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Abstract

Objectives: To compare the accuracy of averaged scores from the original Norbeck Social Support Questionnaire (NSSQ) and averaged scores from each of three new NSSQ versions (NSSQ-R.aid, NSSQ-R.n/a, and NSSQ-R.format). These three new versions of the widely used NSSQ were developed to address three previously identified concerns regarding score accuracy: the Aid subscale's examples of aid, lack of an n/a response option, and the network nomination/rating procedure. Missing data rates were also assessed.

Methods: A convenience sample ($N=223$) completed one of the four NSSQ versions. Score accuracy (restriction) was assessed by size of correlation between averaged scores (averaged score/network size) and network size, with low correlations indicating less score restriction and higher score accuracy. Fisher's r -to- z transformations assessed the significance of the difference between all correlations from the three versions. Missing data rates were assessed using chi-square tests of independence.

Results: The cumulative effects of removing the aid examples and use of the n/a response option improved score accuracy; averaged Aid scores from the NSSQ-R.n/a were statistically significantly less restricted than corresponding scores on the original NSSQ. The final version (NSSQ-R.format) actually resulted in statistically significant decreased score accuracy for averaged Affect scores. There were no statistically significant differences in missing data rates among versions.

Conclusion: Averaged scores from the NSSQ-R.n/a should be used. Future research should focus on the use of situation-specific Aid items.

Keywords

Measurement, Norbeck Social Support Questionnaire, nursing

Date received: 4 September 2019; accepted: 30 January 2020

The Norbeck Social Support Questionnaire (NSSQ)¹ continues to be widely used in nursing and social science research to plan and evaluate interventions to enhance health-related social support networks. This is likely because the NSSQ measures one's network size and structure as well as social support from this network. However, almost since its inception, concerns have been raised regarding two issues: accuracy measuring support from networks of varying sizes^{2–4} and presence of large measurement error in the Aid subscale.⁵

Gigliotti and Samuels⁴ demonstrated that averaging support scores (support score/network size) improved support score accuracy for all subscales, but that the Aid subscale remained problematic. To more fully understand the reasons for this, Gigliotti et al.⁶ conducted cognitive interviews with participants as they completed the NSSQ. These participants voiced three general concerns: (1) they misunderstood the examples in the Aid subscale, (2) the lack of a “not applicable” (n/a) response option forced them to rate all network nominees, and (3) the network nomination and support rating process was not transparent. To investigate the

effects that these three concerns had on score accuracy, we created three new versions that reflect three *incremental* revisions to the original NSSQ. We addressed the first concern (misunderstanding the Aid examples) by removing those examples from the Aid subscale (NSSQ.R-aid). Then, retaining this change, we added an n/a response option (NSSQ.R-n/a). Finally, retaining these two changes, we

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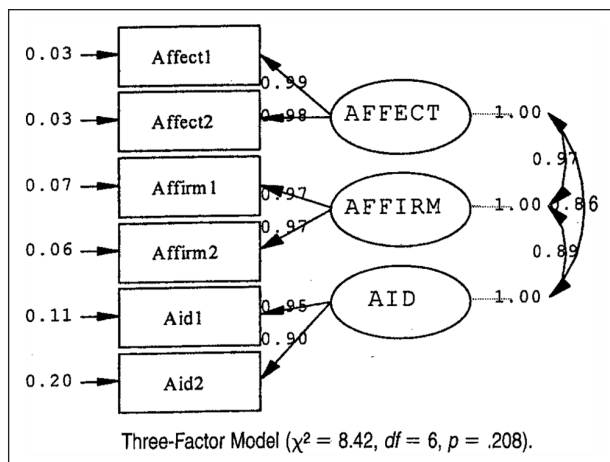
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Table 1. NSSQ original support items and revised aid items.

Designation	Original item	Revised item
Affect 1	How much does this person make you feel liked or loved?	
Affect 2	How much does this person make you feel respected or admired?	
Affirm 1	How much can you confide in this person?	
Affirm 2	How much does this person agree with your actions or thoughts?	
Aid 1	If you needed to borrow \$10, a ride to the doctor, or some other immediate help, how much could this person usually help?	If you needed immediate help, how much could this person help you?
Aid 2	If you were confined to bed for several weeks, how much could this person help you?	If you needed help for several weeks, how much could this person help you?

NSSQ: Norbeck Social Support Questionnaire.

**Figure 1.** Confirmatory factor analysis results.⁵

revised the nomination and rating format (NSSQ-R.format). The purpose of this article is to report the results of these three changes on NSSQ score accuracy.

Background and conceptual framework

The NSSQ¹ is based on Kahn's⁷ conceptualization of three social support functions: Affect, Affirmation, and Aid. Each function is measured by the NSSQ with a two-item subscale (see Table 1). Gigliotti's⁵ psychometric analysis supported its conformation to this intended domain structure (see Figure 1). In addition to measuring these three domains of support, the NSSQ also measures the size of one's network and the types of relationships that comprise it (spouse, family, friends, etc.). Using a two-stage approach, respondents are first asked to list up to 24 network members and identify their relationships to them. After this network nomination stage is completed, respondents are instructed to turn a series of half-pages and rate each network member on each support item in Table 1. Original response categories were: (0) "not at all," (1) "a little," (2) "moderately," (3) "quite a bit," and (4) "a great deal." Ratings for all network members are then summed to produce Affect, Affirmation, and Aid subscale scores.

House et al.² quickly pointed out that, because respondents can nominate from 1 to 24 network members, increased

network size generally results in increased subscale support scores and this confounds support ratings with network size. To remove the influence of network size, many investigators divide summed subscale support scores by network size to produce *averaged* Affect, Affirmation, and Aid scores. Although, as detailed in the following, averaging is not without its own problems,³ Gigliotti and Samuels⁴ demonstrated that averaged scores were more efficient measures of the subscales and this investigation concentrates on how the above-noted concerns raised by cognitive interviewees affect these *averaged* subscale scores.

Respondents' concerns

Aid examples. Results of Gigliotti's⁵ confirmatory factor analysis (CFA) are shown in Figure 1. Standardized residuals, to the far left of the figure, indicate the error or variance in those items not accounted for by the tested theoretical model. With large residuals of .11 and .20, the Aid subscale is most affected by error. A large part of this error may be attributable to the given examples of aid. Notably, Gigliotti et al.⁶ reported that all seven cognitive interviewees focused on the examples of aid (see Table 1). They did not seem to understand that the Aid items were meant to assess any type of immediate or long-term aid and these were examples of such.

Because of this, participants roughly averaged amounts of aid given based on the aid examples. For Aid 1, network members who could provide both money and a ride received higher ratings than those who could provide either money or a ride but not both. Likewise, interviewees interpreted help if "confined to bed for several weeks" (Aid 2) as physical help and, if a network member could not provide physical assistance, ratings were low despite the fact that these network members may be able to provide other means of long-term assistance such as money. We began our revisions by removing the aid examples (NSSQ-R.aid). See revised Aid subscale questions in Table 1.

Response options. All cognitive interviewees were reluctant to rate network nominees lowly for some items. Gigliotti et al.⁶ concluded that this was likely due to a social desirability response option bias. That is, having identified a network

member as being important to them, as per the network nomination instructions, it was difficult to then rate them “a little” or “not at all” without feeling like a “bad” (p. 71) person. A good example of this is a network nominee such as one’s employer or child who would not be expected to be a confidante (Affirm 2) or provide tangible aid. Yet, a rating of “not at all” seemed harsh to interviewees. Therefore, for the second revision, we added a “not applicable” response option (NSSQ-R.n/a). This conforms to the feedback from all of Gigliotti and colleagues’ interviewees who agreed that this would allow them to drop a network member for an item in a socially acceptable way.

Network nomination. Critically, during the NSSQ network nomination process, support items are concealed and—unless a respondent turns the half pages and reads the items and response choices—they do not know that they will subsequently rate each nominee on a series of support items. After network nomination is completed, the respondent is instructed to turn the page and the first two items are revealed. Gigliotti and Samuels⁴ reported the mode network size for their pooled data ($N=611$) was 8 and the majority (61.3%) of respondents nominated 5–12 network members with only 17.7% nominating >15 . The distribution of the pooled data was positively and statistically significantly skewed (Fisher’s skewness = 7.37).

We reasoned that concealment of the support items, and thus the support context, resulted in erroneous nomination of too many network members. This could explain Norbeck et al.’s⁸ test–retest results where respondents nominated fewer network members on the retest ($t=2.26$, $p=.03$; $M=12.57$ vs $M=11.36$). Perhaps, once respondents understood the type of support being rated, they nominated a smaller network of supporters. Gigliotti et al.⁶ reported that none of their seven participants understood why they were nominating network members. After completing the ratings, one said, “If there were not 24 spaces I would have omitted 2, no maybe 3, maybe 4” (p. 70). For the final revision, we changed the format (NSSQ-R.format) so that respondents rate each network nominee on all items before nominating and rating the next supporter (see Figure 2).

Effects on score accuracy

Each of these concerns can reduce score accuracy and their effects likely work in tandem so that individual effects cannot be easily teased out. For example, a participant may list many supporters because he does not know that he will need to rate these supporters. Then, when rating each supporter, he may not want to give a low rating even if the item does not pertain to that supporter and/or he may misunderstand the Aid items. These tandem effects likely result in score restriction and increased participant burden. Then, the effects of score restriction and participant burden likely lower the results of statistical tests. We now detail these effects and present our hypotheses and research question concerning

how the three revisions should improve the accuracy of NSSQ scores.

Score restriction. As noted, *averaged* rather than raw support scores are used to remove the influence of network size. That is, because support ratings from network nominees are summed, larger networks generally result in higher support scores. If high support is a good thing, then participants with smaller, yet highly supportive, networks are at a disadvantage. Although averaging (support score/network size) should remove the influence of network size, because the average (mean) is influenced by each data point and is sensitive to extreme values, averaged scores are subject to score restriction. Score restriction can be tested with a bivariate correlation between the averaged score (support score/network size) and network size. Although a zero correlation is optimal, lower absolute correlations indicate less influence of network size on averaged scores. A negative correlation means that score restriction is present and averaged scores decreased as network size increased.

Effects of aid examples on score restriction. Norbeck³ was first to caution that averaging could result in score restriction. For example, Respondent A nominates seven network members and rates all highly⁴ on a two-item subscale. Respondent B nominates 14 network members and rates 7 highly⁴ but varies the ratings of the other 7. Although both have seven highly supportive network members and B has seven others, B’s averaged subscore (e.g. $91/14=6.5$) will be lower than A’s (e.g. $56/7=8$). Gigliotti and Samuels⁴ found that averaging resulted in some score restriction for all subscale scores. However, only *averaged* Aid subscale scores showed statistically significant score restriction. We hypothesize that the specific examples of aid result in lowered summed Aid ratings (numerators) especially in large networks (denominators) and is one reason that *averaged* Aid scores are restricted. That is, the numerators (support scores) cannot keep pace with the denominators (network size):

Hypothesis 1. Averaged Aid scores from the NSSQ-R.aid will be statistically significantly less correlated with network size than corresponding scores from the NSSQ.

Effects of an n/a option on score restriction. Rarely can all network members give all types of support but, at present, all network nominees must be rated on all items. There is no way to temporarily drop a nominee. Thus, for example, a low rating for one’s young child who would not be expected to provide aid is weighted the same as a low rating for one’s spouse who would be expected to provide aid but did not. In the case of the child’s low rating, the inability to choose to not rate them means that the summed support score is lowered (numerator) but the network size (denominator) remains the same and thus the *averaged* score is falsely lowered. This happens frequently when participants nominate many network members and will result in score restriction, as

People Who Provide Personal Support

PE0. First Name or Initials of Significant Person in Your Life: _____

PE1. Please indicate your relationship with this person (Choose the single best answer):

<input type="radio"/> Spouse or Partner	<input type="radio"/> Work or School Associate	<input type="radio"/> Counselor or Therapist
<input type="radio"/> Family Member or Relative	<input type="radio"/> Neighbor	<input type="radio"/> Minister / Priest / Rabbi
<input type="radio"/> Friend	<input type="radio"/> Health Care Provider	<input type="radio"/> Other (Specify) _____

PE2. Please indicate how much each question applies to this person.

	Not Applicable	Not at all	A little	Moderately	Quite a Bit	A Great Deal
PE2.1 How much does this person make you feel liked or loved?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PE2.2 How much does this person make you feel respected or admired?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PE2.3 How much can you confide in this person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PE2.4 How much does this person agree with or support your actions or thoughts?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PE2.5 If you needed immediate help, how much could this person usually help?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PE2.6 If you needed help for several weeks, how much could this person help you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>PE2.7 How long have you known this person?</p> <table style="width: 100%; border: 1px solid black; text-align: center;"> <tr> <td style="padding: 2px;">Less than 6 months</td> <td style="padding: 2px;">6 to 12 months</td> <td style="padding: 2px;">1 to 2 years</td> <td style="padding: 2px;">2 to 5 years</td> <td style="padding: 2px;">More than 5 years</td> </tr> </table> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p>	Less than 6 months	6 to 12 months	1 to 2 years	2 to 5 years	More than 5 years	<p>PE2.8 How frequently do you usually have contact with this person?</p> <table style="width: 100%; border: 1px solid black; text-align: center;"> <tr> <td style="padding: 2px;">Once a year or less</td> <td style="padding: 2px;">A few times a year</td> <td style="padding: 2px;">Monthly</td> <td style="padding: 2px;">Weekly</td> <td style="padding: 2px;">Daily</td> </tr> </table> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p>	Once a year or less	A few times a year	Monthly	Weekly	Daily
Less than 6 months	6 to 12 months	1 to 2 years	2 to 5 years	More than 5 years							
Once a year or less	A few times a year	Monthly	Weekly	Daily							

PF0. First Name or Initials of Significant Person in Your Life: _____

PF1. Please indicate your relationship with this person (Choose the single best answer):

<input type="radio"/> Spouse or Partner	<input type="radio"/> Work or School Associate	<input type="radio"/> Counselor or Therapist
<input type="radio"/> Family Member or Relative	<input type="radio"/> Neighbor	<input type="radio"/> Minister / Priest / Rabbi
<input type="radio"/> Friend	<input type="radio"/> Health Care Provider	<input type="radio"/> Other (Specify) _____

PF2. Please indicate how much each question applies to this person.

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PF2.1 How much does this person make you feel liked or loved?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PF2.2 How much does this person make you feel respected or admired?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PF2.3 How much can you confide in this person?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PF2.4 How much does this person agree with or support your actions or thoughts?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PF2.5 If you needed immediate help, how much could this person usually help?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PF2.6 If you needed help for several weeks, how much could this person help you?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Once a year or less	A few times a year	Monthly	Weekly	Daily							

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To add more people, continue on the next page. To go to the next section, go to the last page. 6

Figure 2. Revised format (NSSQ-R.format).

in Norbeck's³ example above. As noted previously though, score restriction is most problematic in the Aid subscale. Inclusion of the n/a option should decrease network size for each respective item:

Hypothesis 2A. Averaged Aid scores from the NSSQ-R.n/a will be statistically significantly less correlated with

network size than corresponding scores from the NSSQ-R. aid and original NSSQ.

Hypothesis 2B. We expect that adding an n/a option will have the greatest effect on averaged Aid subscores; nonetheless, this n/a option may also affect averaged Affect and Affirmation scores. Therefore, we will also investigate whether averaged Affect and Affirmation scores

from the NSSQ-R.n/a are statistically significantly less correlated with network size than corresponding scores from the NSSQ-R.aid and original NSSQ.

Effects of network nomination on score restriction. Gigliotti et al.⁶ concluded that the current network nomination process causes respondents to nominate network members that they would not have nominated if they had known the types of support to be rated, or indeed that support was to be rated at all. Although the n/a option, if present, can be used to temporarily drop these network members, it is also likely that some inaccurately low or high ratings will still be given; this would also likely result in score restriction. The more transparent network nomination process of the changed format (NSSQ-R.format) should result in more accurate network nomination and decrease score restriction beyond the effects of the NSSQ-R.n/a:

Hypothesis 3. Averaged Affect, Affirmation, and Aid scores from the NSSQ-R.format will be statistically significantly less correlated with network size than corresponding scores from the NSSQ-R.n/a.

Participant burden. In previous works,^{9–11} many respondents completed the network nomination phase but did not complete the subsequent support ratings phase. Gigliotti et al.⁶ reported that their participants were surprised to learn that they had to rate each network nominee and one participant said they felt “duped” (p. 70). We hypothesized that participant burden is greatest when large networks are erroneously nominated and that this results in missing data. This also prompted the changed format (see Figure 2) so that each network member is rated before nominating the next member. In a small pilot study ($N=43$), we found a statistically significant between-format difference ($\chi^2=9.24$, degrees of freedom (df)=1, $p=.002$) in missing data rates. Of the 20 pilot study participants returning the original NSSQ, 7 had missing data on one or more support items, and 3 of these 7 nominated network members but did not rate them. There were no missing data points on surveys returned by participants using the NSSQ-R.format:

Hypothesis 4. Respondents completing the NSSQ-R.format will have statistically significantly less missing subscale data than those completing the NSSQ, NSSQ-R.aid, or NSSQ-R.n/a.

Method

Measures

NSSQ. Information about what is measured by the NSSQ¹ and its format has already been provided. Psychometric work includes reports of concurrent^{1,8,12} and predictive validity,⁸ internal consistency and stability over time,⁸ test–retest reliability,^{8,12} and absence of social desirability bias.¹ In

addition, Gigliotti⁵ conducted a CFA establishing construct validity and Gigliotti and Samuels⁴ demonstrated that *averaged* scores provided more accurate measures of Affect, Affirmation, and Aid than did raw scores.

NSSQ-R.aid. This version follows the same format as the original NSSQ but the two Aid items are revised to remove examples (see Table 1).

NSSQ-R.n/a. This version retains the changes to NSSQ-R.aid and adds the (n/a) response. This results in six response options: “n/a,” “not at all,” “a little,” “moderately,” “quite a bit,” and “a great deal.” To calculate each participant’s averaged scores on this version, scores for each item are summed and then divided by network number minus the number rated as n/a. Item scores are then combined to form averaged dimension (Affect, etc.) scores. For example, Affect 1 scores of 4, 3, 2, 1, and n/a, and Affect 2 scores of 3, 2, 1, 1, and 0 are scored as Affect 1: $10/4=2.5$ and Affect 2: $7/5=1.4$. The total *averaged* Affect score is $2.5 + 1.4=3.9$.

NSSQ-R.format. The above changes to Aid questions and the addition of the n/a response option were retained in this version. The procedure for network nomination and recording subsequent support ratings was changed (see Figure 2). Specifically, each network member is nominated and rated on all items before nominating and rating the next network member; 24 opportunities to nominate a supporter were given as in all other versions.

Demographic data. The following seven demographic data were collected for each participant: gender, age, marital status, education, employment, total family income, and ethnic/racial background.

Sample

This was a convenience sample of community-dwelling adults ≥ 18 years of age. We strove to sample well the participants’ characteristics predicted to affect the factors of interest; therefore, we recruited participants at various family life stages (i.e. non-parents, parents, and grandparents) to increase the variabilities in both network size and composition. We invited participation from graduate, undergraduate, and continuing education students, faculty and staff at a large public university in the northeast United States. In addition, the investigators and the research assistants (RAs) working on this project recruited acquaintances to participate. Surveys were distributed to 560 people.

Data collection

After human subjects’ approval was obtained from the authors’ university, participation was invited in classrooms, meetings, and in varied community settings. All survey

packets consisted of pencil-and-paper surveys arranged in the following order: cover sheet, introduction letter, demographic data sheet, and one of the four versions of the NSSQ. No permutations of measurement order were done due to the need for the fixed layout of the scannable version (NSSQ-R.format). Survey packet cover sheets were marked to denote version and packets were alternately stacked (NSSQ, NSSQ-R.aid, NSSQ-R.n/a, and NSSQ-R.format) to be distributed sequentially. Surveys were completed anonymously at a time convenient to the participant and returned in a pre-paid envelope to the principal investigator. Participation was regarded as tacit consent.

For classroom distribution, one of the investigators introduced the study, invited participation, and instructed students to take a survey packet if they wished to participate. All were asked to take the packet that was next on top because they were in version order. The investigator and instructor then left the room. Distribution to staff and faculty generally occurred in a group setting, such as a meeting or a shared office space, and the same procedure was followed as above. When data were not collected in a group setting, the study was explained to potential participants and they were invited to participate. In these instances, anonymity of data was stressed and the version next in the distribution sequence was given to them.

Data management

Number of each survey version distributed and returned was tracked carefully. NSSQ subscale data from versions using the original format (NSSQ, NSSQ-R.aid, NSSQ-R.n/a) were recorded on the NSSQ worksheet³ and Affect, Affirmation, and Aid variables were calculated. Data from the NSSQ, NSSQ-R.aid, and NSSQ-R.n/a were then entered into SPSS version 23,¹³ and *averaged* Affect, *averaged* Affirmation, and *averaged* Aid scores were calculated. For *averaged* NSSQ-R.n/a scores, denominators were appropriately reduced as previously described if network nominees were designated as n/a. Data from the NSSQ-R.format were scanned into EXCEL using REMARK OMR software¹⁴ and converted to an SPSS file. SPSS syntax was developed to form Affect, Affirmation, and Aid variables and their averaged counterparts.

Data analysis

Although all were directional hypotheses, we used more conservative two-tailed significance tests for all but the z tests comparing correlational differences of *averaged* scores with network size. With regard to the z tests, given their expected directional nature and the focus of this article, one-tailed tests were used for these. Alpha was set at .05 and power at .80. Kolmogorov–Smirnov tests of normality were performed on all NSSQ variables. *Averaged* support scores were formed by dividing summed Affect, Affirmation, and

Aid ratings by network size. For NSSQ-R.n/a and NSSQ-R.format, if a participant used the n/a option, the network size was reduced accordingly for each item. Tests of equality among NSSQ versions were performed on categorical demographic variables using chi-square tests of independence. Tests of equality among NSSQ versions for network size were tested using analysis of variance (ANOVA). For *averaged* support scores, multivariate analysis of variance (MANOVA) was used to test for among-NSSQ version differences in consideration of the high correlations among Affect, Affirmation, and Aid.

For hypotheses 1–3, Pearson r correlations between *averaged* scores and network size were first done. Then, because we are comparing correlations from independent samples, Fisher's r -to- z transformations were used to test the statistical significance of the difference between two correlation coefficients, using software available at <http://vassarstats.net/rsig.html>.¹⁵ Absolute correlations (no signs) were used for all z tests because hypotheses concerned the correlations' magnitudes. For hypothesis 4, chi-square tests of independence were used to investigate among version differences in missing data rates.

Results

Response

A total of 227 people returned the surveys for an overall 40.5% response rate. Of these 227, 4 did not complete any NSSQ subscales. These four cases were eliminated from the analyses except for the missing data analysis. Concerning NSSQ variables on the remaining 223 surveys, the Affect and Affirmation subscales fared well: two participants missed only Affect, two participants missed only Affirm, and one participant missed both Affect and Affirm. The Aid subscale presented more problems: nine participants missed the Aid subscale and, of these, three missed both the Aid and Affirmation subscales.

No NSSQ subscale had >5% missing data, and respondents with partial missing data were excluded analysis by analysis to preserve variance. Finally, regarding demographic data, four participants did not provide any demographics, two participants missed gender, two participants missed employment status, six participants missed income, and one participant missed ethnicity. There were no patterns to these missing demographic data and demographics were not integral to hypotheses; thus, these respondents were included in all analyses.

Sample characteristics

As shown in Table 2, participants were largely female (90.8%), approximately half (48.9%) were aged 29 years or younger, half (51.4%) were single, and 60.7% were White. As expected, given the sampling frame, most were well

Table 2. Chi-square tests of between-version demographic differences.

Variable	Distribution	Test of between-version differences
Gender (N=217)		$\chi^2 = .828, p = .84$
Female	197 (90.8%)	
Male	20 (9.2%)	
Age (N=216), years		$\chi^2 = .126, p = .39$
18–29	107 (48.9%)	
30–44	54 (24.7%)	
45–54	27 (12.3%)	
55–64	26 (11.9%)	
65 and older	2 (2.3%)	
Marital status (N=218)		$\chi^2 = .1233, p = .42$
Single	112 (51.4%)	
Married/partnered	92 (42.2%)	
Separated	5 (2.3%)	
Divorced	7 (3.2%)	
Widowed	2 (.9%)	
Education (N=219)		$\chi^2 = 12.60, p = .63$
<High school diploma	2 (.9%)	
High school or GED	25 (11.4%)	
Some college	41 (18.7%)	
Associates degree	48 (21.9%)	
Bachelors degree	59 (26.9%)	
Graduate degree	44 (20.1%)	
Employment (N=217)		$\chi^2 = 21.12, p = .04^a$
40h per week	59 (27.2%)	
1–39h per week	116 (53.5%)	
Not employed	39 (18%)	
Retired	2 (.9%)	
Disabled	1 (.5%)	
Income (N=213)		$\chi^2 = .1967, p = .35$
<20,000	18 (8.5%)	
20,000–34,999	24 (11.3%)	
35,000–49,999	22 (10.3%)	
50,000–74,999	31 (14.6%)	
75,000–99,999	32 (15%)	
100,000–149,000	47 (22.1%)	
150,000	39 (18.3%)	
Ethnicity (N=218)		$\chi^2 = .1079, p = .90$
Hispanic	19 (8.7%)	
Asian	29 (13.3%)	
Pacific Islander	2 (.9%)	
Black	19 (8.7%)	
White	132 (60.6%)	
Multi-ethnic	10 (4.6%)	
Choose not to respond	7 (3.2%)	

GED: General Education Development.

^aMost working part time than full time.

educated and somewhat affluent with 68.9% having at least an associate degree and 40.4% reporting a family income US\$>100,000; 19.4% reported that they were not working. There was only one statistically significant between-version difference on sample demographics. Employment status dif-

Table 3. Between-version differences in study variables.

	Mean (SD) (n)	F (df)	Sig.
<i>Averaged Affect</i> ^a			
NSSQ	6.93 (1.04) (55)	21.06 (3, 206)	<.0001
NSSQ-R.aid	6.73 (1.22) (51)		
NSSQ-R.n/a	6.86 (1.15) (61)		
NSSQ-R.format ^b	8.76 (2.32) (53)		
<i>Averaged Affirmation</i> ^a			
NSSQ	6.38 (1.14) (56)	1.22 (3, 206)	.304
NSSQ-R.aid	6.27 (1.12) (48)		
NSSQ-R.n/a	6.42 (1.13) (61)		
NSSQ-R.format	6.02 (1.26) (53)		
<i>Averaged Aid</i> ^a			
NSSQ	6.16 (1.27) (56)	.163	.921
NSSQ-R.aid	6.02 (1.49) (49)		
NSSQ-R.n/a	6.06 (1.48) (57)		
NSSQ-R.format	6.19 (1.49) (53)		
<i>Network number</i>			
NSSQ	9.23 (4.61) (56)	3.76	.012
NSSQ-R.aid	7.50 (4.72) (51)		
NSSQ-R.n/a	8.05 (4.20) (61)		
NSSQ-R.format ^c	6.42 (4.40) (53)		

SD: standard deviation; df: degrees of freedom; NSSQ: Norbeck Social Support Questionnaire.

^aMultivariate Test Wilks' Lambda: $F(9, 496) = 11.68, p < .0001$.^bPost hoc differences: NSSQ-R.format and all other versions $p < .0001$.^cPost hoc differences: NSSQ-R.format and NSSQ $p = .006$.

ferred slightly with the differences being between those working greater than and less than 40 h per week.

Data characteristics

Kolmogorov–Smirnov (K–S) tests of normality showed that *averaged* Affirmation and *averaged* Aid scores were normally distributed in all four versions' samples. However, *averaged* Affect was statistically significantly non-normal in all but the NSSQ-R.format. Subsequent Fisher's tests revealed both positive skew (7.33) and kurtosis (2.99) for this Affect data. Due to the mild skew and kurtosis, and because transformation would impede comparison with the other subscales, no data transformations were performed. There were statistically significant between-version differences in both network number and *averaged* Affect scores (see Table 3). NSSQ-R.format respondents nominated 2.81 fewer network members ($p = .006$) than original NSSQ participants. Also, NSSQ-R.format respondents reported more *averaged* Affect than respondents completing all other versions.

Tests of hypotheses

Results of Pearson r correlations of network size with the *averaged* support subscale scores from the four NSSQ versions are shown in Table 4. Table 5 shows the z test results of statistical significance of the differences between these correlations.

Table 4. Correlations between averaged support scores and network size.

Version subscales	Network number	Sig.
NSSQ		
Averaged Affect (n=55)	-.183	.18
Averaged Affirmation (n=56)	-.087	.52
Averaged Aid (n=56)	-.334	.01
NSSQ-R.aid		
Averaged Affect (n=51)	.175	.22
Averaged Affirmation (n=48)	.068	.65
Averaged Aid (n=49)	-.270	.06
NSSQ-R.n/a		
Averaged Affect (n=61)	.018	.89
Averaged Affirmation (n=61)	-.124	.34
Averaged Aid (n=57)	-.016	.90
NSSQ-R.format		
Averaged Affect (n=53)	-.629	<.0001
Averaged Affirmation (n=53)	-.191	.17
Averaged Aid (n=53)	-.253	.07

NSSQ: Norbeck Social Support Questionnaire.

Hypothesis 1. Removing the aid examples did decrease *averaged Aid's* score restriction (NSSQ-R.aid ($r = -.270, p = .06$)) from its former level (original NSSQ ($r = -.334, p = .01$)). However, this decrease in correlation was not statistically significant ($z = .34, p = .74$).

Hypothesis 2A. It was expected that the next incremental revision (NSSQ-R.n/a) would further ameliorate core restriction for *averaged Aid* scores. This was expected due to the NSSQ-R.n/a respondent's ability to temporarily drop a network member and decrease the denominator when appropriate. In fact, for *averaged Aid*, the "n/a" option did result in an additional attenuation of score restriction ($r = -.016, p = .90$) when compared with *averaged Aid* scores' correlation with network size ($r = -.270, p = .06$) from the first revision (NSSQ-R.aid) but again this correlational decrease was not statistically significantly different ($z = 1.29, p = .10$). However, when comparing *averaged Aid's* performance on the NSSQ-R.n/a with the original NSSQ, the cumulative effect of both the removal of the aid examples and addition of the "n/a" option made the attenuation in score restriction even

Table 5. z tests for significance of the difference between the correlation coefficients: each version's NSSQ variable and network size.

	NSSQ averaged Affect	NSSQ-R.aid averaged Affect	NSSQ-R.n/a averaged Affect	NSSQ-R.format averaged Affect
NSSQ averaged Affect	x	z = .04 p = .48	z = .84 p = .20	z = -2.79* p = .0025
NSSQ-R.aid averaged Affect		x	z = .76 p = .23	z = -2.71* p = .0035
NSSQ-R.n/a averaged Affect			x	z = -3.74* p = .0001
NSSQ-R.format averaged Affect				x
	NSSQ averaged Affirm	NSSQ-R.aid averaged Affirm	NSSQ-R.n/a averaged Affirm	NSSQ-R.format averaged Affirm
NSSQ averaged Affirm	x	z = .09 p = .47	z = -.21 p = .42	z = -.53 p = .30
NSSQ-R.aid averaged Affirm		x	z = -.30 p = .38	z = .60 p = .28
NSSQ-R.n/a averaged Affirm			x	z = -.33 p = .37
NSSQ-R.format averaged Affirm				x
	NSSQ averaged Aid	NSSQ-R.aid averaged Aid	NSSQ-R.n/a averaged Aid	NSSQ-R.format averaged Aid
NSSQ averaged Aid	x	z = .34 p = .74	z = 1.71* p = .04	z = -.45 p = .33
NSSQ-R.aid averaged Aid		x	z = 1.29 p = .10	z = .09 p = .46
NSSQ-R.n/a averaged Aid			x	z = -1.25 p = .11
NSSQ-R.format averaged Aid				x

NSSQ: Norbeck Social Support Questionnaire.

*particular z scores were statistically significant < .05.

more pronounced ($r = -.334, p = .01$ to $r = -.016, p = .90$) and is indeed a statistically significant correlational decrease ($z = 1.71, p = .04$).

Hypothesis 2B. Regarding *averaged* Affect and Affirmation scores, the influence of network size on *averaged* Affect scores showed some score restriction ($r = -.183, p = .18$) on the original NSSQ but this turned to a positive correlation of roughly the same magnitude ($r = .175, p = .22$) on the NSSQ-R.aid. Remarkably, almost no score restriction or inflation was present for *averaged* Affect scores on the NSSQ-R.n/a ($r = .018, p = .89$). Again though, these correlational differences were not statistically significant (see Table 5). Finally, for *averaged* Affirmation, correlations of *averaged* Affirmation with network size among all three versions were also equivocal (see Table 5). Specifically, the original NSSQ *averaged* Affirmation scores showed slight score restriction ($r = -.087, p = .52$) and then slight score inflation ($r = .068, p = .65$) on the NSSQ-R.aid and finally slight score restriction again on the NSSQ-R.n/a ($r = -.124, p = .34$).

Hypothesis 3. The revised network nomination process of the NSSQ-R.format coupled with the previous revisions, removing Aid examples and adding the “n/a” option, was expected to reduce score restriction over and above improvements expected from NSSQ-R.n/a. Remarkably, all three *averaged* scores from the NSSQ-R.format showed notably greater score restriction than corresponding NSSQ-R.n/a scores (see Table 4). Score restriction of *averaged* Aid was worse ($r = -.253, p = .07$) compared with the NSSQ-R.n/a ($r = -.014, p = .92$) as was score restriction of *averaged* Affirmation ($r = -.191, p = .17$) compared with the NSSQ-R.n/a ($r = -.128, p = .32$). However, these correlational differences were again not statistically significant (*averaged* Affirmation ($z = -.33, p = .37$) and *averaged* Aid ($z = -1.25, p = .11$)). The most surprising comparison was *averaged* Affect scores from the NSSQ-R.format with very high score restriction ($r = -.629, p < .0001$) in contrast with corresponding scores from the NSSQ-R.n/a ($r = .021, p = .88$). This correlational difference was statistically significant ($z = -3.74, p = .0001$).

Hypothesis 4. It was expected that the more transparent network nomination process used in the revised format (NSSQ-R.format; version 4) would result in less missing data. This hypothesis was also not supported. Although the NSSQ-R.format had no missing data and the other three versions had some missing data, the differences between versions were not statistically significant for total missing data ($\chi^2 = 15.07, df = 9, p = .089$). This same pattern occurred in each subscale: Affect ($\chi^2 = 3.81, df = 3, p = .282$), Affirmation ($\chi^2 = 6.08, df = 3, p = .108$), and Aid ($\chi^2 = 5.24, df = 3, p = .155$).

Additional analyses

Given these results, we concentrated further analyses on the NSSQ-R.n/a. Importantly, only 9 of the 57 NSSQ-R.n/a

respondents (15.7%) used the “n/a” option: 5 of these 9 only used the “n/a” option for the aid items, 1 respondent used “n/a” for both Aid and Affirmation items, 2 respondents used “n/a” for Affect only, and 1 used “n/a” for Affirmation only. We calculated the achieved effect size of z tests comparing the original NSSQ and NSSQ-R.n/a and found $q = .206$ (small) for *averaged* Affect correlational differences; $q = .041$ (none) for *averaged* Affirmation correlational differences; and $q = .333$ (small to moderate) for *averaged* Aid correlational differences. Post hoc power analyses, using G3Power¹⁶ for these three correlational differences with expected alpha at .05, and sample sizes of 54 (NSSQ), and 57 (NSSQ-R.n/a) were .28 for *averaged* Affect, .07 for *averaged* Affirm, and .52 for *averaged* Aid scores.

Discussion

We begin our discussion with the original NSSQ. This study’s results concerning score restriction for the original NSSQ *averaged* subscale scores are quite similar to the results from all three samples reported by Gigliotti and Samuels.⁴ In this study, as well as in the three former samples, the original NSSQ shows low and non-statistically significant negative correlations of *averaged* Affect and Affirmation scores with network size. As well, for the original NSSQ, all four samples showed larger and statistically significant negative correlations between *averaged* Aid scores and network size.

We turn our attention now to our first revision (NSSQ-R.aid) and its effect on *averaged* Aid scores. Removal of the examples of tangible aid did result in slight reduction in *averaged* Aid score restriction, although the NSSQ-R.aid’s correlation between *averaged* Aid and network size was not statistically significantly different from the corresponding correlations from the original NSSQ. The addition of the “n/a” option on the third revision (NSSQ-R.n/a) also appears to incrementally improve score accuracy over the NSSQ-R.aid for *averaged* Aid scores but again this was not a statistically significant improvement. Although this change was not statistically significant, when comparing correlations of *averaged* Aid scores and network size from the original NSSQ with these same scores from the NSSQ-R.n/a, we can see the cumulative effects of the two revisions. NSSQ-R.n/a *averaged* Aid correlations with network size showed a statistically significant decrease in score restriction when compared with corresponding correlations on the original NSSQ.

Regarding *averaged* Affect and Affirmation, NSSQ-R.n/a *averaged* Affect scores also appear to show improved accuracy from both the original NSSQ and NSSQ-R.aid, although these improvements were not statistically significant. *Averaged* Affirmation’s results were essentially the same among versions. It is likely that, because *averaged* Affect and Affirmation were very slightly affected by score restriction from the start, they did not have much room for improvement. In contrast, *averaged* Aid has consistently shown moderate score restriction and could stand to benefit most from the revisions.

As noted, on the NSSQ-R.n/a, the “n/a” option was used nine times: six times for the Aid subscale, two times for Affect, and one time for Affirmation. Moreover, if a participant used the “n/a” option, multiple network members were rated n/a. In the Aid subscale, one participant rated 12 network members “n/a” and another rated seven members n/a. For the NSSQ-R.n/a version, score restriction is very low for all three averaged subscores.

What then happened to the NSSQ-R.format? We expected this final version to improve upon results from the NSSQ-R.n/a because it incorporated the two former revisions and added a more transparent network nomination process. Instead, there was no improvement. Score restriction for the NSSQ-R.format’s *averaged* Affirmation items was comparable with that of the NSSQ-R.n/a and score restriction for *averaged* Aid and *averaged* Affect was far higher than on the NSSQ-R.n/a. In addition, the NSSQ-R.format’s *averaged* Aid score restriction was comparable with the first revision (NSSQ-R.aid), despite the presence of the “n/a” option which the NSSQ-R.aid version lacked.

However, the truly remarkable result was not just the presence but the actual magnitude of *averaged* Affect’s score restriction on the NSSQ-R.format. In Gigliotti and Samuels⁴ work and on all other versions in this study, score restriction—when present for *averaged* Affect—is fairly low and is highly reflective of the influence of respondents who nominate large networks. This is not the case with the NSSQ-R.format’s *averaged* Affect scores. Notably, score restriction did not occur only when network size was high but rather occurred at all network sizes. We therefore suspect that Affect ratings just could not keep pace with network number whether they listed 4 or 14 supporters. This is even more interesting because the MANOVA results (see Table 3) show that *averaged* Affect scores from NSSQ-R.format respondents were statistically significantly higher than *averaged* Affect scores from all other versions.

Trying to understand this, we considered that, unlike the respondents who completed the other three versions, NSSQ-R.format respondents nominated and rated the first network member on all support items before nominating and rating subsequent network members. Thus, they knew the types of support they were being asked to rate and likely nominated accordingly. For example, a respondent may not have nominated some family members at all if they had not already seen the questions about immediate and long-term aid. However, they *had* read the questions already when rating the first nominee and, realizing that these family members could provide aid, they nominated them. Because they likely could not be rated n/a for Affect, because the n/a connotation is that affection is not expected, they received moderate (2 or 3) but not high (4) ratings. This occurred with many respondents. Thus, while we expected that the new format would provide transparency, we did not consider that the entire rating procedure would be different once a respondent had nominated and rated one network member on all

questions. This likely influenced all subsequent nominations and ratings. Moreover, the changed format did not make a statistically significant improvement in missing data rates.

It is worth noting here that the respondents’ demographic characteristics were equal across the NSSQ response formats and that we attempted to recruit participants so that their demographic characteristics resembled those factors of the general population that might affect response ratings (viz., generational stage—parent, grandparent, etc.—and network size/composition). However, we did not attempt to control other demographic characteristics such as gender and educational attainment; the sample was more female and educated than the general public. Although it is unlikely that educational attainment—equal across groups—would affect understanding the NSSQ’s instructions, we can be less sure whether the response tendencies we found here would differ among a more heavily male group of respondents.

Limitations

We identify four primary limitations to this study. First, respondents only completed one version of the NSSQ and thus we do not know how the same respondent’s scores would be influenced by each change. However, this was necessary because, as demonstrated by Norbeck et al.’s⁸ test-retest results, knowledge of the nomination and rating process influences subsequent network nomination. Thus, it was important that respondents were naïve to the procedure and this was also apparent on our final version (NSSQ-R.format) where respondents nominated and rated one member before continuing the nomination/rating process.

The second limitation was the small subsample sizes. Given the small effect sizes for the z tests of correlational differences, post hoc power analyses show that the sample sizes should have been in the 140–150 range instead of the existing 46–57 range. Although we did consider increasing sample sizes, we could not ethically justify this. That is, with a 40.7% response rate and four versions, this would have meant distributing surveys to 1120 (1680 total) more potential participants. In addition, after reviewing our data collection experiences, we also recognized that our low response rate was likely because improved score accuracy holds little social meaning for most participants. Thus, any specified indirect benefit to these participants would be exaggerated.

The third limitation is that, to the best of our knowledge, none of our respondents were in need of intensive aid (e.g. were infirmed). In any event, to increase response rates and a balanced design, we did not ask about what types of assistance they currently or previously had. We did find a slight difference in the employment status of some participants, but this was not related to any other patterns in the data, including response to aid items. We nonetheless cannot discern if and how respondents who have experienced various levels of need for aid would differ from those who consider aid as an abstract hypothetical.

The fourth and final primary limitation is that, with the exception of the NSSQ-R.aid, the other versions incorporated previous revisions. Thus, we do not know how score accuracy would have been affected if the “n/a” option was the only change and aid examples left in or if the format changed but the aid examples and original response options were left intact. The decision to investigate incremental differences in score accuracy was based on the knowledge of previous work and the hypothesized tandem effects previously noted. We had also expected the aforementioned small sample sizes and more versions would have precluded this investigation altogether.

Conclusion and recommendations

We recommend use of the NSSQ-R.n/a. With Norbeck’s permission, the NSSQ and all psychometric work can be found at <http://eileengigliotti.com/>.¹⁷ The NSSQ-R.n/a along with the revised scoring sheet and the SPSS syntax for “n/a” score conversion can also be found on that site. We also recommend that future researchers follow Norbeck’s³ suggestions regarding exploration of use of situation-specific questions, especially for the aid items. Gigliotti¹⁸ provides psychometric evidence that situation-specific NSSQ items are valid and reliable and offers guidance regarding their use. This avenue holds promise for additionally improved score accuracy.

Implications for research

The NSSQ-R.n/a produced the most accurate scores. Removal of the Aid examples is warranted not only by results of this study but also because their removal makes these items usable in multiple contexts. As Gigliotti and Samuels⁴ note, without examples, participants are free to interpret short- and long-term aid as they see fit and as is relevant for the particular research context or measured population. Without specific examples, a young parent may interpret aid as childcare while an older person may think of assistance with shopping. Also, this version’s addition of the “n/a” option provides a socially acceptable means to “drop” a network member when that network member cannot or would not be expected to provide that type of support. Examples could be aid from one’s child or affection from one’s employer. Our sample was predominately female as well, so further research could consider, for example, whether aid examples are interpreted differently by one’s gender, lifestyle, and so on.

Finally, the NSSQ-R.n/a uses the original format where the participant lists their network supporters before turning the pages and rating these supporters and this was found to be superior to the revised format’s (NSSQ-R.format) nomination process, shown in Figure 2. This study’s results show that the revised format’s nomination/rating method highly influences the nomination process. Specifically, it appears that after participants read the support items, some participants

chose to nominate only those supporters who could provide all three types of support. Importantly, this does not reflect reality. We all have supporters who may be able to give only one or two types of support. Making provision of all three types of support a criterion for nomination, as some seemed to do, resulted in severe score restriction for *averaged* Affect items. Although use of the original nominating format may result in some missing data because participants did not know the extent of their involvement, this study’s results did not show a statistically significant difference in missing data rates among versions.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

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Informed consent

Informed consent was not sought for this study because of sensitive nature of questions regarding social support. Participants were informed verbally and in the introduction letter that participation was regarded as tacit consent. Institutional review board (IRB) approval was given for collection of anonymous data.

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