Metodološki zvezki, Vol. 9, No. 1, 2012, 1-24

# Measurement Quality of Social Support Survey Measurement Instruments

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## Abstract

Social network items have been included in several cross-national surveys (e.g., Generations and Gender Programme, European Quality of Life Survey, International Social Survey Programme). In these surveys, several different methods and questionnaire items are applied to measure similar or identical constructs. These methods are the name generator method and the simplified role relation method. These methods differ significantly in terms of complexity, cost and respondent (and interviewer) burden.

In this paper, we would like to establish whether an estimation of network composition, assessed in percentages of family members, partner, friends etc. can be obtained by a simpler method than the name generator method without reducing the measurement quality of network composition indices. The study uses data from two experiments conducted in 2006 and 2008 on convenience quota samples. The correlated uniqueness model for multitrait-multimethod designs adapted to compositional data is used for estimating data quality indices. Besides the name generator and simplified role relation methods, we also compare the event-related method.

The main findings are that the name generator method offers the highest measurement quality followed by the simplified role relation methods with two provider choices and the simplified role relation method with one provider choice. The event-related method has the lowest measurement quality. The partner over the family ratio was measured with the highest quality amongst all methods while the non-family over family ratio had the lowest. The strength of a tie is an important factor when it comes to measurement quality.


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# 1 Introduction

Social support and social network items have been included in several cross-national surveys, such as the Generations and Gender Programme (GGP), the International Social Survey Programme (ISSP), the European Quality of Life Survey (EQLS), the General Social Survey (GSS), the Survey of Health Ageing and Retirement in Europe (SHARE) and a host of national surveys. In these surveys, several different approaches and questionnaire items are applied to measure similar or identical constructs. These approaches are the name generator approach (GGP and GSS, SHARE) and the simplified role relation method (ISSP, EQLS, GGP, SHARE). These approaches differ significantly in terms of the complexity, cost and respondent (and interviewer) burden. One should select the cheapest variants of question items (in terms of the time spent on completion and the respondent burden) that would provide data of the highest measurement quality.

One of the main outcomes of questionnaire items assessing social support or social networks is the so-called network composition, expressed in percentages of family members, friends, co-workers or neighbors. These indices of network composition, coupled with the fact that there is variability in network composition measures if social support and social networks are measured with different methods or approaches, form the focus of our study. The name generator approach is often considered the best method, yielding the most complete and comprehensive information about a person's social network. Conversely, it is usually less efficient in cost and respondent burden terms. Therefore, we would like to know whether an estimation of network composition, assessed in percentages of family members, partner, friends etc. can be obtained by simpler methods than the name generator method without reducing the measurement quality of network composition indices.

The paper starts with an overview of definitions of social support, social networks and survey measurement methods used to assess social support and network composition. The correlated uniqueness (CU) model for multitrait-multimethod (MTMM) designs is explained together with specific issues related to the fact that we want to evaluate the measurement quality of compositional variables. The measurement quality of three methods for assessing social support (the name generator method, the simplified role relation method and the event-related method) is then estimated. Data from two separate experiments are used for this purpose. In the final section, some shortcomings are discussed together with the main findings and several possibilities to continue studies of the measurement quality of compositional social support measurement instruments.

# 2 Measurement of social support

Social support is an important exchange between an individual and his/her personal or local network and is related, among others, to various outcomes such as social isolation, depression, stress, health-related problems, educational and job performance (for a review, Cohen and Wills, 1985; Hlebec et al., 2011; Sarason et al., 1997; Vaux, 1988). Authors addressing the conceptualization of social support usually stress the difference between actually received social support and the subjective appraisal of social support and understand social support networks as a source of social support (Burleson et al., 1994; Sarason et al., 1990; Vaux, 1988: 59-91). Social support is defined as a dynamic transaction process between the person and her/his support network. The role of social support in ensuring individuals' well-being is conceptualized in two models (Cohen and Wills, 1985; Cutrona and Russell, 1990; Vaux, 1988; Veiel and Baumann, 1992). The main-effect model states that social support is beneficial per se, regardless of whether the person is under stress. The buffering-effect model argues that social support protects people from negative consequences of stressful events. Further, there are several cross-national surveys comprising social support or social network items (Generations and Gender Programme – GGP, International Social Survey Programme – ISSP, European Quality of Life Survey – EQLS, or General Social Survey – GSS). Regardless of the particular conceptualization, there is a consensus that social support is a multidimensional construct comprising a number of support types (e.g. emotional, social, instrumental, informational, and so on) or support in a variety of stressful situations. The most often calculated and interpreted index of personal network characteristics is network composition, in other words, percentages of partner, family, friends and other members within the network (Burt, 1984; Kogovšek and Hlebec, 2008; Marsden, 1987; Müller et al., 1999).

The majority of studies employing social support constructs rely on data from surveys. Many methodological studies explore various aspects of the measurement quality of survey network instruments (such as confirmatory factor analysis (CFA) of MTMM designs) (e.g., Bernard et al., 1987; Bernard et al., 1990; Campbell and Lee, 1991; Coenders et al., 2011; Coromina and Coenders, 2006; Hlebec et al., 2009, 2012a, 2012b; Kogovšek et al., 2002; Kogovšek and Ferligoj, 2003, 2004, 2005; Kogovšek, 2006; Kogovšek and Hlebec, 2008; Kogovšek et al., 2010; Lozar-Manfreda et al., 2004; Marin and Hampton, 2007; Marsden, 1993; Neyer et al., 1991; Van Groenou et al., 1990; Vehovar et al., 2008). However, relatively few studies employ advanced models of the measurement quality of network data which make it possible to estimate reliability and validity of each measurement method separately (such as confirmatory factor analysis (CFA) of MTMM designs) (Coenders et al., 2011; Coromina and Coenders, 2006; Kogovšek et al., 2002; Kogovšek and Ferligoj, 2004, 2005; Kogovšek, 2006; Kogovšek and Hlebec, 2008). This is clearly a considerable advantage over simpler analyses which are made when only two methods are available (e.g. correlations and contingency tables).

The article aims to evaluate the measurement quality of indicators of network composition, which poses several statistical problems as the composition is usually expressed as proportions of a total, whose sum can only be 1. Owing to the constrained nature of compositions, statistical analysis in general and the estimation of measurement quality with a confirmatory factor analysis model for multitrait-multimethod (MTMM) designs in particular are challenging tasks (Coenders et al., 2011). Compositional data are highly non-normal as they range within the 0-1 interval. One component can only increase if some other(s) decrease, resulting in spurious negative correlations among components which cannot be accounted for by the MTMM model parameters.

Within a survey context, two types of measurement instruments are most often used to gather data about social support personal networks: the name generator method and the simplified role relation method. The name generator method, which we will consider as the baseline in this paper, is by far the most complex approach and uses a two-step procedure. Examples are given in Appendices 1 and 2. The names of network members are obtained in the first step and various characteristics of the relationship(s) between the respondent (ego) and network members (alters), along with characteristics of the network members themselves are evaluated in the second step. Although this method yields an abundance of information about personal networks, including network size, and it is even employed in national or cross-national research (e.g., GGS), it is more costly and time consuming than other methods.

The simplified role relation method is by far the easiest to include in a survey (see cross-national surveys such as GGP, EQLS and ISSP). This is an ordinary survey question with a list of roles as answer categories. No additional data are collected about the ties between the respondent and network members or about the network members' characteristics. Examples are given in Appendices 1 and 3. The list of roles can be very short, directly assessing the network composition (e.g. family, friends, neighbors, co-workers and others) or more diversified with some roles, especially family, listed more specifically (e.g. partner, father, mother etc.). In the case of the EQLS, respondents are allowed to pick just one provider for each type of social support. In other cases, two providers are obtained (ISSP). In this article we consider both the one-provider and two-provider versions. Regardless of the number of providers, this method only produces one piece of information about the social support network, i.e. a typical support provider. We lack information about the network size and various indices about the network composition and structure. We can obtain a simplified indicator of network composition which can only be calculated if we have questions on more than one social support type (Hlebec and Kogovšek, 2005; Kogovšek and Hlebec, 2008; Hlebec et al., 2009, 2012a, 2012b; Kogovšek et al., 2010).

The third method studied in this paper is the event-related method. This method assesses the support actually received when a stressful event has occurred (for example, within the last 3 or 5 years) or the perception that support would hypothetically be obtained when needed for stressful event that has not yet occurred (Hlebec and Kogovšek, 2010). This method relates directly to the buffering effect model. In a simple way, a list of stressful events (e.g., death of a close person, retirement etc.) is provided to respondents who then pick the support providers from the list of possible roles. An example of such a measurement instrument is given in Appendix 4. As is the case with the simplified role relation method, only an overall network composition can then be obtained across all events (Hlebec et al., 2009; Hlebec and Kogovšek, 2010).

A researcher wanting to conduct a survey about social support provision must decide which measurement instrument is the most suitable for the purpose of the study and which data collection method would be most efficient (having the best data quality and the lowest costs). In order to assist in this decision process, in this article we want to show whether an estimation of the network composition, assessed in percentages of family members, partner, friends etc. can be obtained from a simpler method than the name generator method without reducing the measurement quality. We will summarize the findings of previous studies on comparisons of the abovementioned methods in the following paragraphs.

Comparisons of the name generator, simplified role relation and event-related methods for measuring social support networks have so far only involved a comparison of two methods at once and with elementary statistical procedures which do not make it possible to estimate method reliability and validity (Hlebec and Kogovšek, 2005, 2010; Hlebec et al., 2009, 2012a, 2012b; Kogovšek and Hlebec, 2008; Kogovšek et al., 2010). For instance, Kogovšek and Hlebec (2008) found that the differences between the name generator and simplified role relation methods were relatively small when both methods used the same number of support provider choices. Differences were larger within methods between one provider choice and two provider choices.

While the name generator and simplified role relation methods seem somewhat similar, comparisons of the name generator method and the event-related method (actually received support for stressful events that occurred within the last three years) indicate that the methods differ significantly (Hlebec et al., 2009). A detailed exploration of differences between the simplified role relation method (perceived support) and the event-related method shows quite a big difference, especially the lower percentage of the husband/wife/partner in the simplified role relation method (39.8% compared to 53.3% in the event-related method) (Hlebec et al., 2012b).

Based on a summary of previous studies, we can expect that, when the three methods are considered together and their reliabilities and validities are properly estimated, the name generator and the simplified role relation method would be more similar, whereas the event-related method would be more specific, firstly, because with the latter method only one provider of social support is measured and, secondly, because it is quite possible that actually obtained stress-related support is different than overall support (including three theoretically defined dimensions, namely, instrumental, emotional and informational support, see Vaux, 1988). Further, when only one provider choice is also considered for the simplified role relation method the method becomes more similar to the event-related method, but not completely, only in the sense that just one provider choice is taken into account. The distinction between overall support and stress-related support remains. Based on the fact that the partner is the most frequent unique provider of all kinds of social support in both the main and the buffering effect hypotheses, the partner should be measured the most consistently across all methods, whereas the non-family composition should vary the most across methods.

In the next subsections, the MTMM approach to evaluating measurement quality is outlined. Due to the specific characteristics of compositional data, the analysis cannot be carried out in a standard way. The necessary procedures are also summarized drawing from Coenders et al. (2011), who used the MTMM approach to estimate reliability and validity of network compositions across data collection modes (personal vs. telephone) and question orderings.

# 3 Correlated uniqueness model for multitrait-multimethod (MTMM) designs

MTMM designs (Campbell and Fiske, 1959) are a well-established approach to assessing the measurement quality (reliability and validity) of survey questions (see Saris and Gallhofer, 2007 and references therein). These designs consist of multiple measures of at least two factors (traits) with the same set of at least three measurement procedures (methods). Accordingly, these designs include DM measures, that is, the number of methods (M) times the number of traits (D). MTMM designs are usually analyzed by means of CFA models, a particular case of structural equation models (SEM). A number of CFA models for MTMM data have been formulated and tested in the literature (see Coenders and Saris, 2000 for a review). These authors showed the great flexibility of the so-called correlated uniqueness (CU) model (Marsh, 1989), of which many other MTMM models constitute particular cases. The CU model is a CFA model specified as follows.

Let $x_{idm}$ be the measurement of individual $i$, for trait $d$ with method $m$:

$$x_{idm}=\tau_{dm}+\lambda_{dm}t_{id}+e_{idm} \tag{3.1}$$

where $t_{id}$ is the latent variable score of individual *i* corresponding to trait *d* and $e_{idm}$ is the measurement error term of individual *i*, for trait *d* with method *m*, and with the assumptions $E(t_{id}) = 0$, $E(e_{idm}) = 0$, and $cov(e_{idm} ; e_{id'm'}) = 0$.

The model parameters are:

- $\tau_{dm}$: expected value of $x_{idm}$;
- $\lambda_{dm}$: factor loading of $x_{idm}$ on trait $t_{id}$;
- $\theta_{dm}$: measurement error variance of $e_{idm}$;
- $\theta_{dd'm}$: covariance between two measurement error terms sharing a common method $e_{idm}$ and $e_{id'm}$. In an MTMM design it is expected that use of the same method involves common errors. These covariances are called method effects for this reason. All other error covariances are zero by assumption;
- $\phi_{dd}$: variance of the trait latent variable $t_{id}$; and
- $\phi_{dd'}$: covariance between two trait latent variables $t_{id}$ and $t_{id'}$.

Two main measurement quality indicators can be obtained by the model:

- Standardized trait loadings $\lambda_{dm}$ measure the strength of the relationship between the observed scores and trait latent scores. When squared, they equal the percentage of variance of the measurement $x_{dm}$ explained by the latent variable score $t_d$. They are the most often used measurement quality indicators in CFA models. From a psychometric point of view they are equal to the product of reliability and validity (Saris and Gallhofer, 2007). In the MTMM framework, validity is understood in a somewhat restricted manner as the absence of method effects.
- Intercepts $\tau_{dm}$, $\tau_{dm'}$,… measure the relative bias of several methods *m, m'*,… when measuring trait *d*. If $\tau_{dm}=\tau_{dm'}$, then there is no difference in the biases of methods *m* and *m'* when measuring trait *d*. If $\tau_{dm}>\tau_{dm'}$, then method *m* yields systematically larger scores than method *m'* when measuring trait *d*. The latter result does not tell us which of both methods is correct. It only tells us that both methods yield different mean values.

A path diagram of the CU model with three traits and three methods is displayed in Figure 1 ($\tau_{dm}$ parameters are omitted for simplicity).

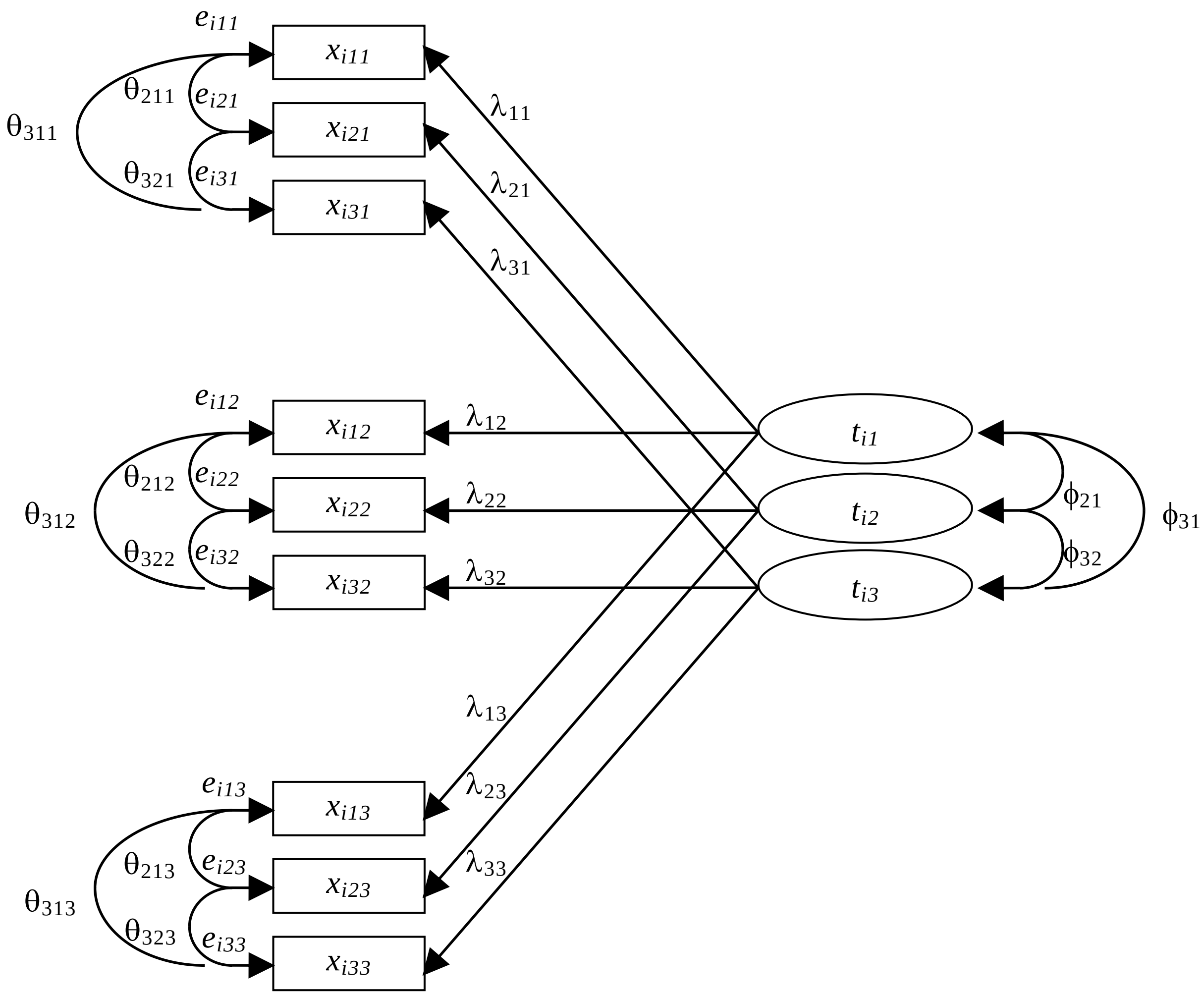


**Figure 1:** Path diagram of the CU model for MTMM designs with three traits and three methods.

# 4 Statistical data analysis of compositions

Compositional data concern the relative size of $D$ components within a total, usually expressed in proportions over 1 or over 100%. This is the case of data on network compositions expressed as percentages of friends, family and other types of members of a personal network. The measurement quality of compositional data cannot be studied by simply fitting the proportions or percentages to a SEM (e.g., to a CU model). Compared to unconstrained absolute data (e.g., number of friends, family and so on in the network), compositional data lie in a heavily constrained space. A $D$-term composition measured on individual $i$ with a given method $m$ takes the form:

$$x_{i1m}, x_{i2m},\ldots,x_{iDm} \tag{4.1}$$

with the constraints:

$$0 \leq x_{idm} \leq 1 \text{ and } \sum_{d=1}^{D} x_{idm} = 1 \qquad (4.2)$$

The problems reported by Aitchison (1986) such as non-normality of compositional data, constrained sum, perfect collinearity, also apply to the CU model with compositional data, with an important addition (Coenders et al., 2011). The compositional $x_{idm}$ data cannot fit the CU model. Intuitively, for a given set of true compositions $t_{idm}$ the observed component $x_{i1m}$ can only increase if some other components decrease. $x_{i1m}$ is thus not only dependent on $t_{i1m}$ but on all $t_{idm}$. The CU model assuming each observed variable to load only on a trait is thus mis-specified.

In compositional data only the relative size of components is observed. Thus, ratios are the only meaningful way of expressing the data. The analysis of compositional data with standard statistical methods is only possible after some kind of ratio transformation has been applied. Several ratio transformations have been used in the literature, among which Coenders et al. (2011) suggest using the additive logratio transformation (alr), which is already mentioned by Aitchison (1986). The alr transformation is simply computed as the log ratio of each component to the last:

$$y_{idm} = ln(x_{idm}/x_{iDm}) \text{ with } d = 1; 2; \ldots; D-1 \qquad (4.3)$$

Of course, any component may be situated in the last position at will. It must be clear by now that the alr transformed composition has one fewer dimension than the original composition.

Coenders et al. (2011) suggest to simply estimate the CU model on the alr transformed $y_{idm}$ data on the $(D\text{-}1)M$-dimensional data set with conventional methods for SEM, taking into account the following limitations regarding parameter interpretation, which, fortunately, do not affect parameters related to measurement quality $\lambda_{dm}$ and $\tau_{dm}$:

- Trait correlations tend to be positive because alr data have a common denominator. The correlations among ratios cannot be interpreted.
- For the same reason, error term covariances $\theta_{dd'm}$ are also spurious and positive. These error covariances play only a methodological role and cannot be interpreted as method effects as in the classical MTMM analyses.

# 5 Data

Data sets from two separate experiments were composed for this paper, as shown in Table 1.

**Table 1:** Characteristics of measurement instruments[4].

| | | | **Measurement instrument** | | |
|---|---|---|---|---|---|
| | **N** | **Experi-ment** | Name generator (NG) | Simplified role relation (RR) | Events (Respondents select only those that actually occurred in the last three years) |
| **Group A** | **232** | **2006** | 6 support types no limitations in network size | 6 support types 2 providers* (maximum network size 12) | |
| **Group B** | **330** | **2008** | 6 support types 2 providers[5] (maximum network size 12) | | 15 events 1 provider (maximum network size 15) |
| **Group C** | **346** | **2008** | | 6 support types 2 providers* (maximum network size 12) | 15 events 1 provider (maximum network size 15) |

* The RR data were analyzed in two ways, taking into account the 12 mentioned providers or the 6 named as the first choice.

Data from the 2006 experiment were collected on a convenience quota sample of 232 respondents by students of the social network analysis course at the Faculty

[4] For a more detailed information on types of support measured with each of the measurement instruments, see Appendices 1 and 4.

[5] Kogovšek et al. (2010) compared the name generator method without and with a limitation on the first two provider names. The individual data differences across the name generator options (without and with the limitation) were minor (the largest difference was 4.2% for partner and 3.5% for friends). When using aggregated data (% of partner, % family, % of friends in the overall sample), the differences between the no limitation and limitation conditions disappeared. Therefore, we will assume that both name generator measurements are equivalent in this paper and they are used as one single method.

of Social Sciences at the University of Ljubljana in October and November 2006. Each student filled in the questionnaire during an interview training session which lasted four hours. Three weeks later they acted as interviewers and interviewed five additional respondents of their own choice with the quota sample design. The quotas were designed so that half of the respondents had to be male and half female, and within these two groups there had to be one in each of the three age groups (20-29, 30-49 and 50+ years of age). The two methods were administered in two separate waves with a two-week interval.

The data from the 2008 experiment were collected on two convenience quota samples of 330 and 346 respondents. Data were collected by students of the Faculty of Arts at the University of Ljubljana in October and November 2008, while the characteristics of respondents were set by quota requirements. The name generator or, alternatively, the simplified role relation measurement instruments were asked at the beginning of the questionnaire and the event-related support was assessed at the end, in a single wave.[6] In all other respects, the procedures were identical to those used in the 2006 experiment. The basic properties of both samples were almost identical. Therefore, we believe that using samples from two different years not widely apart had no major effect on the results of the present study.

The data set features three groups of respondents, each of which gets two of the three methods, while the third one is missing (three-group split-ballot MTMM design in Saris et al., 2004). This requires estimation methods which can handle missing data. A variant of the ML estimator with missing data described by Yuan and Bentler (2000) and in Arminger and Sobel (1990) is robust to non-normality and is the method we use in this article (MLR option in the Mplus program, Muthén & Muthén, 2007).

# 6 Results

Owing to time limitation in the event-related method (3 years), the estimation of network composition, especially the non-family parts of the composition, resulted in a high number of 0 values. Therefore, the roles were amalgamated into three major categories and the composition calculated for the partner, family and non-family proportions of the social support network. Of these three components, the proportion of family members was used as denominator to calculate the alr transformation. The remaining few zeroes were imputed in the manner suggested by Coenders et al. (2011), following Martín-Fernández et al. (2003) and Pierotti et

[6] Although two batteries of questions with a different content (life satisfaction, personality traits) were placed between the two network measurements memory effects are possible. However, since the two network approaches were quite different (asking about social support more generally on the one hand and about support in very concrete, specific events on the other hand) we believe these effects were probably minimal.

al. (2009). We estimated the CU model twice. In the first model run, the simplified role relation method was based on two support provider choices. In the second model, the simplified role relation method was based only on the first support provider choice.

**Table 2:** Descriptive statistics of the raw x compositions (i.e. proportions of each component) and the additive log ratio (alr) y scores. 2 support providers for the simplified role relation method.

| | Min | Max | Mean | St.dev. |
|---|---|---|---|---|
| $x_{11}$ | .017 | .635 | .185 | .130 |
| $x_{21}$ | .026 | .949 | .306 | .200 |
| $x_{31}$ | .026 | .949 | .510 | .184 |
| $x_{12}$ | .026 | .635 | .247 | .159 |
| $x_{22}$ | .026 | .893 | .256 | .163 |
| $x_{32}$ | .026 | .948 | .497 | .194 |
| $x_{13}$ | .021 | .952 | .389 | .300 |
| $x_{23}$ | .021 | .944 | .265 | .233 |
| $x_{33}$ | .024 | .926 | .346 | .264 |
| $y_{11}$ | -3.61 | 1.95 | -1.27 | 1.11 |
| $y_{21}$ | -3.61 | 3.61 | -0.73 | 1.28 |
| $y_{12}$ | -3.61 | 2.94 | -0.99 | 1.38 |
| $y_{22}$ | -3.61 | 3.23 | -0.84 | 1.23 |
| $y_{13}$ | -3.63 | 3.69 | 0.03 | 1.80 |
| $y_{23}$ | -3.46 | 3.53 | -0.31 | 1.41 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family; 3: family).
The second subindex shows the method (1: name generator; 2: simplified role relation; 3: event-related support).

**Table 3:** Descriptive statistics of the raw x compositions (i.e. proportions of each component) and the additive log ratio (alr) y scores. 1 support provider for the simplified role relation method.

| | Min | Max | Mean | St.dev. |
|---|---|---|---|---|
| $x_{12}$ | .048 | .905 | .401 | .277 |
| $x_{22}$ | .048 | .905 | .218 | .169 |
| $x_{32}$ | .048 | .905 | .381 | .244 |
| $y_{12}$ | -2.94 | 2.94 | -0.06 | 1.81 |
| $y_{22}$ | -2.94 | 2.94 | -0.59 | 1.32 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family; 3: family).
The second subindex shows the method (2: simplified role relation – one provider choice).

The *x* scores (raw component proportions after imputation of zero values) vary across the different methods (Table 2 and 3). The name generator and the simplified role relation methods yield similar frequency distributions[7] of composition with family being the largest component and partner the smallest. Partner is the largest category in the event-related method (0.389) while the non-family category is the smallest (0.265).

The alr *y* scores are relative to the 3rd component (family). Positive ratios show components which are larger than the family and negative ratios components which are smaller than the family.

Table 3 presents only the simplified role relation method with one support provider choice. The simplified role relation method now yields similar estimates of network composition to the event-related method in the sense that the role of partner is emphasized and the category non-family members is the smallest.

Tables 4 and 5 show the so-called MTMM matrix, which is an ordered correlation matrix among all measures. The shaded cells show correlations between the same trait using two methods. The higher the correlation between two methods, the more valid and reliable they tend to be in the MTMM framework. The partner to family ratio (trait 1) is evaluated similarly by all three methods, whereas there are larger differences (a smaller correlation) for the non-family over family ratio, with the event-related method being quite different from the remaining two. The remaining correlations relate different traits, which have a common denominator, and are thus not interpretable.

**Table 4:** Correlation matrix.

Model 1: 2 support providers for the simplified role relation method.

| | $y_{11}$ | $y_{21}$ | $y_{12}$ | $y_{22}$ | $y_{13}$ | $Y_{23}$ |
|---|---|---|---|---|---|---|
| $y_{11}$ | 1.000 | | | | | |
| $y_{21}$ | .165 | 1.000 | | | | |
| $y_{12}$ | .605 | .027 | 1.000 | | | |
| $y_{22}$ | -.007 | .480 | .313 | 1.000 | | |
| $y_{13}$ | .611 | .001 | .660 | .122 | 1.000 | |
| $y_{23}$ | .143 | .308 | .303 | .388 | .435 | 1.000 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family).
The second subindex shows the method (1: name generator; 2: simplified role relation-two provider choices; 3: event-related support).

When the simplified role relation method is limited to one provider choice (Table 5), the correlations with the name generator and event-related methods are reduced. Still, the partner to family ratio is evaluated similarly by all three methods.

[7] 100 times the mean *x* scores are the average percentage frequencies for each role.

**Table 5:** Correlation matrix.

Model 2: 1 support provider for the simplified role relation method.

| | $y_{11}$ | $y_{21}$ | $y_{12}$ | $y_{22}$ | $y_{13}$ | $y_{23}$ |
|---|---|---|---|---|---|---|
| $y_{11}$ | 1.000 | | | | | |
| $y_{21}$ | .165 | 1.000 | | | | |
| $y_{12}$ | .570 | .023 | 1.000 | | | |
| $y_{22}$ | .110 | .394 | .470 | 1.000 | | |
| $y_{13}$ | .611 | .001 | .626 | .177 | 1.000 | |
| $y_{23}$ | .143 | .308 | .293 | .366 | .435 | 1.000 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family).
the second subindex shows the method (1: name generator; 2: simplified role relation – one provider choice; 3: event-related support).

The CU model 1 (2 support providers for the simplified role relation method) yielded a robust Yuan and Bentler $\chi^2$ statistic of 21.7 with 5 degrees of freedom and $p$-value=0.001. As regards the commonly used goodness of fit measures in SEM, the 90 percent C.I. (confidence interval) for RMSEA was 0.036 to 0.088 and the CFI was 0.973. The CU model 2 (1 support provider for the simplified role relation method) yielded a robust $\chi^2$ 18.1 and $p$-value=0.003. The C.I. for RMSEA was 0.029 to 0.082 and CFI was 0.980. More importantly, standardized expected parameter changes associated to the modification indices were small (Saris et al., 2009). Goodness of fit is thus acceptable according to the common standards in SEM.

The measurement quality in Model 1, as indicated by the standardized $\lambda_{dm}$ trait loadings in Table 6 (product of reliability and validity), is the highest for method 2 (simplified role relation with two providers, closely followed by method 1 (name generator) and, at a long distance, by method 3 (the event-related method). There is a clear distinction between traits as the partner over family ratio has systematically higher estimates than the non-family over family ratio. The simplified role relation method with two provider choices included resembles the name generator method, especially as half of the sample for the name generator method is also limited to two choices.

In general, the partner to family ratio (trait 1) has the highest measurement quality regardless of the method used. The ratio involving other non-family network members (trait 2) has the lowest measurement quality for all methods, especially the event-related method.

As regards the expected $\tau_{dm}$ ratios in Table 6, Method 1 produces the smallest partner to family log ratio (−1.316) and method 3 the largest (+0.040), with method 2 being very close to method 1 (−0.944). The differences among methods regarding relative size of the others' network to the family network (trait 2) go in the same direction, although they are smaller in magnitude. As shown in Table 2, method 3 (event-related support) has the lowest percentage of family members (.346, i.e. 34.6%).

**Table 6:** Measurement quality estimates and 90% C.I. from the CU model.

Model 1: 2 support providers for the simplified role relation method.

| | Standardized $\lambda_{dm}$: loadings | | | $\tau_{dm}$: expected values | | |
|---|---|---|---|---|---|---|
| | lower 90% limit | estimate | upper 90% limit | lower 90% limit | estimate | upper 90% limit |
| $y_{11}$ | .733 | .805 | .877 | -1.386 | -1.316 | -1.246 |
| $y_{21}$ | .568 | .685 | .802 | -0.853 | -0.767 | -0.681 |
| $y_{12}$ | .796 | .879 | .963 | -1.035 | -0.944 | -0.854 |
| $y_{22}$ | .599 | .723 | .846 | -0.938 | -0.856 | -0.774 |
| $y_{13}$ | .612 | .670 | .727 | -0.082 | 0.040 | 0.161 |
| $y_{23}$ | .378 | .480 | .583 | -0.391 | -0.288 | -0.185 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family).
The second subindex shows the method (1: name generator; 2: simplified role relation; 3: event-related support).

Compared to model 1 where the simplified role relation method had two provider choices, the one-choice model 2 (Table 7) has a first noticeable difference, namely the quality estimates for the one-choice simplified role relation method are lower than with the first model. Other quality estimates remain about the same. The simplified role relation method is more similar to the event method and less similar to the name generator method when the respondent is allowed to mention only one support provider.

**Table 7:** Measurement quality estimates and 90% C.I. from the CU model.

Model 2: 1 support provider for the simplified role relation method.

| | Standardized $\lambda_{dm}$: loadings | | | $\tau_{dm}$: expected values | | |
|---|---|---|---|---|---|---|
| | lower 90% limit | estimate | upper 90% limit | lower 90% limit | estimate | upper 90% limit |
| $y_{11}$ | .723 | .797 | .871 | -1.373 | -1.302 | -1.231 |
| $y_{21}$ | .521 | .651 | .782 | -0.839 | -0.752 | -0.666 |
| $y_{12}$ | .723 | .801 | .879 | -0.143 | -0.023 | 0.096 |
| $y_{22}$ | .535 | .675 | .814 | -0.692 | -0.603 | -0.515 |
| $y_{13}$ | .635 | .698 | .760 | -0.101 | 0.019 | 0.140 |
| $y_{23}$ | .374 | .480 | .585 | -0.392 | -0.289 | -0.186 |

*Note:* The first subindex shows the trait (1: partner; 2: non-family).
The second subindex shows the method (1: name generator; 2: simplified role relation – one choice; 3: event-related support).

# 7 Conclusion and discussion

If we assume the name generator method is some kind of a gold standard, the most similar results are obtained with the simplified role relation method when two provider choices are permitted. The simplified role relation method with one provider choice is closer to the event-related method. This result is consistent with the findings of Kogovšek and Hlebec (2008) and Hlebec and Kogovšek (2011) that differences in network composition estimates are somewhat larger for one choice compared to compositional estimates when both choices are taken together.

The acceptable measurement quality of the two-provider simplified role relation method indicates that perhaps, if only the overall network composition (across several items) is required in an analysis, the simplified role relation method can be used in survey instruments without much loss of the measurement quality of indices of network composition. It is nevertheless too soon to accept the simplified role relation method as a universally satisfactory substitute for the name generator method, especially since previous research on network composition indices (Hlebec et al., 2012a) suggested that the response format (the number and specificity of given roles in the role relation method) has a stronger effect on measurement quality than the distinction between the name generator and the simplified role relation method.

Therefore, the answer to the question concerning cheaper methods (the simplified role relation method in comparison to the name generator) which would yield good quality data is neither straightforward nor univocal. Perhaps, in some instances, if one only needs an evaluation of the network composition of the overall support network, the simplified role relation method can be used instead of the name generator method. Still, some response categories, those which are not unique such as friends, co-workers, neighbors and others, would be underestimated as suggested by Hlebec and Kogovšek (2011).

It is quite possible that the lower values of estimates of the measurement quality of the event-related method are a consequence of the fact that the event-related method measures a very specific concept of social support – support received in case of stressful events. The fact is that identical wordings of network items are used for the name generator method and both versions of the simplified role relation method. In this sense, the event-related method may not be completely comparable to the other two methods and the differences may be of a more substantive rather than a methodological nature. This is consistent with the distinction between the main effect hypothesis and the stress buffering hypothesis and the fact that someone may actually turn to a very small proportion of the usual social support network in times of great distress (Cohen and Wills, 1985; Cutrona and Russell, 1990; Hlebec and Kogovšek, 2010; Vaux, 1988; Veiel and Baumann, 1992).

The finding that the partner over family ratio is measured with the highest quality across all methods indicates that the partner is the most important individual provider of social support, is linked to the respondent with a strong relationship and has a superior role in all kinds of support provision, regardless of the main or the buffering effect hypothesis and of the perceived or actually provided support upon stressful events. The ratio involving other non-family network members has the lowest measurement quality in all methods, especially the event-related method. This category comprises the respondents' weaker ties, which are often probably not called upon for social support upon stressful events. The composition of weaker ties (non-family) should be further explored in more elaborated composition indices, separating at least friends from other ties, as previous research shows that considerable variability across methods for specific roles may be present and hidden under the joint category (non-family) (Hlebec and Kogovšek, 2005, 2011).

In the future, network data quality estimates could be further studied by way of a meta-analysis where the effect of the method on the quality estimates could be controlled for other possible factors (e.g., demographic variables).

Measures of composition have specific properties and have to undergo transformations before fitting them to a statistical model. This article has shown how this can be done in the MTMM case.

Zero components are a serious nuisance for any analysis of compositional data. For this reason, in our analysis we had to use crude amalgamated compositional measures (partner, family and non-family). The number of zeroes can be reduced by increasing the number of provider choices, by increasing the number of support items, by reducing the length of the list or possible roles, by increasing the time span of actual stressful events, or by moving from actual to hypothetical stressful events, with the latter two issues referring only to the event-related method.

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# Appendix

## Appendix 1 – Question wording of the social support network indicators (name generator and role relation methods)

1. There are some tasks in an apartment or a garden that a person cannot do by him/herself. It may happen that you need someone to hold a ladder for you or help you move furniture. Who would you ask for help? (instrumental support)

2. Say you have the flu and have to rest for a few days. You would need help with various household tasks such as shopping and similar. Who would you ask for help? (instrumental support)

3. Now imagine you need to borrow a larger sum of money. Who would you ask for help? (instrumental support) (In 2008, an additional prompt was included – “such as 5 monthly wages”)

4. Say you have problems in your relationship with your husband/wife/partner – problems you cannot solve on your own. Who would you ask for help? Even if you are not married and do not have a partner, try to answer what you would do in such a case. (emotional support)

5. What about the situation where you feel a little down or depressed and would like to talk to someone about it. Who would you ask for help? (emotional support)

6. Say you need advice with regard to an important life decision, for instance getting a job or moving to another place. Who would you ask for help? (informational support)

## Appendix 2 – The name generator measurement instrument

In the case of the name generator approach, a respondent could name as many names of actual persons as he/she wanted (2006), or only two providers of social support (2008). Additional information on the type of the relationship was then collected for each named person, obtained from the questions set out in Appendix 1. In this article we use the type of the relationship as the basis for calculating the network composition. In addition, a number of other variables were measured considering the characteristics of network members. The response categories for the type of relationship were:

| 2006 | 2008 |
|---|---|
| Husband/wife/partner<br>Mother<br>Father<br>Daughter<br>Son<br>Sister<br>Brother<br><br><br>Other relative from my family<br>Other relative from partner's family | Husband/wife/partner<br>Mother<br>Father<br>Daughter<br>Son<br>Sister<br>Brother<br>Grandmother or grandfather<br>Granddaughter or grandson<br>Other relative from my family<br>Other relative from partner's family |
| Good friend | Good friend |
| Neighbor | Neighbor |
| Co-worker | Co-worker |
| Other | Other |

Calculation of network composition indices, for instance the percentage of friends:

2006 – Unlimited number of support providers:

% friends = n friends' names/network size*100.

Any network composition index can be expressed as *x* proportion scores:

x= n friends' names/network size

2008 – Limitation to two providers:

Given the six indicators about social support provision and limitation to two providers, a respondent can list from 0 to 12 persons, which is treated as the network size. Instead of names, only roles (a friend, partner etc.) are considered. Any role for instance, a friend, may also be selected from 0 to 12 times (n). Therefore, the percentage of friends in the network may be estimated as follows:

% friends = n friends/network size*100.

These indicators were estimated for all possible roles (persons), for both providers together.

## Appendix 3 – The simplified role relation measurement instrument[8]

First, we would like to ask you who you would ask for help in some cases when help is usually needed.[9]

A1. Some tasks in an apartment or a garden a person cannot do by him/herself. It may happen that you need someone to hold a ladder for you or help you move furniture.

SHOW CARD WITH

Who would you ask for help first?
Who would you ask for help second?

| | FIRST | SECOND |
|---|---|---|
| Husband/wife/partner | 01 | 01 |
| Mother | 02 | 02 |
| Father | 03 | 03 |
| Daughter | 04 | 04 |
| Son | 05 | 05 |
| Sister | 06 | 06 |
| Brother | 07 | 07 |
| Grandmother/grandfather | 08 | 08 |
| Granddaughter/grandson | 09 | 09 |
| Other kin – my family | 10 | 10 |
| Other kin – partner's family | 11 | 11 |
| Good friend | 12 | 12 |
| Neighbor | 13 | 13 |
| Co-worker | 14 | 14 |
| Someone else (who) ___________ | 15 | 15 |
| No one | 16 | 16 |

Calculation of the network composition:

Given the six indicators about social support provision and limitation to two providers, a respondent can pick from one of 16 response categories from 0 to 12 times. Therefore, the “network size” is fixed to 12 and we consider it as the baseline when estimating the network composition. Any role relation, for instance,

[8] In 2006, the lists of roles were slightly different for each of the six social support network questions. The differences were for various informal and formal providers that were comprised in the category “someone else” in 2008. Further, in 2008, two categories were added, namely the grandparent and grandchildren categories.

[9] (The same six questions as in Appendix 1. Question 1 is shown as an example.)

a friend, may also be selected from 0 to 12 times (n). The percentage of friends in the network may thus be estimated as follows:

% friends = n friends/(12 - number of “no one” choices)*100.

These indicators were estimated for all possible roles (persons), for both providers together, and excluding the category “no one”. If the category “no one” was selected, the fixed network size was reduced by 1 as many times as the category “no one” appeared.

## Appendix 4 – The event-related measurement instrument

Various things happen to us in our lives. Which of the listed **life events** have you personally already experienced in the last three years? For events you have experienced, please indicate **who helped you the most at that time**. (For each event the respondent must choose ONE response)
The list of answer categories is the same as in Appendix 3.

| | Category1 |
|---|---|
| Wedding (emotional, instrumental, informational support) | |
| Difficulties with a boss (emotional support) | |
| Death of a close family member (emotional support) | |
| Change of personal habits (emotional, informational support) | |
| Death of a close friend (emotional support) | |
| Pregnancy (emotional, instrumental, informational support) | |
| Great changes in health/behavior of family members (emotional, informational support) | |
| Great changes in financial state (emotional, instrumental, informational support) | |
| Birth of a new family member (emotional, instrumental, informational support) | |
| Living changes (moving, renovation of a home) (instrumental, informational support) | |
| Great changes in religious activity (emotional, informational support) | |
| Change at the workplace (emotional, informational support) | |
| Great personal injustice or disease (emotional, instrumental, informational support) | |
| Great changes in living conditions (emotional, informational support) | |
| Retirement (emotional, informational support) | |

Calculation of the network composition:
Given the 15 events and limitation to one provider, a respondent can pick from one of 16 response categories from 0 to 15 times. The network size is fixed to 15. The formula for the network composition is the same as the formula set out in Appendix 3.