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## Can You Picture Your Relationships?

Internet-Based Assessment of Ego-centered Social Networks  
and Relationship Perceptions of Closeness and Reciprocity

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## Abstract

The assessment of ego-centered social networks and relationship qualities are known as time consuming and complex procedures. Results on three age-diverse samples (study 1:  $N = 957$ , age diverse internet-based sample; study 2:  $N = 342$ , middle aged community sample; study 3:  $N = 199$ , older parents) illustrated the suitability of a self-administered pc-based assessment of ego-centered network and four easy-to-use pictorial items for relationship evaluations. Results indicated diverse structures of ego-centered social networks across samples, family types and age groups. Pictorial items showed to be reliable and valid items, representing convenient measures of relationship perceptions.

(96 words count)

Key words: ego-centered network, pc-based assessment, relationship quality, graphical items

The assessment of ego-centered social networks incorporates not only structural features, but additionally intends to describe and differentiate personal relationships regarding relationship qualities. However, the elaborate and time-consuming generation of networks often requires researchers to shorten or simplify their measures of perceived relationship evaluations. Empirical projects frequently reduce the number of assessed indicators and utilize – less reliable – one-item measures. Based on the theoretical model of relationship diversity (Neyer, Wrzus, Wagner, & Lang, 2009), we aimed at the development of a self-applicable, parsimonious, and reliable method to assess social networks as well as relationship indicators of emotional closeness and perceived reciprocity. Goal of this technical report is the introduction of our pc-based network generator and the examination of four graphical items in the context of ego-centered networks, their reliability as well as convergent and discriminant validity.

### *Ego-Centered Social Networks*

Relationships picture the interdependence between individuals and their personal circumstances. At a given time each individual maintains a variety of social relationships, i.e. to parents, siblings, co-workers or neighbors. Ego-centered social networks, being constituted out of these social relationships, may be regarded as the mirror of an individual's ability to adapt and regulate one's own goals in the light of changing and demanding social-structural environments (Lang & Heckhausen, 2006; Lang, Wagner & Neyer, 2009). Ego-centered social networks are defined as the whole extent of relationships (alters) of one individual (ego) including kin and non-kin ties alike (Hollstein, 2003; Vermunt & Kalmijn, 2006). It provides researchers with distinguishing information on overall network characteristics as well as features of each single network partner (Antonucci & Akiyama, 1995; Kogovsek & Ferligoj, 2005). The investigation of ego-centered relationship networks considers social relationships as within and between person phenomenon, providing information on intraindividual relationships and interindividual differences in intraindividual relationships (Gable & Reis, 1999). Empirical research suggests consistency and variation in the composition of social networks over time and according to life circumstances as well as beneficial and disadvantageous effects on the individual's development and well-being (Antonucci, Akiyama, & Takahashi, 2004;

Fiori, Smith, & Antonucci, 2006). Assessing social networks thus requires the complex collection of a variety of different relationship partners and categories to obtain the best possible picture of social embeddedness.

Social network assessments are most frequently conducted with quantitative methods (e.g., Kahn & Antonucci, 1980) but also standardized interviews or free recall methods are applied (Wrzus, Köckeritz, Wagner, & Neyer, 2009). However, even methods such as the social convoy questionnaire (Kahn & Antonucci, 1980) are frequently carried out as personal interviews since self-administrations are rather difficult to accomplish. To reduce costs and efforts we aimed at the intervention of an easy-to-apply method to assess ego-centered networks supported by personal computers. Based on the programming languages PHP and HTML, we intended to create a pc-based questionnaire to assess social networks in self-administration (see method section for further details).

### *General Relationship Dimensions*

The integrative self-regulatory model of relationship diversity (Neyer et al., 2009; Lang et al., 2009) proposes two main principles that enable individuals to regulate personal relationships, to distinguish between social network partners, and thus, to adapt to changing environmental contexts. The two proximate processes are closeness regulation and reciprocity monitoring where the first refers to the human striving and maintenance for emotional proximity, and the second addresses the social motivation of equity and cooperation. Both principles are involved in all types of personal relationships but in differential intensity. Based on these theoretical assumptions, our goal was the implementation of reliable, parsimonious, and easy-to-use measures of emotional closeness and perceived reciprocity that differentiate across social network partners, life situations and age groups.

*Emotional Closeness.* “Closeness regulation serves to secure continuity and stability of relationships, even in times of instability.” (Lang et al., 2009, p. 45). Recognizing the importance of this characteristic, emotional closeness has been widely addressed and conceptualizations of reliable and valid measures became increasingly important. In the context of social network analyses a rapid, reliable, and parsimonious measure is necessary to grasp perceived closeness across a variety of affiliations. Having in mind the limitations of widely used verbal closeness measures, Aron and

colleagues (1991) introduced the IOS scale, a simple pictorial item that includes seven images of two differentially overlapping circles. Each of the two circles represents a relationship partner, self and other. The degree of overlap between the circles illustrates the level of perceived interconnectedness between self and other. Therefore, the more overlap between the two circles, the closer one feels to the respective relationship partner. On this 7-point scale, participants are asked to choose the picture that best represents the selected relationship. Several empirical investigations supported the reliability and validity of the measure and pointed out the broad indication of the graphic item. It proved to be widely useful, across different populations and situations. Finally, it showed to perform differently and/or reasonably better in several aspects, compared to the widely used simple verbal item of 'How close one feels to another person' or more elaborate questionnaires (Aron et al., 1001).

To improve the reliability of perceived closeness, we intended to utilize the idea of a parsimonious pictorial measure and supplemented the IOS scale by an additional graphic item. Following the idea that emotional closeness is cognitive equally represented as geographical proximity, we expected people to not only know whether they feel more or less close to a person, but to be able to picture this perception on a given dimension. In the *Graphic Closeness Scale (GCS)* participants were instructed to place a grey bar at that point on the given ray that best indicated the perceived closeness or distance to each relationship partner. The graphic depiction showed a line with two endpoints: 'me' (Ich) and 'stranger' (Fremder). By moving a slidable grey bar, participants were able to illustrate the degree of perceived emotional closeness with regard to each social relationship. In other words, the nearer the bar was moved to the 'me' endpoint the closer the participant perceived the relationship, while nearness to the 'stranger' endpoint indicated a more distant relationship (see Figure 1).

*Perceived Reciprocity.* "Reciprocity monitoring aims at equilibrating and balancing the social differences and inequalities within and across social relationships." (Lang et al., 2009, p. 45). Within each dyadic interaction a minimum of mutuality is necessary for relational satisfaction. Social exchange, and in this context, the formation of a stable dyadic interaction, depends largely upon the principles of cost minimization and reward maximization (Thibaut & Kelley, 1959). However, since both actors of a relational dyad strive for effectiveness and situational control, relationships are

assumed to rely on the obligatory 'norm of reciprocity' (Befu, 1980; Gouldner, 1960, Perugini, Gallucci, Presaghi, & Ercolani, 2003). Our first graphical measure was oriented on a visualization often used in the verbal description of social relationships: the degree of perceived equilibrium. This facet was assessed by the *Graphic Balance Scale* (GBS). The graphic includes seven different images. Each picture shows a scale that depicts the possible facet of perceived balance vs. disbalance in social interactions. Higher investment of one relationship partner, i.e. regarding support, advice, help, etc., results in a scale that is 'tipped' more in his/her direction.

Similar to emotional closeness, we invented a second item to obtain a more reliable indicator of perceived reciprocity. Sahlins (1972) described reciprocity as a relation – action and reaction – between two linked partners, illustrating his work on reciprocal behavior by using two opposite arrows. Utilizing this image, our *Graphic Interdependence Scale* (GIS) demonstrates seven possible variations in perceived reciprocity or mutuality within social relationships. The scale pictures two arrows, pointing in opposite directions onto 'me' (Ich) or 'other' (Anderer). The variation in line style, e.g. dotted vs. dashed, specifies whether the participant or the other person is perceived to do more for the relationship. Thus, the more faded the line becomes the less reciprocal is the relationship. In both pictorial items, the first three graphics illustrate under-benefit, i.e. the participant does more than the relationship partner, the fourth points out mutuality, and picture five to seven demonstrate over-benefit, i.e. the other does more compared to the participant himself. Participants are instructed to think in terms of help, favours, support, advice, etc., before choosing the best fitting picture to indicate perceived reciprocity for each social relationship (Figure 2a and b).

### *Research Questions and Overview of Studies*

Our empirical investigations were lead by two major research questions. First, does the pc-based and self-administered network assessment produce a sufficient and diverse number of social network partners? We expected social networks to mirrors people's diverse relationship structures within and outside the family. The name generator is thus hypothesized to gather social affiliates of one person that refer to a variety of backgrounds, functions, and relationship qualities. Differences in

network structures were anticipated based on current living situations, goals, or individual characteristics.

Second, are the newly invented graphical items easy-to-apply, reliable, and valid indicators of perceived closeness and reciprocity? In this context, we expected the pictorial items to show a differential interplay with the already established IOS scale, illustrated by a high positive association with GCS and low correlations with GBS and GIS. Furthermore, indicators are proposed to be capable to differentiate between relationship types and to grab potential contextual influences on relationship regulation characteristics.

The technical report illustrates results of three different samples collected within an empirical investigation between 2005 and 2009 that was funded by the German Research Community (DFG). To test our new measures extensively we chose three different assessment strategies: age diverse internet-based assessment (study 1), pc-based, self-administered interviews (study 2), and paper-pencil questionnaires (study 2 follow-up, study 3). We included different age groups as well as living situations, and evaluated the stability of relationship qualities across a 1 year period. With respect to the first research question analyses focused on the size and composition of ego-centered social networks assessed in internet-based and pc-based lab study. To approach the second issue statistical investigations distinguished between the single item as well as the level of compounds of perceived closeness and reciprocity, examining associations with relationship and individual characteristics, and finally comparing characteristics of across relationship types.

### **Study 1**

Study 1 was an internet-based study released at the internet platform of the Humboldt University of Berlin ([www.psytest.de](http://www.psytest.de)) and the Institute of Psychogerontology of the University of Erlangen-Nuremberg ([www.gerotest.de](http://www.gerotest.de)). In any case the welcome page provided a brief introduction on the content and approximate duration (about 45 min) of the study. At the end of the session, each participant received a personal feedback. There were no restrictions on the participation.

### *Participants*

The internet-based-sample consisted of 957 people (78% female) with an age range between 18 and 86 years ( $M = 39.4$ ,  $SD = 18.0$ ). About a third of participants was single (34%), half lived in a stable partnership (26%) or was married (24%) and the remaining were divorced (9%) or widowed (7%). The percentage of childlessness was rather high (78%). Furthermore, the sample showed to be highly educated (66% with high-school degree or higher) and about half of them (45%) reported to be full- or part-time employed, with remaining people being students, pensioners, etc. Women were younger,  $t(950) = 3.93$ ,  $p < .001$ , less likely to have a university degree,  $\chi^2(4) = 12.87$ ,  $p < .01$ , more often part-time employed,  $\chi^2(2) = 13.64$ ,  $p < .01$ , and more likely to live in a stable partnership but not in a marriage,  $\chi^2(4) = 18.21$ ,  $p < .01$ .

Analyses differentiated between three age groups: (1) younger than 30 yrs. ( $N = 446$ ), (2) between 30 and 50 yrs. ( $N = 222$ ), and (3) older than 50 yrs. ( $N = 288$ ). Older participants were more likely to be male,  $\chi^2(2) = 11.93$ ,  $p < .01$ , less well educated,  $\chi^2(2) = 11.93$ ,  $p < .01$ , more likely to be not employed<sup>1</sup>,  $\chi^2(4) = 167.39$ ,  $p < .001$ , more likely to be married or single because of divorce and widowhood,  $\chi^2(8) = 510.91$ ,  $p < .001$ , and more likely to have children,  $\chi^2(2) = 125.23$ ,  $p < .001$ .

### *Measures*

The assessment started with a number of questions on demographic characteristics such as sex, age, and education, as well as partnership and parental status.

*Ego-Centered Social Network.* Centerpiece of the study was the assessment of social networks. A single name generator requested to list all social relationships that “you already know for a long time and/or have frequent contact with“ (based on Hinde, 1979). The instruction referred to all different types of social affiliations, not only family members and friends, but also colleagues, neighbors or acquaintances, and explicitly asked for positive as well as negative connoted social relations. To obtain a sufficient size and heterogeneous structure of networks, participants were initially asked “Where did you get to know this person from?” A drop down menu presented a variety of 19 relationship categories that served as cognitive primer (Neyer, 1997). Before picking the next social affiliate, each named network partner is characterized regarding selected demographic and

relationship characteristics such as age, sex, duration of knowing this person (7-point scale from 'less than 1 yr.' to 'since birth'), geographical proximity (6-point scale from 'more than 200km away' to 'in the same household'), or perceived conflict (5-point scale from 'very rarely/never' to 'very often'). Below the input fields an alternating overview table listed all previously named network partners. Thus, at any time participants were able to review the generated social network and to add still missing persons. This assessment procedure enabled participants to generate a list of social network partners by themselves. Networks contained a minimum of 3 and a maximum of 35 relationship partners. Participants completed their social network by pressing the button "No further relationship partner" and continued with evaluations of relationship qualities. Therefore all following pages pictured the entire list of previously generated network partners.

*Perceived Emotional Closeness.* The GCS showed a line with two endpoints: 'me' (Ich) and 'stranger' (Fremder). Participants were asked to *"Imagine, you are at the left end of the line ("I"). The line represents the emotional closeness or distance between you and the other person. If you place the other person at the opposite end, she/he would be very distant to you and you could call her/him a "stranger". Please mark the line for each of your previously named persons to indicate your emotional closeness to this person."* A slidable grey bar was moved into the wanted position to illustrate the degree of perceived emotional closeness with regard to each network member (Range: 0 'not close' to 100 'very close'). In addition, we administered the IOS scale as a second indicator of closeness (Aron et al., 1992). On the 7-point scale participants were asked to choose the picture that best represented each listed relationship. Subsequently, the two items were linear transformed to both range between 0 (not close at all) to 1 (very close). Since the two measures were highly correlated ( $r = .67$ ) they are pooled as one compound of emotional closeness.

*Perceived Reciprocity.* The GBS included seven differently balanced scales. Instructions clarified that *"The figure shows differently tilted balances, which represent the relationship between you and the respective person. The focus is on how much you or the other person 'do' for your relationship. The person who brings more into the relationship outweighs the other person. How balanced or imbalanced do you perceive your relationship with each person? Please think of help, favors, as well as information and mark the picture which represents your relationship best."* Thus,

more investment “weighted” more, tilting the scale in this direction. The GIS illustrates perceived reciprocity by seven depictions of two arrows, pointing in opposite directions onto 'me' (Ich) and 'other' (Anderer). Perceived imbalance was distinguished by the type of line, e.g. dotted vs. dashed line. Instructions indicated that *"Social relationships differ in being one-sided/unidirectional, i.e., one person does more than the other, or interdependent/mutual, i.e., both persons help each other equally. Please opt for the picture that illustrates best how interdependent/mutual your relationship is with each person."*

In both graphics the first three pictures indicated more effort and support considering help, advices, etc. from the participant's side, the fourth one illustrated reciprocity, and the last three pictures pointed out a higher investment of the relationship partner. The two items were substantially correlated ( $r = .65$ ) and, thus, pooled as a reliable indicator of reciprocity ( $\alpha = .79$ ). For this indicator of perceived *absolute reciprocity*, both formerly bipolar reciprocity items were recoded to a 4-point unipolar scale with higher numbers indicating higher levels of reciprocity (Range 0 ‘non-reciprocal’ to 1 ‘reciprocal’) and subsequently they were combined to the single index of reciprocity. To reduce answering patterns within graphical items they appeared in alternating order. Hence, participants first evaluated GCS pertaining to all network partners, followed by GBS, IOS, and finally GIS.

### *Results and Discussion*

*Ego-Centered Social Networks.* The Internet-based sample named 11112 relationship partners with an average of 11.62 ( $SD = 7.18$ ) social affiliations per person. Social networks were highly diverse with respect to named social relationship types. Kin ties, e.g. parents, siblings, close kin, comprised 34% of relationships, elective kin such as partner, step-kin and old friends, constituted 40%, and non-kin ties like acquaintances, colleagues, or neighbors completed the remaining 26%.

Closer considerations indicated no substantial differences in overall network size between young, middle and old adulthood ( $\eta^2 = .002$ ). However, age groups differed substantially in their network compositions. In middle and late adulthood less parents ( $\eta^2 = .52$ ), siblings ( $\eta^2 = .01$ ), and old friends ( $\eta^2 = .05$ ) were part of the network. At the same time, older age groups named more children ( $\eta^2 = .04$ ), close kin ( $\eta^2 = .02$ ), distant kin ( $\eta^2 = .02$ ), in-laws and step-family ( $\eta^2 = .11$ ), as well as

acquaintances ( $\eta^2 = .06$ ). Number of romantic partners ( $\eta^2 = .07$ ) and colleagues ( $\eta^2 = .01$ ) was highest in middle adulthood. Results remained stable even after controlling for effects of gender. Results illustrated that the used name generator not only produced network sizes similar to those achieved with the concentric circles and other generators (Wrzus, Köckeritz, Wagner, Neyer, 2009), but also led to a highly diverse list of social relationship partners across the life span. This supported the suitability of the single generator and emphasized the usability within internet-based studies.

*Graphical Items.* Objectivity of assessment and analysis was assured by (1) a strict process of investigation, (2) comprehensive instructions, (3) minimized interviewer effects, since networks and relationship ratings are conducted internet-based, and (4) no room for subjective interpretation in analyzing graphical items. Being based on two graphical items each, internal consistency was satisfactory in emotional closeness and perceived reciprocity alike (cf. upper part of Table 2). Even relationship specific analyses indicated stable alphas for separate kin, elective kin, and non-kin relationship systems in perceived emotional closeness ( $\alpha$  between .71 and .80) and reciprocity ( $\alpha$  between .72 and .75). Findings confirm a stable internal consistency across indicators and relationship systems.

Addressing convergent and discriminant construct validation a first set of analyses was conducted by utilizing the well-established IOS scale (cf., Aron et al., 1991). A second set of analyses considered additional relationship and individual characteristics. Patterns of intercorrelations between IOS and the new graphical items are displayed in the upper part of Table 2. Results indicated a sufficient validity of the graphical items. IOS proved to distinguish between indicators of closeness ( $r = .63$ ) and reciprocity (GIS:  $r = .12$ , GBS:  $r = .08$ ). Furthermore, the low correlation between indices of reciprocity and closeness ( $r = .12$ ) and differential patterns in associations with assessed relationship characteristics proved the convergent and discriminant validity of the pictorial items (see study 1 in Table 3). For example, genetic relatedness was positively associated with closeness but negatively with perceived reciprocity, thus illustrating previous findings that suggested higher intimacy with kin but also less strong monitoring of mutuality in support (Korchmaros & Kenny, 2006; Neyer & Lang 2003; Neyer et al., 2009; Rook, 1987). A final set of analyses illustrated associations between individual grand-means of closeness and reciprocity with selected demographic

variables (see study 1 in Table 4). Older people reported generally higher emotional closeness to social network partners and less perceived reciprocity. Again, results contribute to previously reported results that indicate social networks of older people as characterized by emotionally close confidants but also higher need for support and more non-reciprocal relationships (Ikkink & van Tilburg, 1998 1999; Lang, 2001; Lang & Carstensen, 1994).

The differential ability of indices was also proved with regard to found variations in relationship qualities among selected relationship types (upper part of Table 6). People felt less close to non-kin compared to kin and even more close to elective kin ( $\eta^2 = .16$ ). However, this main effect of relationship type interacted substantially with age ( $\eta^2 = .02$ ). Results illustrated that in old age relations to biological kin were closer than in young and middle adulthood. A differential ability was equivalently supported with respect to perceived absolute reciprocity ( $\eta^2 = .04$ ), but no interaction with age occurred. In this context biological kin relationships differed substantially from elective and non-kin, indicating less perceived reciprocity in genetic family relations.

In sum, results of this diverse internet-based sample supported both of our research questions. First, the self-applicable, internet-based assessment method produced age-diverse social networks that showed high variability in composition across the life span. Second, findings indicated the suitability, reliability and validity of the newly invented graphical items. Consistency of measures was stable across different relationship systems. Correlations demonstrated a distinctive, clear pattern between IOS and GCS on the one side and GIS and GBS on the other. Correlations with relationship specific characteristics further supported these differential meanings. Both indices closeness and reciprocity were additionally able to differentiate between theoretically defined relationships systems. Goal of the following study 2 was to go further into the question whether the new name generator would be able to assess social networks that differentiate between live conditions in a more age homogeneous sample. Moreover, study 2 included a number of covariates to analyze possible associations with personality characteristics.

## Study 2

Study 2 participants were recruited by advertisements in local newspapers and postings in several public places throughout two big German cities. For each participating couple<sup>2</sup> an individual appointment was scheduled, where participants completed the same personal-computer-assisted questionnaire on social relationships as in study 1 with several additional individual characteristics. Sessions were administered either at the university or at the participants homes, took almost two hours ( $M = 112$  min,  $SD = 32$  min), and each couple received a compensation fee of 30 Euro, approximately \$40 (USD). After the interview, all targets were asked to disclose the name and address of their living old parents, so they could be included in the empirical investigation (study 3 participants). One year after the initial assessment middle aged adults were asked to take part in a follow-up study that was conducted via paper-pencil questionnaires mailed to the home. This questionnaire did not focus on the entire personal network but assessed only specific relationship types.

### *Participants*

Participants of this second sample were 342 middle-aged adults ( $M = 37.7$ ,  $SD = 5.0$ , range 25-54), living in 171 heterosexual couples. The majority of participants was highly educated (15.6 years), working full time (61%), and not religious (66%). The average partnership duration was about ten years ( $M = 10.5$ ,  $SD = 5.5$ ) and more than half of them were married (64%). Participants were differentiated into four family types: (a) motivated childless ( $N = 82$ ), (b) involuntary childless ( $N = 70$ ), (c) patchwork family ( $N = 94$ ), and (d) traditional family ( $N = 96$ ), which did not differ considering core demographic characteristics like age, years of education, occupational status, and religious affiliation. Partnership duration of parents in traditional families was substantially longer compared to other family types (motivated childless:  $M = 9.5$ ,  $SD = 5.6$ ; involuntary childless:  $M = 9.3$ ,  $SD = 5.2$ ; patchwork family:  $M = 7.8$ ,  $SD = 4.0$ ; traditional family:  $M = 14.7$ ,  $SD = 4.3$ ;  $F(3, 338) = 38.30$ ,  $p < .001$ ,  $\eta^2 = 0.25$ ). Upon examination of partnership status, motivated childless couples (44%) and patchwork parents (52%) were less likely to be married, compared to involuntary childless (71%) and traditional (84%) couples ( $\chi^2(3, N = 342) = 36.44$ ,  $p < .001$ ).

To conduct analyses of retest stability in perceived closeness and reciprocity, participants of study 2 were contacted again after one year. In total, 175 individuals (77 couples and 21 individuals; 52% female) were consent to take part in this follow-up (51% of study 2). Participants not participating in the second assessment did not differ from other persons at the first assessment regarding demographic characteristics such as sex, age, education, or marital and parental status. However, those taking part at both assessments reported a higher general closeness perception across personal networks. There were no differences with respect to reciprocity indicators.

### *Measures*

The assessment of personal networks corresponded the one of study 1 with only two minor differences: First, we additionally assessed the degree of friendship (5-point scale from 'not at all' to 'very good' plus the additional option to indicate 'the word friend does not fit for this person') with respect to each single network partner, but second, did not include the information on perceived stability anymore. Relationship qualities were assessed with identical graphical items and instructions as described in study 1 (see Table 2 for descriptives and internal consistencies).

*Covariates.* To validate the measures, this study additionally included a number of scales on personality and individual characteristics that will be described briefly. The assessment of *life satisfaction* is based on two already existing scales: the scale of life evaluation (Ferring, Filipp & Schmidt, 1996, 6 items) and the life satisfaction scale (Diener, Emmons, Larsen & Griffin, 1985, 4 items). A 7-point agreement format rating, ranging from 1 (not at all) to 7 (very much) was utilized. The ten item scale showed a good internal consistency ( $\alpha = .76$ ).

The assessment of *partnership distress* was based on two items of the German version of the partnership measure of Hendrick (1988, German version: Hassebrauck, 1991). The two negative formulated items led to an internal consistency of  $\alpha = .68$ . In addition, *partnership specific attachment* was included (Asendorpf, Banse, Wilpers, & Neyer, 1997). The two subscales dependency (8 items,  $\alpha = .62$ ) and security (6 items,  $\alpha = .72$ ) were rated at a 7-point scale from 1 (applies not at all) to 7 (applies very much).

*Personality* facets were measured by a short version of the Big Five Inventory (Lang, Lüdtke, & Asendorpf, 2001). Core characteristics were captured by three items each, despite the openness subscale, which consisted of four items. Based on a 7-point agreement rating, participants judged the accuracy of each item. Internal consistency varied between .38 - .71. Furthermore, a six item scale assessed general *self-esteem* (Marsh & O'Neil, 1984) on a 7-point agreement format rating, ranging from 1 (not at all) to 7 (very much). The internal consistency of the scale was satisfactory ( $\alpha = .75$ ). In combination with self-esteem, the 5-item *shyness* scale of Asendorpf and Wilpers (1998) was utilized. The same format rating was used and Cronbach's Alpha was .80. Finally, a shortened version of the *familialism* scale of Bardis (1959) was integrated as a measure of general attitudes on the family. Again, the six items were evaluated at a 7-point format to indicate the degree of agreement from 1 (not at all) to 7 (very much). Cronbach's Alpha was .68. Descriptive statistics and Cronbach's Alphas of all covariates are displayed in Table 5.

### *Results and Discussion*

*Ego-Centered Social Networks.* Participants of study 2 listed 4561 relationship partners. Thus, the average of 13.34 ( $SD = 8.24$ ) social affiliations was slightly higher than the one of study 1 ( $d = .22$ ). Again, networks showed a high heterogeneity in composition. With 35% the amount of kin was fairly similar compared to study 1. This was also true pertaining to elective kin that constituted about 37% of personal networks and of non-kin with about 28%. Closer considerations, however, indicated a number of differences between social networks of study 1 and study 2. Due to structures of the sample networks in study 2 consisted, e.g. of substantially more children ( $d = .72$ ) and more romantic partners ( $d = .53$ ), since the study was conducted as a family study with heterosexual couples, but also of less old friends ( $d = .41$ ), since young parents are known for a reduction and/or rearrangement of their social networks, particularly in the first years of parenthood (Schneewind et al., 1996).

Focusing on social network characteristics of different parental situations, family types with children, both patchwork and traditional, reported equal numbers of network members, but differed substantially from motivated childless individuals, who reported least numbers of social affiliations ( $\eta^2 = .05$ ). This difference was not due to listed children, since involuntary childless people did not

differ from any of the family types regarding overall network size. Indeed, differences were traced back to other kin and elective kin relations. Motivated childless individuals least often integrated their own parents ( $\eta^2 = .02$ ), distant kin ( $\eta^2 = .02$ ), and in-law relationships ( $\eta^2 = .04$ ) in their social networks. Furthermore, step-family members were most likely to be listed by Patchwork families ( $\eta^2 = .11$ ). Findings again supported the suitability and usability of the name generator. Beyond the achieved network size and diversity of social affiliations it showed a sufficient sensitivity to differentiate compositions across life and family conditions.

*Graphical Items.* Since the strategy of data assessment was identical to the internet-based study, criteria for objectivity were met alike. Furthermore, all attending research assistants were trained in advance to reduce influences related to possible requests during the interview. Reliability indices showed to be very similar to study 1 and thus, were satisfactory (middle section of Table 2). This was also true regarding relationship system specific Cronbach's Alphas with .74 to .77 for closeness and .76 to .77 for reciprocity measures. A subsample of study 2 additionally provided data on the one year retest-stability. This index is based on five selected relationships: mother, father, partner, colleague and old friend. Coefficients showed to be relatively stable across this period with a coefficient of .74 for emotional closeness and .56 for the compound of perceived reciprocity.

Results on convergent and discriminant validation supported findings of study 1 and highlighted the good statistical qualities of the graphical items (cf., middle section of Table 2; third main row of Table 3). In addition to demographic variables (cf., Table 4) study 2 applied several individual characteristics to include further external validation criteria (cf. Table 5). Results indicated convergent and discriminant correlational patterns alike. Perceived closeness and reciprocity both were related to higher life satisfaction, a finding also suggested by previous research (Antonucci, Fuhrer, & Jackson, 1990). In addition, closeness showed positive associations with self-esteem, whereas absolute reciprocity was negatively associated with partnership distress. Generally, findings regarding level 2 correlations were relatively weak.

The last step of analyses confirmed the differential ability of the quality indices across relationship systems (cf., middle part of Table 6). Perceived emotional closeness ( $\eta^2 = .07$ ) and absolute reciprocity ( $\eta^2 = .07$ ) were able to differentiate biological and elective kin from non-kin in

the context of intimacy and between biological kin on the one side and elective and non-kin on the other regarding perceived mutuality in support and advice.

The social network generator confirmed its suitability as self-applicable assessment method. The family specific differences in network size and compositions ones more confirmed previous results of network sensitivity as a function of individual characteristics (Doherty & Feeney, 2004). Findings pertaining to the graphical items supported prior results of the internet-based study and proved the reliability and validity of the graphical items. Stability indices across one year additionally indicated a moderate to high constancy of perceived closeness and reciprocity across selected relationships, emphasizing the existence of stability and change in relationship perceptions that actually can be assessed by the new graphical items. The application of further individual level characteristics demonstrated the expected convergent and discriminant intercorrelations. For example the positive relationship between average closeness perceptions in social networks and self-esteem supported suggestions of sociometer theory that feelings of social belonging and closeness boost peoples self evaluation (e.g., Leary, 2004; Leary, Tambor, Terdal, & Downs, 1995). Perceived imbalance in social relationships was connected generally with more conflict on the relationship level and specifically with more distress in heterosexual partnerships. Furthermore, perceptions of reciprocity increased general life satisfaction.

In sum, results confirmed the majority of the findings from study 1 and added further facts regarding the sensitivity of the social network generator and correlative patterns with individual characteristics in middle adulthood. Goal of the last study was to complement the knowledge of relationship principles into late adulthood and to regard the applicability of pictorial items in paper-pencil assessments.

### **Study 3**

This study consisted of the old parents of study 2's participants. Paper-pencil questionnaires that were mailed to their home included an information sheet about the study in general and on how we obtained their addresses. It additionally pointed out the names of the participating child and child-

in-law. The paper-pencil questionnaire did not focus on an entire social network but assessed only specific relationship types, similar to the follow-up assessment of study 2.

### *Participants*

The sample included 86 fathers and 113 mothers aged between 50 and 85 years ( $M = 64.4$ ,  $SD = 7.1$ ). The majority of old parents were pensioners (63%) and married (77%), with an average partnership duration of 34 years ( $SD = 15.0$ ). Singles were either divorced (7%) or widowed (14%).

### *Measures*

*Social Relationships.* Old parents were asked to give information about their current romantic partner, their child and child in-law that participated in our study 2, one grand-child, one (former) colleague, and one long-term friend. Instructions pointed out that one should only list currently existing relationship partners. Participants named 948 relationship partner ( $M = 4.76$ ,  $SD = .98$ ). Since only selected relationship types were assessed, no comparison with study 1 and study 2 were possible. The assessment of relationship specific descriptions and qualities was identical to study 1 and 2, but only administered as paper-pencil questionnaire.

*Covariates.* Assessed covariates were similar to study 2, including life satisfaction, partnership distress, attachment, and personality characteristics. The sample was additionally questioned about subjective health. Based on the revised version of the *symptom checklist* (SCL-90-R; Hessel, et al., 2001), the intensity of certain health symptoms (12 items) was evaluated regarding the incidence within the last seven days on a 7-point scale with a range from 1 (not at all) to 7 (very much). Internal consistency was good ( $\alpha = .81$ ).

### *Results and Discussion*

*Graphical Items.* Apart from using the paper-pencil version, the investigation was identical in instructions, utilized pictures, and order of items. Thus objectivity was the same as in previous studies. Reliability was somehow less consistent but still satisfactory in the selected and, thus smaller, social networks of old parents (emotional closeness:  $\alpha$  between .52 and .77; reciprocity:  $\alpha$  between .52

and .78). Patterns of inter-item correlations also remained in the expected direction (cf. lower part of Table 2).

Correlations between relationship quality indicators and relationship (Table 3), demographic (Table 4) characteristics illustrated quite similar patterns compared with study 1 and study 2. Associations with personality facets, however, differed in some ways (Table 5). Dissimilarities are most likely due to differences in age range, sample structure and selected relationships. Despite the differences, correlations generally point in the expected direction. Most notably, relations occurred almost exclusively with perceived closeness, such as with self-esteem or attachment security, but not with perceived reciprocity. Only one – anticipated – substantial association with perceived reciprocity occurred: a negative correlation with subjective health. The more symptoms older adults reported (i.e., lower status of health) the less balanced they perceived their relationships in average. It is generally expected that the relevance of perceived closeness increases throughout the life span (Lang et al., 2009) being also linked to the differential composition of social networks in old age (e.g., Carstensen, Isaacowits, & Charles, 1999; Lang, & Carstensen, 2002). In contrast, feasibility of reciprocity monitoring is anticipated to decrease particularly due to less cognitive capacities and fewer cooperative relationships (Ikkinck & Van Tillburg, 1998, 1999; Labouvie-Vief, 2005; Labouvie-Vief & Medler, 2002). These expectations are widely supported by our data.

Also regarding our final step of analysis, the degree of perceived closeness occurred to be a strong distinctive feature, thus supporting the importance of closeness perceptions in old age. Kin and elective kin relationship partners were described as substantially closer compared to non-kin affiliates ( $\eta^2 = .35$ ). Nevertheless, absolute reciprocity was still able to distinguish kin and non-kin relationships ( $\eta^2 = .02$ ), indicating that perceptions of mutuality in support remain important throughout the life span (c.f., Table 6).

Study 3 complemented the previous picture clearly supporting their applicability in paper-pencil assessments, their differential ability, and their age specific variations particularly regarding closeness perceptions. Furthermore, correlative patterns between compounds of closeness and reciprocity with relationship and individual characteristics emphasized the appropriateness of utilizing graphical items across the entire life span.

## General Discussion

Goal of the current paper was the introduction of two new assessments methods: (1) a self-applicable and pc-based name generator for ego-centered social networks, and (2) three pictorial items to evaluate emotional closeness and perceived reciprocity across social network partners. Based on three different samples – diverse in age range and family situation – and different assessment methods – internet-based, pc-based labor study, paper-pencil questionnaire – we were able to emphasize the robustness in usability, reliability, and validity.

First, study 1 and 2 showed differential structures and compositions of ego-centered social networks, depending on individual and contextual conditions. Second, relationship indicators demonstrated to be reliable and valid measures that were convenient in the assessment and evaluation of personal networks. Compared to the approved IOS scale of Aron and colleagues (1992), the newly invented GCS indicated a high interconnectedness; in contrast, GBS, and GIS pointed out differential relations. Moreover, composed indices of emotional closeness and absolute reciprocity confirmed as valid measures. They enabled the differentiation of relationship types and showed variability in associations with relationship and individual characteristics. The mix of assessment methods supported the general applicability of the network generator and the graphical items, since all produced reliable and valid results. Occurring differences, particularly in correlational patterns, have to be addressed in following studies to reveal possible influences or dependences between methods of data collection and strategies of social network sampling.

Aiming on the implementation of an easy-to-use assessment method to generate ego-centered social networks, the pc-assisted generator enabled participants to create an individual list of social affiliations on their own. Resulting networks were comparable to prior findings (e.g., Fung, Stoeber, Yeung, & Lang, 2008; Neyer & Lang, 2003; Wrzus, et al., 2009). General network size was rather stable across age in the heterogeneous internet-based sample. Despite the nonexistent decline of network size in late adulthood the composition of social networks differed substantially, indicating the expected increase of kin relations in old age. Thus results confirmed the self-applicability of social network generators in the internet across the life span. The middle aged community sample of study 2

illustrated variations in general network size and composition by family situation. Motivated childless people named substantially less social network partners and this was particularly true with respect to kin and elective kin. This pattern, however, was not found for involuntary childless individuals that showed higher similarity with traditional parents. The robust diversity of networks and the sensitivity for certain age groups and environmental circumstances supported the validity of the utilized assessment method.

The newly invented GCS supported our assumptions on people's ability to illustrate emotional closeness in a similar way than geographical proximity. Results were confirmed by patterns of intercorrelations with the approved IOS scale and the stable reliability throughout the three samples. The compound of perceived closeness illustrated a differential ability across social relationship systems and confirmed previous findings with respect to associations between perceived closeness and other relationship characteristics. Additionally, correlations with demographic and individual characteristics such as life satisfaction and self-esteem blend in with previous findings. Findings were generally able to approve the new measure and the formed index of emotional closeness.

To assess the second relational characteristic the two new graphical items GIS and GBS formed a reliable indicator of perceived reciprocity. Particularly across ego-centered networks the two items developed the expected correlational structure and confirmed theoretical expectations in study 1 and study 2. Associations with relationship characteristics and individual traits illustrated the expected patterns. However, some differences across samples and instabilities occurred, particularly with respect to the follow-up study and study 3 that were both characterized by selective networks with low variability in relationship types. Nevertheless, correlational patterns in study 3 go along with expected changes in meaning and/or perception of reciprocity in old age (Lang et al., 2009). Being dependent on the support of other people, for example for reasons of low health, seems to change the observation and regulation of reciprocity. Despite this fact, older people tend to terminate unbalanced relationships except for those with genetic and elective kin (Ikkink & Tilburg, 1998, 1999). Possible reasons such as the existence of a "social support bank" in genetic kin or the relevance of social norms to buffer perceptions of disbalance in late life need further elaboration. These two new

measures may open up a convenient possibility to address reciprocity in studies on social relationships.

Some caveats of the conducted studies have to be mentioned. First of all, longitudinal investigations of the entire social network are necessary to confirm the interpretation of *change sensitivity* of social network measures. Second, certain unregarded life events, such as moving into a new city or retirement, are expected to affect social network structures but require a different type of research studies (cf., Wrzus et al., 2009). Third, investigations should compare the new pictorial items with already existing verbal measures. Aron and colleagues (1991) already tested and acknowledged the IOS scale. Similar studies have to be conducted for GCS, GIS and GBS alike. Fourth, reciprocity measures contain a high amount of *reciprocal* relationships that have to be addressed more closely. Indeed, it is a well known fact that people generally strive for reciprocity within social interactions (Gouldner, 1960; Tilburg, Sonderen, & Ormel, 1991). However, the measure has to become more sensitive regarding the regulatory mechanism behind the resulting perception, e.g. by implementing diary studies.

In sum, the three conducted studies illustrated the method-adequate, age-robust assessment of social networks by a pc-based name generator, the reliability of easy-to-use pictorial items across assessment methods and age groups, and the differential ability of the two relationship dimensions emotional closeness and perceived reciprocity regarding relationship and individual characteristics.

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<sup>1</sup> German law requires people to leave the labor force with 65 years at the latest, thus a high percentage of participants has been in pension at the time of assessment.

<sup>2</sup> Study 2 was initiated as a family study that focused on social relationships in heterosexual couples of different life situations. The aim of the current paper was the validation of assessment methods and thus, dyadic structures were neglected.

Table 1  
Social Network Composition of Study 1 and Study 2 Samples

	Study 1		Study 2		Cohen's <i>d</i>
	(N=957)		(N=342)		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Network size	11.62	7.18	13.34	8.24	.22
Parent	1.13	0.84	1.29	0.76	.20
Sibling	0.90	0.94	0.92	0.90	.02
Child	0.20	0.61	0.88	1.17	.72
Close kin (r=.25)	1.38	1.82	1.08	1.43	.18
Distant kin (r>.0625)	0.30	0.81	0.52	1.04	.24
Partner	0.52	0.53	0.78	0.44	.53
In-law/Step-family	0.74	1.62	1.56	2.09	.44
Colleague	1.27	1.81	2.08	2.47	.37
Acquaintance	1.78	2.69	2.13	2.69	.13
Old friend	3.38	3.47	2.10	2.67	.41

Note. *N* = valid cases, *M* = Mean, *SD* = Standard deviation

Table 2  
Item Characteristics and Internal Consistency of the Two Single Graphic Closeness and Graphic Reciprocity Measures (Relationship Level)

	<i>M</i>	<i>SD</i>	Range Raw	LT	IOS <i>r</i>	GCS <i>r</i>	GIS <i>r</i>	$\alpha$
Study 1 ( <i>N</i> = 11112)								
<i>Closeness</i>								
IOS	0.42	0.30	1-7	0-1				.77
GCS	0.69	0.26	1-100	0-1	.63			
<i>Reciprocity</i>								
GIS	0.77	0.29	1-7	0-1	.12	.12		.74
GBS	0.75	0.29	1-7	0-1	.08	.08	.59	
Study 2 ( <i>N</i> = 4561)								
<i>Closeness</i>								
IOS	0.47	0.31	1-7	0-1				.77
GCS	0.71	0.26	1-100	0-1	.63			
<i>Reciprocity</i>								
GIS	0.80	0.27	1-7	0-1	.14	.14		.77
GBS	0.77	0.28	1-7	0-1	.06	.07	.63	
Follow-up ( <i>N</i> = 514)								
<i>Closeness</i>								
IOS	0.60	0.29	1-7	0-1				.87
GCS	0.74	0.21	1-10.5	0-1	.77			
<i>Reciprocity</i>								
GIS	0.79	0.25	1-7	0-1	.35	.33		.84
GBS	0.77	0.26	1-7	0-1	.31	.25	.73	
Study 3 ( <i>N</i> = 948)								
<i>Closeness</i>								
IOS	0.58	0.32	1-7	0-1				.77
GCS	0.75	0.22	0-10.8	0.01-1	.63			
<i>Reciprocity</i>								
GIS	0.80	0.27	1-7	0-1	.20	.21		.68
GBS	0.80	0.27	1-7	0-1	.18	.13	.52	

*Note.* IOS = Inclusion of the Other in the Self Scale, GCS = Graphical Closeness Scale, GIC = Graphic Interdependence Scale, GBC = Graphic Balance Scale, LT = Linear Transformed, *r* = Pearson correlation,  $\alpha$  = Cronbach's Alpha. All correlations were substantial at  $p < .05$ .

Table 3

Item Characteristics and Inter Correlation of the Aggregated Compounds of Closeness and Reciprocity with Selected Relationship Characteristics (Individual Level)

	Study 1		Study 2				Study 3					
	<i>M</i>	<i>SD</i>	CLO	REC	<i>M</i>	<i>SD</i>	CLO	REC	<i>M</i>	<i>SD</i>	CLO	REC
			<i>r</i>	<i>r</i>			<i>r</i>	<i>r</i>			<i>r</i>	<i>r</i>
Relationship Dimensions												
Compound of Closeness	0.56	0.25			0.61	0.13			0.67	0.15		
Compound of Reciprocity	0.76	0.26	<b>.12</b>		0.77	0.11	-0.00		0.80	0.14	<b>.23</b>	
Relationship Characteristics												
Duration of relationship	4.75	1.79	<b>.12</b>	<b>-.11</b>	4.95	0.71	<b>.16</b>	-.04	5.79	0.40	<b>.17</b>	<b>.16</b>
Geographical Proximity	3.63	1.55	.01	-.01	3.32	0.73	<b>.11</b>	-.06	3.42	0.84	.08	-.12
Contact frequency	2.61	1.43	<b>.33</b>	<b>.06</b>	2.61	0.70	<b>.40</b>	.00	2.80	0.70	<b>.20</b>	.07
Conflict frequency	1.82	1.02	<b>-.07</b>	<b>-.28</b>	1.92	0.51	-.04	<b>-.23</b>	1.73	0.43	<b>-.22</b>	<b>-.18</b>
Perceived Similarity	/				3.14	0.81	<b>.29</b>	.01	3.64	1.14	<b>.33</b>	<b>.23</b>
Genetic Proportionality	0.13	0.20	<b>.12</b>	<b>-.13</b>	0.16	0.09	<b>.27</b>	<b>-.19</b>	0.14	0.04	<b>.22</b>	.14
Perceived Stability	3.98	1.13	<b>.51</b>	<b>.26</b>	/				/			

Note. Bold faced correlations are substantial at  $p < .05$ .

Table 4  
 Compounds of Closeness and Reciprocity correlated with Selected Demographic Characteristics  
 (Individual Level)

	Descriptive Statistics		CLO <sup>1</sup>	REC <sup>1</sup>
	<i>M</i>	<i>SD</i>	<i>r</i>	<i>r</i>
Study 1 ( <i>N</i> = 957)				
Sex (1 = female)	0.22	0.41	.01	-.04
Age	39.41	18.02	<b>.11</b>	<b>-.18</b>
Partnership St. (1 = partnership)	0.50	0.50	.06	.00
Parental St. (1 = parent)	0.21	0.41	.05	<b>-.09</b>
Study 2 ( <i>N</i> = 342)				
Sex (1 = male)	0.50	0.50	.02	-.05
Age	37.72	5.04	-.06	-.07
Marital St. (1 = married)	0.64	0.48	.04	-.08
Parental St. (1 = parent)	0.56	0.50	<b>.11</b>	<b>-.13</b>
Study 3 ( <i>N</i> = 199)				
Sex (1 = male)	0.43	0.50	-.01	.06
Age	64.41	7.13	-.02	.03
Marital St. (1 = partnership)	0.93	0.25	.13	-.03

*Note.* <sup>1</sup>All correlations concerning sex are Spearman-Rhos. Bold faced correlations are substantial at  $p < .05$ .

Table 5  
Compounds of Closeness and Reciprocity correlated with Selected Individual Characteristics  
(Individual Level)

	Descriptive Statistics			CLO	REC
	<i>M</i>	<i>SD</i>	<i>α</i>	<i>r</i>	<i>r</i>
Study 2 ( <i>N</i> = 342)					
Life Satisfaction	5.30	0.89	.76	<b>.14</b>	<b>.19</b>
Self Esteem	5.55	0.97	.75	<b>.13</b>	.08
Shyness	3.16	1.24	.80	-.09	-.07
Partnership Distress	2.36	1.09	.68	-.09	<b>-.16</b>
Attachment Security	6.00	0.94	.72	<b>.18</b>	<b>.18</b>
Attachment Dependency	4.23	0.95	.62	.10	-.03
Familialism	4.53	1.07	.68	<b>.22</b>	-.02
BFI: Neuroticism	4.04	1.34	.64	-.05	-.04
BFI: Extraversion	4.85	1.29	.71	.06	<b>.14</b>
BFI: Openness	5.34	1.06	.68	-.03	.07
BFI: Agreeableness	5.18	0.98	.38	.11	-.08
BFI: Conscientiousness	5.58	1.07	.61	<b>.19</b>	-.01
Study 3 ( <i>N</i> = 199)					
Life Satisfaction	5.27	1.06	.80	.04	-.07
Self Esteem	5.56	1.10	.74	<b>.17</b>	.03
Shyness	3.03	1.39	.80	<b>-.18</b>	.07
Partnership Distress	2.04	0.97	.76	<b>-.25</b>	.02
Attachment Security	5.96	0.97	.65	<b>.20</b>	.07
Attachment Dependency	4.81	1.26	.76	<b>.22</b>	.07
Familialism	5.12	1.10	.66	.06	-.03
BFI: Neuroticism	4.18	1.31	.57	.01	-.14
BFI: Extraversion	4.62	1.26	.60	-.03	-.06
BFI: Openness	4.99	1.09	.67	.07	-.03
BFI: Agreeableness	5.51	1.00	.45	<b>.17</b>	-.08
BFI: Conscientiousness	5.86	0.90	.60	<b>.15</b>	.02
Symptom Checklist	2.10	0.96	.81	-.02	<b>-.15</b>

Note. Bold faced correlations are substantial at  $p < .05$ .

Table 6  
Differences in Emotional Closeness and Perceived Reciprocity in Three Relationship Systems

	Closeness			Reciprocity		
	<i>M</i>	<i>SD</i>	$\eta^2$	<i>M</i>	<i>SD</i>	$\eta^2$
Study 1						
Kin	0.61 <sub>a</sub>	0.20	<b>.16</b>	0.70 <sub>a</sub>	0.19	<b>.04</b>
Elected Kin	0.64 <sub>b</sub>	0.16		0.77 <sub>b</sub>	0.18	
Non-Kin	0.44 <sub>c</sub>	0.19		0.78 <sub>b</sub>	0.20	
Study 2						
Kin	0.66 <sub>a</sub>	0.18	<b>.07</b>	0.72 <sub>a</sub>	0.18	<b>.07</b>
Elected Kin	0.67 <sub>a</sub>	0.16		0.81 <sub>b</sub>	0.15	
Non-Kin	0.50 <sub>b</sub>	0.17		0.83 <sub>b</sub>	0.18	
Study 3						
Kin	0.77 <sub>a</sub>	0.17	<b>.35</b>	0.76 <sub>a</sub>	0.21	<b>.02</b>
Elected Kin	0.72 <sub>a</sub>	0.18		0.83 <sub>b</sub>	0.17	
Non-Kin	0.46 <sub>b</sub>	0.19		0.81 <sub>ab</sub>	0.24	

*Note.*  $\eta^2$  = Partial Eta square. Bold faced Eta squares indicate substantial effects at  $p < .05$ . Analyses have been conducted with aggregated data, i.e., mean-aggregated at the respective relationship level, to avoid an artificial inflation of coefficients.

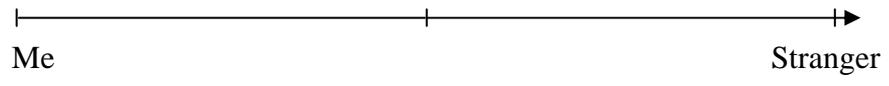
*Figure Captions*

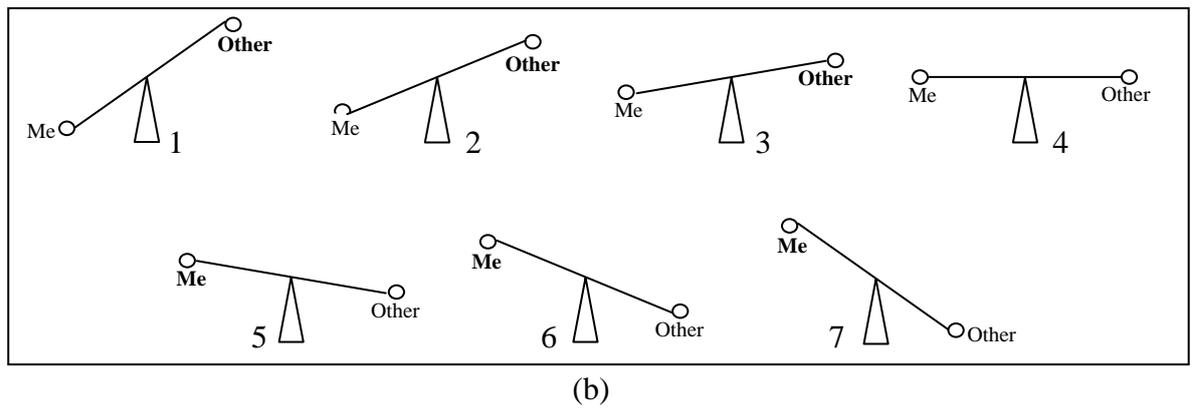
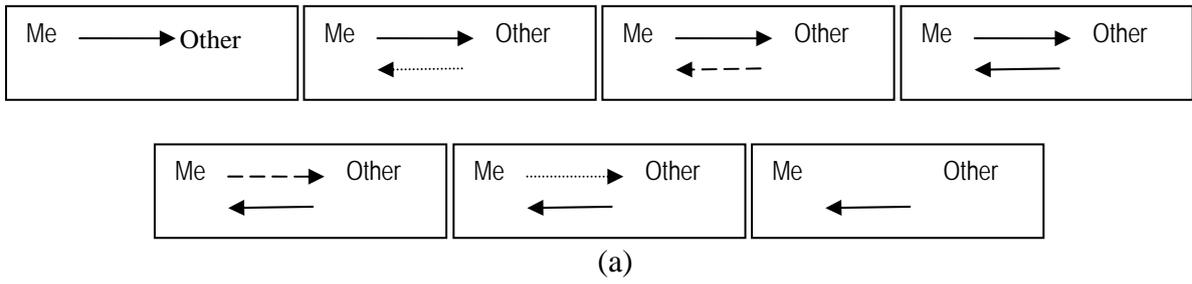
*Figure 1*

The Graphic Closeness Scale (GCS)

*Figure 2*

The (a) Graphic Interdependence Scale (GIS) and the (b) Graphic Balance Scale GBS)







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