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# Validation of a brief form of the Perceived Neighborhood Social Cohesion questionnaire<sup>1</sup>

## Abstract

The aim of this study was the validation of a brief form of the Perceived Neighborhood Social Cohesion questionnaire using data from 5,065 men from the 'C-SURF' cohort study.

A 9-item scale covering 3 factors was proposed. Excellent indices of internal consistency were measured ( $\alpha=.93$ ). The confirmatory factor analyses resulted in acceptable fit indices supporting measurement invariance across French and German forms. Significant correlations were found between P-NSC-BF and satisfaction and self-reported health, providing evidences of the concurrent validity of the scale. P-NSC-BF scores and depression and suicide attempts were negatively associated, sustaining the protective effect of perceived social cohesion.

## Keywords

Depression, reported health issues, perceived neighborhood social cohesion, suicide attempt, Switzerland

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## **Introduction**

During the last few decades, the perception of social resources has become an important field of research in mental health sciences. On one hand, a formidable corpus of research provided evidences that perceived social support is protective against physical health issues (Abbott & Freeth, 2008; Gilbert, Quinn, Goodman, Butler, & Wallace, 2013; Robinette, Charles, Mogle, & Almeida, 2013) and mental health issues, especially depression (Fone et al., 2014; He, Zhou, Zhao, Zhang, & Guan, 2014; Liu, Gou, & Zuo, 2014; Murayama et al., 2015; Weber, Puskar, & Ren, 2010; Zhang & Jin, 2014); on the other hand, numbers of studies have underlined the relevance of social cohesion within neighborhoods (De Silva, Huttly, Harpham, & Kenward, 2007; De Silva, McKenzie, Harpham, & Huttly, 2005; Stafford, De Silva, Stansfeld, & Marmot, 2008).

Indeed, neighborhood social cohesion, which mainly consists of trust, attachment, safety and reciprocity within a given community (Berkman, 2000; Sampson, Raudenbush, & Earls, 1997), has been related to various mental health issues, including alcohol, cigarette or marijuana use (Lin, Witten, Casswell, & You, 2012; Lindstrom, 2003, 2004, 2005; Sampson, Morenoff, & Gannon-Rowley, 2002), or depression and depressive disorders (Fone et al., 2014; Fujiwara & Kawachi, 2008; Mair, Diez Roux, & Galea, 2008; Mair, Diez Roux, & Morenoff, 2010), or even the prevalence of suicide attempts (Fitzpatrick, Irwin, Lagory, & Ritchey, 2007), which are two outcomes analyzed in the present study.

Perceived measurement of social resources is of great interest for cross-cultural research in order to collect comparable data among several countries. Nevertheless, as recently stated by Dupuis, Studer and colleagues (2016), instruments measuring perceived social cohesion that are both valid and available in various languages are still scarce, which represents a major

issue for international research on the topic that require common measurements among every linguistic sample. In order to deal with this issue, Dupuis, Studer and colleagues (2016) proposed a new instrument, the Perceived Neighborhood Social Cohesion questionnaire (P-NSC), a questionnaire measuring 3 dimensions from another instrument developed and validated in English (Stafford et al., 2003), and highlighted evidences of its validity in French and in German. Nonetheless, there is a permanent need for shorter instruments in health or social surveys with multiple topics, and questions have already been raised about the length of the P-NSC.

The aim of this study was thus the development of a brief 9-item form of the P-NSC (P-NSC-BF) and its validation in French and German using data from the same validation study.

## **Methods**

### *Study design*

This scale validation is based on data from the Swiss national cohort study on substance use risk factors (C-SURF). C-SURF's sample consists of men aged around 21.3 years old who were enrolled from 3 of Switzerland's 6 federal military recruitment centers; thereby, the sampling covers both French-speaking and German-speaking areas. In Switzerland, military conscription is mandatory, and each adult male Swiss citizen must spend 3 days at a recruitment center for an evaluation of his physical and psychological capacities for either military or civic service. Although participants were enrolled in these military centers, the cohort study is completely independent of the military and questionnaires were distributed to participants' private addresses. There was a follow-up of participants independently of whether they carried out military service, a civic service or no service at all. This study is

based on data collected during the follow-up. The research protocol was approved by the Human Research Ethics Committee of Lausanne University Hospital (Protocol No. 15/07).

### *Participants*

The cohort consists of 5,990 young men who participated to the baseline survey. Of them, 5,223 subjects participated to the follow-up, and 5,065 provided valid answers to the questionnaires. Follow-up data are used because participants were asked to complete the P-NSC at follow-up only. The remaining 158 participants were listwise deleted due to missing values throughout the questionnaire.

Table 1 summarizes the final sample's characteristics. Additional information about sampling and non-respondents was reported by Studer et al. (2013) and information about the loss-to-follow-up was reported by Dupuis, Baggio et al. (2014).

### *Measurements*

#### Perceived Neighborhood Social Cohesion questionnaire

The Perceived Neighborhood Social Cohesion questionnaire (P-NSC) was developed by Dupuis, Studer and colleagues (2016) in order to assess one's perception of neighborhood social resources. It is based on 3 of the 4 self-rated factors of a 8-factor instrument measuring both perceived and structural aspects of social capital developed and validated in English by Stafford and colleagues (Stafford et al., 2004; Stafford et al., 2003). The P-NSC consists of only 3 subscales of the original instrument (i.e. the 5 other subscales were not included), but it did not result from an item reduction; indeed, each item from the 3 factors of interest were retained in order to provide an instrument specifically thought for self-assessed measurement of social cohesion within neighborhoods. Those 3 dimensions are trust (e.g. trust in people, including members of the neighborhood who are not personally known), attachment to

neighborhood (e.g. feeling part of the community), tolerance and respect (e.g. reciprocal tolerance among the community). Answers are expressed in a 7-point Likert scale.

#### Perceived social support

Seven other variables were taken into account in order to estimate concurrent validity. As stated in the validation of the complete version of the P-NSC, 2 subscales of the Multidimensional Scale of Perceived Social Support (Canty-Mitchell & Zimet, 2000; Zimet, Powell, Farley, Werkman, & Berkoff, 1990) were used in order to measure perceived support from friends and significant others (i.e. intimate partner). Both subscales are based on 4 items going from 1 to 7.

#### Satisfaction with life and work

Two instruments were used in order to assess satisfaction with life and work: the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985) was used to measure general satisfaction on the basis of 5 items on a 7-point scale. In addition, the 3,366 participants who were currently working were also asked to complete the Generic Job Satisfaction Scale (Macdonald & MacIntyre, 1997), which consists of 6 items on a 5-point Likert scale.

#### Physical and mental health, depression and the 12-month prevalence of suicide attempts

Physical and mental health was assessed using the Short-Form Health Survey SF-12 (Ware, Kosinski, Bayliss, et al., 1995; Ware, Kosinski, & Keller, 1995), which consists of 2 items on 3-point scale and 10 items on a 5-point Likert scale. In addition, depression was assessed using ICD-10 criteria for major depression on a 6-point scale (Ware, Kosinski, Bayliss, et al., 1995; Ware, Kosinski, & Keller, 1995). Finally, the participants had to report whether they had tried to commit suicide during the previous 12 months.

#### *Demographic covariates*

Three socio-demographic variables were taken into account in order to control for confounders. First, participants' mailing addresses were used to estimate hometown urbanity using the following cut-off; hometowns with less than 10,000 inhabitants were considered as rural, while hometowns with more than 10,000 inhabitants were considered as urban. Second, participants' age was also taken into account. Third, since most of participants were still in professional training, their parents' level of income was used as a proxy for socioeconomic status.

### *Statistical analyses*

As the very first step of the validation, a reliability analysis was performed in order to keep only 3 items per factor, namely the ones that insured the highest values in internal consistency for each subscale, and for the whole test. Cronbach's  $\alpha$  was used to measure internal consistency (Cronbach, 1951). A coefficient  $\alpha$  greater than .70 suggest that a scale is reliable enough (Bland & Altman, 1997; Tavakol & Dennick, 2011); Tavakol and Dennick (2011) consider that coefficients greater than .90 indicate redundancy in a scale, while Bland and Altman (1997) consider values around .95 as desirable.

Confirmatory factor analyses were performed in order to test whether the same 3-factor structure as the complete version of the P-NSC had a sufficient goodness-of fit; given the fact that each factor is related to 3 items (i.e. the minimal number of indicators per factor in order to model cross-loadings or higher-order factors), it was also assumed that the factors were related to a higher-order factor (as illustrated in figure 1, below). According to Rhemtulla et al. (2012), Likert-type scales with 5 points or more can be considered as continuous, and Maximum Likelihood estimation is preferable when the sample consists of 100 participants or more. The estimation method used thus was the Maximum Likelihood estimation. Different

indices were used to estimate the adequacy of the model. In conformity with the validation of the complete version of the P-NSC (Dupuis, Studer, et al., 2016), since  $\chi^2$ -based affected by large sample sizes (Barrett, 2007), such indices were not taken into account. The Comparative Fit Index (CFI) and the Tucker-Lewis non-normed fit Index (TLI) were used instead. CFI and TLI values greater than .95 are generally considered to sustain the goodness-of-fit of the factor structure (Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) represents how closely the model fits the data. RMSEA values below .10 are acceptable, yet values below .07 are preferable (Steiger, 2007).

Measurement invariance was tested across the French and the German versions of the scale. Testing measurement invariance consists of comparing goodness-of-fit in successive models with constrained values in both linguistic versions. Vandenberg and Lance (2000) recommended that testing measurement invariance should rely on 8 different steps: the first and preliminary step of the analyses is to test whether the covariance matrices are comparable (step 1: covariance matrix equivalence). The next four steps cover measurement invariance. A same factor model is used across both groups, but values are not assumed to be equal in each one (step 2: configural invariance). Then, factor loadings are assumed to be equal across both groups (step 3: metric invariance). The next step consists of constraining intercepts to be equal across both groups (step 4: scalar invariance). Finally, measurement invariance can be assumed when residuals are equal across both groups (step 5: invariant uniqueness). The last three steps cover structural invariance, that is to say, invariant factor variances (step 6), invariant factor covariances (step 7), and equal factor means across both groups (step 8).

As a preliminary step of the analyses, Box's M test was performed to test homogeneity between each covariance matrix. As stated by Nimon (2012), Box's M test is too sensitive,



thus homogeneity in covariance matrices should be assumed as long as  $p$  is above .001. Then, the same model is used, but values are not assumed to be equal in both versions of the scale (model 1: configural invariance); second, factor loadings are constrained to be equal among in both versions (model 2: metric invariance); third, a model with equal factor loadings and equal intercepts is tested (model 3: scalar invariance); fourth, factor loadings, intercepts and means are constrained to be equal (model 4: latent mean invariance); last, a final model with constrained equal loadings, intercepts, residuals and factor means was tested (model 5: strict invariance). This last model is a straightforward way to test structural invariance including Vandenberg & Lance's steps 6 to 8.

Measurement invariance can be assumed when no significant difference between successive tests is found. Yet, inference tests in CFA are based on the  $\chi^2$ , which was inappropriate given the large sample. Instead, the criterion proposed by Cheung and Rensvold (2002) was used; namely, even if significant differences in  $\chi^2$  are found, differences in CFI lower than .01 between models suggest that difference of fit can be considered as negligible.

To assess concurrent validity, partial correlations between P-NSC-BF scores and the other scales were then calculated; age, community size and language were used as control variables. The correlations measured were also compared to those measured between the complete version of the questionnaire and the other variables of interest. Finally, the correlations between both brief and complete forms of the scale and subscales were calculated. Since the scales were assumed to measure the same constructs, correlations higher than .900 were expected.

All analyses except the confirmatory factor analyses were performed using SPSS 21 software. The confirmatory factor analyses were performed with R packages, namely ‘lavaan’ (Rosseel, 2012) and ‘semTools’.

## **Results**

### *Sample characteristics*

The sample consisted of 2,745 French-speaking participants and 2,320 subjects from German-speaking areas who were  $21.3 \pm 1.2$  years old when assessed for C-SURFs’ follow-up. Regarding hometown urbanity, 3,097 were from rural places and 1,968 were from urban places. Regarding socioeconomic status, a majority of participants reported that their parents’ incomes were either ‘about the same’ (40.8%) or ‘better off’ (33.0%) than other Swiss families’ incomes ( $4.4 \pm 1.0$ ). The characteristics of the sample are detailed in Table 1.

*[Insert Table 1 about here]*

### *Factor structure*

The reliability analysis highlighted that the following items had to be conserved in order to minimize losses in reliability: item 1 (Most people in this area can be trusted), item 3 (People in this area will take advantage of you), item 4 (If you were in trouble, there are lot of people who would help you), item 8 (Most people in this area are friendly), item 9 (People in this area have lots of community spirit), item 10 (People in this area do things to help the community), item 12 (People in this area treat each other with respect), item 13 (People in this area are tolerant of others who are not like them) and item 14 (In this area the are people who belong and some who don’t). Cronbach’s  $\alpha$  for the overall scale was .93, which indicated an excellent internal consistency. The internal consistency was .79 for factor 1 (item 1, item 3 and item 4), .87 for factor 2 (items 8 to 10), and was .87 for factor 3 (items 12 to 14).

Resulting from confirmatory factor analyses on the same 3-factor model as the complete scale, the CFI was .928, indicating an acceptable fit, and the TLI was .892 and the RMSEA was .137, which was mediocre. The factor structure is detailed in Figure 1.

*[Insert Figure 1 about here]*

Concerning measurement invariance, Box's M test resulted in significant differences in covariances between matrices ( $M= 341,794$ ,  $F_{[45,80447757]}=7.581$ ,  $p<.001$ ), suggesting that they could not be considered as equivalent. Nonetheless, the  $\Delta$ CFI between successive models (i.e. configural invariance, metric invariance, scalar invariance, latent mean invariance and strict invariance) were lower than .01, which indicated that there was no relevant difference of fit between both linguistic samples (Table 3). Regarding strict invariance, a CFI of .913, a TLI of .915 and a RMSEA of .121 were measured, sustaining both goodness-of-fit and measurement invariance of the factor structure.

*[Insert Table 2 about here]*

#### *Concurrent validity*

Correlations from .140 to .270 were measured between P-NSC-BF scores and the other scales. Regarding social support, a correlation of .204 was measured for support from friends, while correlations of around .145 were measured between P-NSC-BF scores and support from significant others (Table 3). Such values were consistent with the former validation study. Concerning satisfaction, correlations of around .270 were measured between P-NSC-BF scores and satisfaction with life, except with factor 2 ( $r = .217$ ,  $p < .01$ ). The associations with satisfaction with work were lower but still significant ( $r = .171$ ,  $p < .01$ ). Correlations of around .220 were measured between P-NSC-BF factors and the SF-12. Finally, correlations of around  $-.200$  were measured between P-NSC-BF factors and depression, while lower

associations were found between P-NSC-BF and episodes of suicide attempt during the previous 12 months ( $r = -.097$ ). Comparable correlations were obtained between the same factors with the complete form of the inventory using all items. In particular, a correlation of .275 was measured for satisfaction with life, a correlation of .177 was measured for satisfaction with work, while a correlation of .246 was found for health quality (SF-12). A correlation of -.228 was measured between the P-NSC complete form and depression, while a point-biserial correlation of -.100 was found between the scale and suicide attempts during the previous 12 months. Finally, the correlations between both brief and complete forms of the scales were of .940 for factor 1 (Trust), of .977 for factor 2 (Attachment) and of .962 for factor 3 (Tolerance). The correlation between both total scores was of .982.

*[Insert Table 3 about here]*

## **Discussion**

The results of this study were supportive of the validity of the P-NSC-BF. Indeed, the reliability analysis confirmed that little loss in reliability resulted from reducing the number of items. The measures of internal consistency were very satisfactory, with a Cronbach's  $\alpha$  of .93 for the whole scale. The confirmatory factor analyses resulted in mediocre but acceptable fit indices. Moreover, Box's M test highlighted differences between the two linguistic groups observed. However, as stated by Hopkins and Clay (1963), Box's M test is sensitive to unequal variances between groups. These differences might thus be attributable to the difference in sample size causing differences in variances. Nevertheless, the successive models performed to test measurement invariance resulted in negligible differences in fit indices, which sustained the factor structure of the complete version of the scale, and even provided evidences supporting structural invariance across both linguistic subsamples.

Partial correlations of around .20 were found with regard to perceived support, satisfaction and health-related status, which can be considered as small but relevant effects sizes according to Cohen (1992), sustaining thereby the concurrent validity of the scale. Such results were similar to those obtained with the complete version of the scale, which supports the validity of the brief form. Furthermore, these results sustain the association between perceived neighborhood social cohesion and wellbeing, suggesting protecting effects against health outcomes. Finally, correlations about .950 were measured between both brief and complete forms of the questionnaire, which indicated that the brief form is clearly measuring the same dimensions with little loss of information due to item reduction.

As stated by Sampson (2003), consideration of social environmental resources promises a deeper understanding of health issues, and some initiatives must be encouraged, especially prevention strategies that are based on research on collective resources. The current findings encourage thereby the development of both longitudinal research and preventive interventions focusing on perceived neighborhood cohesion.

### **Limitations**

First, C-SURFs' sample only consists of men, which makes the analyses gender-blind. Yet, gender is known to moderate some association between social cohesion and health issues (Stafford, Cummins, Macintyre, Ellaway, & Marmot, 2005). Then, the sample consists of young adults, which is not representative of the entire Swiss population. Finally, military conscription is compulsory for Swiss citizens only; further studies are thus recommended in order to investigate potential difference in the foreign population living in Switzerland.

### **Conclusion**

The current study has pointed evidences of the validity of the new brief form of P-NSC. As stated, the P-NSC was the very first scale of that kind validated in French and in German; moreover, the long 8-dimension instrument that was used to create the P-NSC-BF was validated in English. The P-NSC-BF might be thus an instrument of great interest for international research projects.

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### **Note**

1. Both French and German versions of the P-NSC-BF can be downloaded on C-SURF's website (<http://www.c-surf.ch>).

### **Conflict of interest**

None.

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**Table 1: Sample characteristics (N = 5,065)**

	N	(%)	Mean $\pm$ SD (min, max)
Age			21.3 $\pm$ 1.2 (18.9, 29.6)
Financial situation of the parents			4.4 $\pm$ 1.0 (1, 7)
<b>Hometown urbanity by language</b>			
Rural + French	1,446	(28.5)	
Urban + French	1,299	(25.6)	
Rural + German	1,651	(32.6)	
Urban + German	669	(13.2)	
<b>Perceived social support</b>			
Support from friends			23.6 $\pm$ 4.8 (4, 28)
Support from significant other			23.7 $\pm$ 5.6 (4, 28)
Satisfaction with life			26.8 $\pm$ 5.6 (5, 35)
Satisfaction with work			23.0 $\pm$ 3.7 (6, 30)
Physical and mental health			47.2 $\pm$ 5.3 (12, 56)
Depression			8.47 $\pm$ 7.9 (0, 60)
Suicide attempt during the previous 12 months	64	(1.3)	

**Table 2: Summary of measurement invariance tests**

Measurement invariance tests	CFI	TLI	RMSEA
Model 1: configural invariance	.928	.892	.137
Model 2: metric invariance	.927	.906	.127
Model 3: scalar invariance	.917	.902	.130
Model 4: latent mean invariance	.914	.912	.124
Model 5: strict invariance	.913	.915	.121

\* p<0.05; \*\* p<0.01

**Table 3: Concurrent validity**

Correlate <sup>a</sup>	N <sup>b</sup>	P-NSC-BF	Trust	Attachment	Tolerance
Support from friends	5,065	.204**	.200**	.175**	.200**
Support from significant other	5,065	.145**	.137**	.134**	.137**
Satisfaction with life	5,065	.270**	.273**	.217**	.273**
Satisfaction with work	3,366	.171**	.157**	.164**	.157**
Physical and mental health	5,065	.226**	.225**	.187**	.225**
Depression	5,065	-.208**	-.202**	-.183**	-.202**
Suicide attempt during the past 12 months <sup>c</sup>	5,065	-.097**	-.103**	-.066**	-.103**

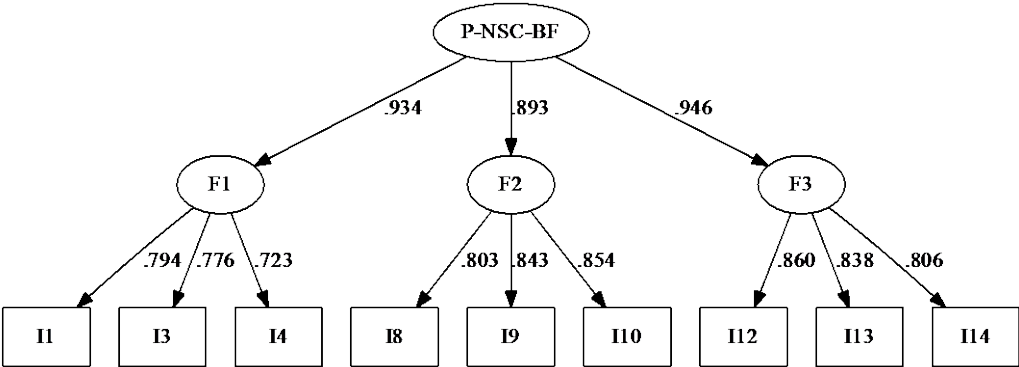
<sup>a</sup> Control variables: town/village density, age, and language

<sup>b</sup> Differences in sample sizes are due to exposure

<sup>c</sup> Point-biserial correlation

\* p<0.05; \*\* p<0.01

**Figure 1: Factor structure with standardized loadings**



F1: trust; F2: attachment; F3: tolerance