied based on demographic, individual, and couple-level factors. For some couples COVID-19-related stressors often exacerbated conflicts, which led to diminished sexual frequency and willingness for intimacy (like Li et al., 2020; Luetke et al., 2020; Panzeri et al., 2020), whereas others experienced improvements in their sexual life, particularly those living happily with their partner and being satisfied with their relationship (Eleuteri et al., 2021).

Limitations and future perspectives

The first limitation of this study pertains to the nature of the sample, where participants were all users of a mobile application for couples. These

people may not be representative of adults in couple relationships, for instance, they may be more technologically literate and motivated to maintain or improve their relationships. Moreover, the app was not designed for relationships in distress, and so the M-QoRS may be less suited to the measurement of very low-quality relationships. However, the sample was diverse in several meaningful ways: the types of couple relationships (i.e., not exclusively married or in stable partnerships), sexual orientation, and nationality and culture. This suggests that the M-QoRS has broad relevance and applicability. However, we should still be mindful that the final sample presented a higher concentration of UK and US participants; therefore, our results can best be generalized to these two countries. Moreover, across cultural contexts, "couples" are variously defined, and people may have divergent expectations from these relationships, such that relationship quality may be perceived differently. Future studies could explore the cultural adaptation of the instrument, including to non-Western and non-English-speaking populations, to enhance its cross-cultural validity.

Turning to the operationalization of relationship quality and construction of the M-QoRS, a limitation pertains to the possibility that other relevant dimensions of quality of relationship might have been excluded from the development of the scale. Although our choice of domains was supported by a wide literature, and we believe that we have included the main ones, we should still be open to the possibility of including in future developments of the M-QoRS more quality of relationship domains, particularly some related to the eudemonic aspect of relationship quality (see Fowers et al., 2016).

One last set of recommendations pertains to the further improvement of the validity and reliability of the scale. First, we advise future investigations to test convergent validity by correlating the M-QoRS with other known scales of quality of relationship. Comparing the M-QoRS with more established relationship quality scales could provide additional evidence for its validity and help situate it within the broader landscape of relationship assessment tools. In terms of reliability, we suggest administering the instrument to the same sample more than once over time in order to test for temporal reliability.

Conclusions

This study set out to develop a new scale to measure the complex nature of the quality of intimate relationships by acknowledging both their unidimensionality and multidimensionality. A further aim was to propose a tool with the potential to be used within and beyond the context of mHealth and mobile interventions. The Multidimensional Quality of Relationship Scale (M-QoRS) is the result of such an effort.

A first advantage of the scale is that it is not only applicable to married couples but also to people in diverse types of intimate relationships. This sets the scale apart from previously proposed instruments, such as the widely used Kansas Marital Satisfaction Scale (Nichols et al., 1983; Schumm et al., 1986). Additionally, the large percentage of LGBQ+ people whose data fed into the development of the M-QoRS, indicates that this is an instrument that does not take a heteronormative stance in measuring relationship quality. This kind of inclusivity aligns the instrument with other validated relationship measures, such as the Dyadic Adjustment Scale (Kurdek, 1992).

A second advantage is that the M-QoRS has been developed within the framework of the Paired app evaluation study (Aicken et al., 2025; Witney et al., 2024). This makes the scale a psychometrically sound and useful instrument for assessing relationship quality in other mHealth and mobile interventions. In fact, the scale offers some advantages for such types of interventions, including presenting a relatively reduced number of items, being easy and quick to complete, and being specifically designed for smartphone app use.

This last point is of particular relevance for promoting and testing more national-level policies aimed at supporting individuals, couples, and families with their relationships. For instance, in the UK only, the government has committed, at least since 2002, "to help people establish and maintain successful relationships with their partners. Specifically, it assists families through focusing on services and initiatives that target the adult couple relationship" (Lord Chancellor's Advisory Group on Marriage and Relationship Support, 2002, p. 12).

This commitment, which is shared by other countries across the globe, appears now even more topical in the aftermath of the COVID-19 pandemic, which has profoundly impacted, amongst many other things, on couples' relationship quality (Pietromonaco & Overall, 2021). In view of this, the M-QoRS can be an ally for the evaluation of the numerous online interventions that are emerging as a response to the negative effect that the pandemic is having on relationship quality for some couples (see Barden et al., 2021; Tsai et al., 2020).

Ultimately the Multidimensional Quality of Relationship scale is part of an effort to help people experience a healthy and harmonious romantic relationship with their partner and, in doing so to support their personal and interpersonal well-being.

Note

1. Ethical approval was provided by the Open University Human Research Ethics Committee, ref: HREC/3797/Gabb.

Disclosure statement

Better Half/Paired was not involved in the collection of the data used in this study, analysis, interpretation, writing, or decision to submit this article. Jacqui Gabb was seconded to Paired as chief relationships officer during the study and analysis. There is no conflict of interest; the role was non-remunerated, and she retained her academic independence. Paired was not involved in the analysis, interpretation, writing, or decision to submit this article.

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Data availability statement

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

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Appendix A. Correlation matrix of manifest variables

	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10	Item11	Item12	Item13	Item14	Item15	Item16	Item17	Item18
Item1	1																	
Item2	.675	1																
Item3	.78	.66	1															
Item4	.592	.56	.574	1														
Item5	.759	.61	.648	.555	1													
Item6	.534	.48	.443	.465	.612	1												
Item7	−.174	−.19	−.16	−.1	−.19	−.15	1											
Item8	.624	.57	.592	.494	.654	.523	−.18	1										
Item9	.699	.63	.652	.603	.649	.462	−.17	.65	1									
Item10	.661	.57	.623	.565	.597	.488	−.24	.59	.9	1								
Item11	.721	.68	.693	.629	.655	.494	−.18	.66	.72	.707	1							
Item12	.639	.63	.631	.672	.59	.475	−.19	.56	.73	.716	.75	1						
Item13	.633	.6	.635	.571	.583	.449	−.17	.59	.72	.676	.68	.715	1					
Item14	.598	.51	.638	.594	.53	.408	−.13	.56	.6	.577	.65	.664	.716	1				
Item15	.472	.48	.533	.353	.446	.309	−.08	.37	.41	.402	.56	.405	.392	.332	1			
Item16	.348	.37	.316	.254	.279	.227	−.02	.29	.31	.341	.43	.301	.287	.245	.566	1		
Item17	.547	.61	.591	.471	.501	.41	−.21	.49	.62	.599	.71	.606	.599	.457	.644	.586	1	
Item18	.525	.58	.539	.434	.513	.388	−.19	.51	.58	.526	.66	.604	.609	.502	.509	.432	.784	1

Note. Results are based on polychoric correlations.