**ORIGINAL RESEARCH**

# Measuring the Realisation of Well-Being Needs of Adolescents: Validation of the Social Production Function Instrument for the Level of Well-Being–Short (SPF-ILs)

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## Abstract

Adolescent well-being is increasingly scrutinized due to its decline. This study was conducted to validate a theory-driven instrument for the measurement of well-being needs with a sample of Dutch adolescents. The short (15-item) Social Production Function Instrument for the Level of well-being (SPF-ILs) measures whether a person's needs for stimulation, comfort, behavioural confirmation, affection and status are met. In this study, its psychometric properties for adolescents were examined. Data collected in spring 2018 (T1) and spring 2019 (T2) from 1,304 Dutch adolescents (53.0% girls) aged 11–17 (mean, 13.7±1.1) years were used. The instrument's factor structure, internal consistency, construct validity, and gender and age factorial invariance were evaluated. The results showed that the SPF-ILs is valid and reliable for the assessment of adolescents' well-being needs realisation. Confirmatory factor analyses supported the five-factor (stimulation, comfort, behavioural confirmation, affection and status) model, showing good internal consistency ($\alpha=0.86$ at T1, 0.88 at T2), convergent/divergent validity, as well as gender and age factorial invariance. Comparison across groups revealed the expected differences in the realisation of physical (comfort and stimulation) and social (behavioural confirmation, status and affection) well-being needs between girls and boys and over time. SPF-ILs use increases our understanding of how adolescents achieve well-being via the fulfilment of well-being needs. The maintenance of adolescents' well-being is a global challenge, and this study revealed clear differences in adolescents' realisation of well-being needs, increasing our understanding of what interventions are needed to support such realisation.

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# 1 Introduction

Given the deterioration of well-being levels among adolescents, the examination of how this population achieves well-being has become increasingly important. Adolescence involves some of the fastest changes in human development, occurring from early (10–13 years) to middle (14–17 years) and late (18–21 years) stages. These changes are physical/biological (bodily), emotional/physiological (related to personal identity) and social [related to emotional separation from one's parent(s) and strong peer identification] (Ross et al., 2020; Steinberg & Morris, 2001; Christie & Viner, 2005). As a result of these rapid and substantive transformations, adolescence is a critical period of life during which many factors that contribute to lifelong well-being may or may not be acquired or solidified (Ross et al., 2020). Good social and physical well-being enables adolescents to deal with the challenges of this life stage and eases their transition into adulthood. Well-being among adolescents in Western countries used to be quite stable and high (Inchley et al., 2016), but numerous studies have demonstrated that it has declined in recent years (e.g. Children's Society, 2020; Due et al., 2019; Earle, 2016; Frith, 2016; Marquez & Long, 2021; Mishina et al., 2018; Twenge et al., 2018). Due to this decline, especially among girls (Cosma et al., 2023; Patalay & Fitzsimons, 2018; Yoon et al., 2023), the examination of adolescents' well-being needs (needs that are fundamental for the realisation of well-being) has become increasingly important.

## 1.1 A Theory-Driven Instrument for the Assessment of Well-Being Needs

Nieboer and colleagues (2005) developed the Social Production Function Instrument for the Level of well-being–short (SPF-ILs), which is used to measure physical and social well-being needs based on social production function (SPF) theory. This instrument has been proven to be reliable and valid for general populations (Nieboer et al., 2005) and community-dwelling general, frail and Turkish-migration-background older populations (Nieboer & Cramm, 2018). Whether it can be used to reliably and validly assess adolescents' well-being needs remains to be determined. Hence, the main objective of the current study was to examine the reliability and validity of the SPF-ILs for adolescents.

## 1.2 Adolescents' Physical Well-Being Needs

According to SPF theory, physical well-being is achieved by obtaining sufficient stimulation and optimal comfort (Lindenberg, 1996; Nieboer et al., 2005). Stimulation is obtained, for example, by physical exercise or via mental and sensory stimuli, which produces arousal contributing to physical well-being, and requires (some degree of) physical effort (Ormel et al., 1999). The level of physical activity among adolescents tends to decrease with age however (Kwan et al., 2012; Sigmundová et al., 2013). Comfort refers to the absence of somatic and psychological conditions such as hunger, thirst, pain, fatigue and excessive stress (Nieboer et al., 2005; Ormel et al., 1999).

## 1.3 Adolescents' Social Well-Being Needs

According to SPF theory, social well-being is achieved by obtaining status (e.g. through certain lifestyles and talents), behavioural confirmation (living according to one's own or

relevant others' norms) and affection (love, intimacy and support from family and friends) (Lindenberg, 1996; Nieboer & Cramm, 2018; Nieboer et al., 2005). Adolescents spend most of their time in school, and social interaction with their peers is known to have important implications for their well-being realisation. For example, adolescents' *status* at school is associated with significant long-term physical and social well-being (de Bruine et al., 2019; Kulawiak & Wilbert, 2020; McElhaney et al., 2008; Mundt & Zakletskaia, 2014; Ostberg & Modin, 2008). As adolescents pay increasing attention to their social standing among their peers, they become highly motivated to pursue peer status (Levy et al., 2004; Rubin et al., 2006), leading to substantial changes in this status during early adolescence that affect the realisation of well-being needs (McDonald et al., 2010). Popularity at school and in other social contexts (e.g. sports clubs) is the most relevant form of status for adolescents (Cillessen & Marks, 2011). It is based on peer social consensus, and adolescents find themselves in more or less desirable positions along the popularity continuum. Despite the acknowledgement of the importance of peer status in adolescents' social life, limited research attention has been given to the need-oriented pursuit of peer status for well-being realisation.

Evidence also indicates that adolescents' social needs play important roles in their behaviour. For example, adolescents' behavioural development can be driven by the need for social acceptance and significant others' expectations about their behaviour (Wright et al., 2012). Robust findings have been reported regarding the importance of *behavioural confirmation* in a wide array of situations (e.g. when experimenting with risky behaviours such as smoking, drinking, using drugs, engaging in unprotected sex, being physically aggressive and becoming involved in gang activities) throughout adolescence (e.g. Andrews et al., 2002; Dishion et al., 2005; Maxwell, 2002; National Center on Addiction and Substance Abuse at Columbia University, 2006; Simons-Morton et al., 2004; Underwood, 2003). In their search for self-identity, adolescents desire feedback from significant others (parents and peers) in the form of behavioural confirmation, which is known to differ greatly among groups (e.g. depending on whether adolescents have low or high self-esteem, how they view their lives and whether they receive feedback on self-perceived weakness or strength) (Rosen, 2006).

*Affection* is also known to be important for adolescents' well-being (e.g. Sijtsema et al., 2020). During adolescence, parents are focal providers of love and warmth and may thus be effective alternative sources of affection when it is difficult to obtain from peers. Parental warmth (or, conversely, rejection) has been found to have a much larger impact than that from peers on young adolescents (Sentse et al., 2010), with differences found between groups with positive and negative self-perceptions (Rosen, 2006).

Social well-being needs can become more or less salient depending on individual characteristics and social contexts (Sijtsema et al., 2020). Adolescents' perceptions of popularity are influenced by diverse psychosocial processes, and notably by the implicit norms that shape the social hierarchies in their peer groups. The determination of (un)popularity often hinges on the prevailing judgment of the majority of classroom members, and judgments tend to differ among distinct social groups (Bravo et al., 2024). Sports team membership notably shifts teenagers' social needs, increasing the significance of qualities such as teamwork, athleticism and sportsmanship. Recognition and acceptance become contingent on one's performance on the team, a criterion that may not carry equivalent weight in the classroom setting. Moreover, social needs realisation differs among adolescent peer groups. For example, an individual may experience popularity and acceptance among close friends, but

concurrently struggle with acceptance in larger social settings. In addition, the same social need may precipitate distinct behaviours depending on the context (i.e. in a school environment with peers or in the familial sphere with siblings and parents).

## 1.4 Gender Differences in Well-Being Needs Realisation

Although the order of many of the transformations that occur during adolescence seems to be universal, their timing and pace vary. For example, Inchley and colleagues (2016) showed in a longitudinal study that well-being decreased with age in adolescents of both sexes, and that overall well-being levels were generally higher among boys than among girls. In support of these findings, Patalay and Fitzsimons (2018) found that well-being during adolescence was highly unstable, and was more likely to decline over time in girls than in boys. This difference could be explained by girls' increasing tendency to compare themselves socially with others, whom they perceive as 'better' than themselves (Booker et al., 2018), which is expected to manifest as a lower perceived status level. Gender differences in the realisation of affection and behavioural confirmation are less clear. Relative to boys, girls frequently report higher levels of loneliness (Cosma et al., 2023), display more empathy and sensitivity to distress in their peers, and fear rejection by their peers (McDonald et al., 2010; Rose & Rudolph, 2006; Yoon et al., 2023). Yet, they may still make more effort than boys to realise well-being via affection and behavioural confirmation to compensate for their lower perceived status levels, as the substitution in (social) well-being needs realisation is likely to occur (Nieboer & Lindenberg, 2002).

Clear gender differences in physical well-being needs realisation have been observed, with girls reporting lower levels of perceived health and more frequent health complaints (Cavallo et al., 2006). Girls are at greater risk of poor health during adolescence. This gender gap emerges at 13 years and increases with age; by the age of 15 years, one in five girls self-reports fair or poor health and one in two has multiple health complaints more than once a week. Based on these findings, we expect the level of comfort to be lower in girls than in boys. As physical activity levels tend to be lower among girls than among boys (Ekelund et al., 2012; Hallal et al., 2012), we also expect the level of stimulation to be lower in girls. Thus, the first hypothesis (H1) regarding differences in the realisation of well-being needs that was tested in this study was:

**H1** Girls will have lower status, comfort and stimulation levels than will boys.

## 1.5 Realisation of Well-Being Needs Over Time

In general, well-being declines over time during adolescence (Marquez & Long, 2021). Significant differences emerge between 11- and 15-year-olds, with more of the latter reporting multiple health complaints, reduced life satisfaction and fair or poor health; thus, a reduction in the level of comfort is expected (Cavallo et al., 2006; Cosma et al., 2023). As adolescents', and especially girls', physical activity levels have been reported to decrease over time (Ekelund et al., 2012; Hallal et al., 2012), their level of stimulation is also expected to deteriorate. Moreover, the need for approval from significant others increases during adolescence, making the realisation of behavioural confirmation more difficult. People lose

**Table 1** Socio-demographic characteristics of the study sample ($n=1304$)

| | T1 ($n=1,124$) | T2 ($n=1,055$) | T1+T2 ($n=875$) |
|---|---|---|---|
| Gender (female) | 53.1% | 55.4% | 55.5% |
| Age (years) | 13.67 (1.12) | 14.62 (1.13) | 14.50 (1.07) |
| Grade | | | |
| 7 | 31.6% | 0.1% | --- |
| 8 | 31.5% | 33.5% | 35.4% |
| 9 | 36.9% | 34.3% | 34.7% |
| 10 | --- | 32.1% | 29.8% |
| Education (low) | 26.8% | 22.1% | 20.8% |
| Ethnocultural background (non-western) | 43.3% | 40.3% | 39.9% |

*Note* Data are reported as percentages or means (standard deviations)

(some of) their previous certainty and childhood values during adolescence, and acceptance in peer groups becomes increasingly important and difficult. Adolescents experience increased pressure with age to make and maintain friends and form intimate relationships, and school performance and other sources of stress increase during this period of life (West & Sweeting, 2003), threatening the realisation of behavioural confirmation and affection. The pressure to conform with peers and the exploration of identity contribute to stress in adolescence, and media influences and gender norms may exacerbate the disparity between adolescents' lived reality and their perceptions or aspirations for the future (Cosma et al., 2023).

In the current study, we examined only short-term changes over a 1-year period. Nonetheless, we expected the realisation of affection, behavioural confirmation, comfort and stimulation to decline over time. The expectation for status was less clear. With increasing age, opportunities to realise status may increase for some adolescents, but decrease for those who are less successful in achieving popularity. In addition, indicators such as family status and income level are likely to remain stable over time. Thus, we formulated hypothesis 2 (H2):

**H2** Adolescents' realisation of affection, behavioural confirmation, comfort and stimulation will decline over time.

To test the validity of the SPF-ILs for adolescents, we examined differences in the levels of physical (comfort and stimulation) and social (behavioural confirmation, status and affection) well-being needs realisation between girls and boys and over time.

## 2 Method

The aim of this study was to validate a theory-driven instrument for the measurement of well-being (the SPF-ILs) with a sample of Dutch adolescents aged 11–17 years. We report data from two waves of a larger longitudinal study that involved confirmatory factor analyses (CFAs), the assessment of convergent and divergent validity and subgroup comparisons. The validation of the SPF-ILs involved the comparison of affection, behavioural confirmation, status, comfort and stimulation levels between boys and girls, based on expectations derived from previous research (higher comfort, stimulation and status levels for boys than

**Table 2** SPF-ILs item descriptive statistics and factor loadings

| Item | T1 | | | T2 | | |
|---|---|---|---|---|---|---|
| | Mean | Missing | $\lambda$ | Mean | Missing | $\lambda$ |
| *Affection* | | | | | | |
| 1. Do people pay attention to you? | 3.29 (0.65) | 0.8% | 0.73 | 3.22 (0.69) | 0.5% | 0.80 |
| 2. Do people help you if you have a problem? | 3.34 (0.69) | 0.8% | 0.74 | 3.27 (0.72) | 0.5% | 0.76 |
| 3. Do you feel that people really love you? | 3.31 (0.78) | 0.9% | 0.78 | 3.21 (0.85) | 0.7% | 0.80 |
| *Behavioral confirmation* | | | | | | |
| 4. Do others appreciate your role in the group? | 3.23 (0.75) | 0.9% | 0.69 | 3.16 (0.77) | 0.6% | 0.76 |
| 5. Do people find you reliable? | 3.41 (0.65) | 0.8% | 0.53 | 3.37 (0.66) | 0.6% | 0.58 |
| 6. Do you feel useful to others? | 2.97 (0.78) | 0.8% | 0.76 | 2.93 (0.81) | 0.7% | 0.75 |
| *Status* | | | | | | |
| 7. Do people think you do better than others? | 2.42 (0.80) | 1.2% | 0.71 | 2.47 (0.80) | 0.7% | 0.66 |
| 8. Do people find you an influential person? | 2.40 (0.90) | 1.3% | 0.71 | 2.41 (0.87) | 0.9% | 0.75 |
| 9. Are you known for the things you have accomplished? | 2.30 (0.94) | 0.9% | 0.73 | 2.32 (0.91) | 0.9% | 0.75 |
| *Comfort* In the past few months have you felt: | | | | | | |
| 10. …relaxed? | 2.80 (0.75) | 0.8% | 0.67 | 2.73 (0.78) | 0.5% | 0.73 |
| 11. …in excellent health? | 3.01 (0.84) | 0.8% | 0.80 | 2.88 (0.88) | 0.6% | 0.82 |
| 12. …physically comfortable? | 3.09 (0.84) | 0.8% | 0.81 | 2.94 (0.87) | 0.5% | 0.85 |
| *Stimulation* | | | | | | |
| 13. Are your activities challenging to you? | 2.39 (0.81) | 0.8% | 0.41 | 2.33 (0.78) | 0.6% | 0.35 |
| 14. Do you really enjoy your activities? | 3.13 (0.71) | 0.8% | 0.70 | 3.05 (0.72) | 0.5% | 0.75 |
| 15. How often are you fully concentrated when doing something? | 2.73 (0.68) | 0.9% | 0.56 | 2.64 (0.69) | 0.5% | 0.58 |

*Notes* $\lambda$ = single factor loadings on the intended dimensions. All factor loadings had $p$ values < 0.001

**Table 3** Results of the confirmatory factor analyses

| Model | SB $\chi^2$ | df | $p$ | RMSEA | 90% CI RMSEA | CFI | SRMR |
|-------|------|-----|--------|-------|--------------|-------|-------|
| T1 | 217.074 | 80 | <0.001 | 0.039 | 0.033-0.045 | 0.971 | 0.032 |
| T2 | 301.398 | 80 | <0.001 | 0.052 | 0.046-0.058 | 0.957 | 0.037 |

*Notes* SB $\chi^2$=Satorra-Bentler chi-squared value, df=degrees of freedom, RMSEA=root mean square error of approximation, CI=confidence interval, CFI=comparative fit index, SRMR=standardised root mean square residual. The criteria used to interpret model fit were RMSEA<0.08, CFI>0.90 and SRMR≤0.08

for girls). We also expected to observe a reduction in the realisation of well-being needs (except status) over time.

## 2.1 Participants

The present study was part of a larger project examining psychological and socio-ecological predictors of well-being among adolescents in the Netherlands (Luijten et al., 2021a, 2021b, 2022, 2023). The data analysed in this study were collected in spring 2018 (T1) and spring 2019 (T2). The total sample consisted of 1,304 adolescents (53.0% girls, mean age 13.7±1.1 years) from three secondary schools (T1: $n$=1,124, 53.1% girls, mean age 13.7±1.1 years; T2: $n$=1,055, 55.4% girls, mean age 14.6±1.1 years). The majority [$n$=875 (67.1%)] of the participants took part in both waves. Most participants were enrolled in higher (senior

**Table 4  a** measurement invariance across genders and grades at T1. **b** measurement invariance across genders and grades at T2

| Model | SB $\chi^2$ | df | RMSEA | ΔRMSEA | CFI | ΔCFI | SRMR | ΔSRMR |
|-------|------|-----|-------|--------|-------|-------|-------|-------|
| **a** | | | | | | | | |
| **Gender invariance** | | | | | | | | |
| 1. Configural | 349.74 | 160 | 0.046 | - | 0.966 | - | 0.036 | - |
| 2. Metric | 396.06 | 170 | 0.049 | 0.003 | 0.959 | 0.007 | 0.048 | 0.012 |
| 3. Scalar | 464.17 | 180 | 0.053 | 0.004 | 0.949 | 0.000 | 0.050 | 0.002 |
| 4. Strict | 499.72 | 195 | 0.053 | 0.000 | 0.945 | 0.004 | 0.052 | 0.002 |
| **Grade invariance** | | | | | | | | |
| 1. Configural | 445.19 | 240 | 0.048 | - | 0.963 | - | 0.040 | - |
| 2. Metric | 464.48 | 260 | 0.046 | 0.002 | 0.964 | 0.001 | 0.044 | 0.004 |
| 3. Scalar | 501.80 | 280 | 0.046 | 0.000 | 0.960 | 0.004 | 0.046 | 0.002 |
| 4. Strict | 557.86 | 310 | 0.047 | 0.001 | 0.956 | 0.004 | 0.048 | 0.002 |
| **b** | | | | | | | | |
| **Gender invariance** | | | | | | | | |
| 1. Configural | 411.86 | 160 | 0.055 | - | 0.959 | - | 0.038 | - |
| 2. Metric | 450.54 | 170 | 0.056 | 0.001 | 0.954 | 0.005 | 0.051 | 0.013 |
| 3. Scalar | 504.45 | 180 | 0.059 | 0.003 | 0.947 | 0.007 | 0.053 | 0.002 |
| 4. Strict | 538.01 | 195 | 0.058 | 0.001 | 0.944 | 0.003 | 0.054 | 0.001 |
| **Grade invariance** | | | | | | | | |
| 1. Configural | 517.28 | 240 | 0.058 | - | 0.956 | - | 0.043 | - |
| 2. Metric | 548.05 | 260 | 0.057 | 0.001 | 0.954 | 0.002 | 0.054 | 0.011 |
| 3. Scalar | 593.05 | 280 | 0.057 | 0.000 | 0.950 | 0.004 | 0.055 | 0.001 |
| 4. Strict | 659.08 | 310 | 0.057 | 0.000 | 0.944 | 0.006 | 0.057 | 0.002 |

*Notes* SB $\chi^2$=Satorra-Bentler chi-squared value, df=degrees of freedom, RMSEA=root mean square error of approximation, CFI=comparative fit index, SRMR=standardised root mean square residual. The criteria used to interpret model fit were RSMEA<0.08, CFI>0.90 and SRMR≤0.08

**Table 5** Descriptive statistics for SPF-ILs subscales

| Needs | # items | T1 Mean | SD | α | T2 Mean | SD | α |
|---|---|---|---|---|---|---|---|
| Affection | 3 | 3.31 | 0.59 | 0.79 | 3.23 | 0.65 | 0.82 |
| Behavioral confirmation | 3 | 3.21 | 0.58 | 0.70 | 3.15 | 0.61 | 0.74 |
| Status | 3 | 2.37 | 0.72 | 0.75 | 2.40 | 0.71 | 0.76 |
| Comfort | 3 | 2.97 | 0.68 | 0.80 | 2.85 | 0.73 | 0.84 |
| Stimulation | 3 | 2.75 | 0.53 | 0.56 | 2.67 | 0.53 | 0.56 |
| Overall | 15 | 2.92 | 0.45 | 0.86 | 2.86 | 0.48 | 0.88 |

Note α = Cronbach's alpha

general and preuniversity) education (73.0%) and had Western (from Europe, the United States, Canada, Australia and New Zealand) ethno-cultural backgrounds (56.8%); 27.0% were enrolled in lower (pre-vocational) education and 43.2% had non-Western (from Africa, the Middle East, Asia, and Latin and South America) ethno-cultural backgrounds.

## 2.2 Procedure

The three secondary schools participating in the present study provided preliminary active informed consent to their students' participation. Informational emails outlining the study aims and procedure, the right to voluntary participation and data confidentiality were then sent to the students and their parents. Parents were able to decline their children's participation (informed passive consent), and students could verbally decline participation at any time during the study (informed active consent). Overall, 6.2% ($n = 84$) of the contacted parents and 1.0% ($n = 13$) of the adolescents declined participation at T1; at T2, no parent and 0.8% ($n = 11$) of the adolescents declined participation. Before filling out online questionnaires, each participant received a unique ID number to ensure the confidentiality of their data. Participants used their ID numbers in both waves of the study, allowing us to match the fully pseudonymised data. The questionnaires were administered during regular class hours under the supervision of the lead researcher (CL) and trained research assistants. Thereafter, the participants received small, non-financial encouragements (e.g. candy) and a card with the lead researcher's contact information in case of questions and a list of websites with information about the questionnaire topics. At the end of each wave, one gift card (€5–10, depending on grade) per class and one gift (e.g. iPhone or PlayStation) per school were raffled off to the participants. The medical ethics committee of Erasmus Medical Centre,

**Table 6** Pearson correlation coefficients for SPF-ILs subscales at T1 and T2

| | Affection | Behavioral confirmation | Status | Comfort | Stimulation | Overall |
|---|---|---|---|---|---|---|
| Affection | [0.47] | 0.65 | 0.27 | 0.50 | 0.38 | 0.75 |
| Behavioral confirmation | 0.67 | [0.45] | 0.42 | 0.47 | 0.41 | 0.79 |
| Status | 0.32 | 0.42 | [0.45] | 0.31 | 0.32 | 0.66 |
| Comfort | 0.50 | 0.49 | 0.27 | [0.60] | 0.49 | 0.76 |
| Stimulation | 0.45 | 0.44 | 0.32 | 0.52 | [0.44] | 0.69 |
| Overall | 0.79 | 0.81 | 0.64 | 0.76 | 0.71 | [0.57] |

Note Values in brackets are correlations between T1 and T2. Values above and below this diagonal are correlations between (sub)scales at T1 and T2, respectively. All $p < .001$

**Table 7** **a** Pearson correlation coefficients for construct validity at T1. **b** Pearson correlation coefficients for construct validity at T2

| Instrument | Well-being needs | | | | | SPF-ILs |
|---|---|---|---|---|---|---|
| | Affection | Behavioral confirmation | Status | Comfort | Stimulation | |
| **a** | | | | | | |
| **Convergent validity** | | | | | | |
| MHC-SF | 0.54*** | 0.57*** | 0.40*** | 0.57*** | 0.41*** | 0.68*** |
| PANAS-C (PA) | 0.49*** | 0.49*** | 0.34*** | 0.59*** | 0.43*** | 0.64*** |
| Cantril's ladder | 0.50*** | 0.44*** | 0.28*** | 0.58*** | 0.34*** | 0.58*** |
| **Divergent validity** | | | | | | |
| RCADS-25 | −0.48*** | −0.43*** | −0.24*** | −0.64*** | −0.38*** | −0.60*** |
| Depression | −0.49*** | −0.44*** | −0.26*** | −0.64*** | −0.42*** | −0.62*** |
| Anxiety | −0.40*** | −0.37*** | −0.19*** | −0.55*** | −0.30*** | −0.50*** |
| **b** | | | | | | |
| **Convergent validity** | | | | | | |
| MHC-SF | 0.54*** | 0.56*** | 0.40*** | 0.57*** | 0.45*** | 0.69*** |
| Cantril's ladder | 0.51*** | 0.46*** | 0.30*** | 0.62*** | 0.42*** | 0.63*** |
| **Divergent validity** | | | | | | |
| RCADS-25 | −0.47*** | −0.48*** | −0.22*** | −0.67*** | −0.37*** | −0.60*** |
| Depression | −0.51*** | −0.48*** | −0.23*** | −0.69*** | −0.43*** | −0.64*** |
| Anxiety | −0.37*** | −0.41*** | −0.18*** | −0.56*** | −0.26*** | −0.49*** |

*Note* ***$p < .001$

Rotterdam, the Netherlands, established that the rules stipulated in the Medical Research Involving Human Subjects Act did not apply to this study (protocol no. MEC-2018-055).

## 2.3 Measures

### 2.3.1 SPF-ILs

The 15-item SPF-ILs (Nieboer et al., 2005) measures whether a person's needs for stimulation, comfort, affection, behavioural confirmation and status are being met. Examples of items are 'Do you feel that people really love you?' (affection), 'Do you really enjoy your activities?' (stimulation), 'Do you feel useful to others?' (behavioural confirmation), 'Have you felt relaxed?' (comfort) and 'Do people think you do better than others?' (status). Mean scores range from 1 (never) to 4 (always), with higher scores indicating greater well-being.

**Table 8** Mean SPF-ILs scores for boys and girls at T1 and T2

| Needs | T1 | | | T2 | | |
|---|---|---|---|---|---|---|
| | Girls | Boys | $p$ | Girls | Boys | $p$ |
| Affection | 3.32 (0.61) | 3.30 (0.58) | 0.448 | 3.20 (0.66) | 3.27 (0.63) | 0.108 |
| Behavioral confirmation | 3.21 (0.56) | 3.20 (0.60) | 0.782 | 3.13 (0.58) | 3.18 (0.64) | 0.201 |
| Status | 2.30 (0.70) | 2.46 (0.74) | <0.001 | 2.30 (0.69) | 2.53 (0.71) | <0.001 |
| Comfort | 2.77 (0.68) | 3.19 (0.61) | <0.001 | 2.65 (0.69) | 3.10 (0.70) | <0.001 |
| Stimulation | 2.69 (0.51) | 2.81 (0.55) | <0.001 | 2.60 (0.48) | 2.76 (0.59) | <0.001 |
| Overall | 2.86 (0.45) | 2.99 (0.45) | <0.001 | 2.78 (0.45) | 2.97 (0.50) | <0.001 |

*Note* Data are reported as means (standard deviations)

| Needs | T1 | T2 | P |
|---|---|---|---|
| Affection | 3.32 (0.57) | 3.24 (0.64) | <0.001 |
| Behavioral confirmation | 3.20 (0.57) | 3.14 (0.61) | 0.008 |
| Status | 2.34 (0.70) | 2.39 (0.70) | 0.052 |
| Comfort | 2.96 (0.67) | 2.85 (0.73) | <0.001 |
| Stimulation | 2.74 (0.51) | 2.67 (0.52) | <0.001 |
| Overall | 2.91 (0.44) | 2.86 (0.48) | <0.001 |

**Table 9** Mean SPF-IL scores at T1 and T2 ($n=875$)

*Note* Data are reported as means (standard deviations)

The reliability and validity of this instrument have been tested thoroughly and proven in the general adult population, as well as in older adults with frailty, older Dutch natives and older adults with migration backgrounds (Nieboer & Cramm, 2018; Nieboer et al., 2005).

## 2.4 Other Well-Being Measures

To provide data for the validity analyses, the participants completed four additional well-being measures: the Mental Health Continuum–Short Form (MHC-SF), the Positive and Negative Affect Scale for Children (PANAS-C), Cantril's ladder and the Revised Child Anxiety and Depression Scale-25 (RCADS-25).

### 2.4.1 MHC-SF

We used the Dutch adolescent version of the MHC-SF (Keyes, 2005; Luijten et al., 2019), which consists of 14 items measuring overall well-being. Participants were instructed to think about the past month and rated the items on a 6-point scale (0=never, 5=every day). The items measure the degrees of emotional ($n=3$; e.g. 'How often did you feel happy?'), psychological ($n=6$; e.g. 'How often did you feel good at managing the responsibilities of your daily life?') and social ($n=5$; e.g. 'How often did you feel that you had something important to contribute to society?') well-being. Mean total scores were calculated, with higher scores indicating greater well-being. The MHC-SF has been validated for use with Dutch adolescents (Luijten et al., 2019) and showed good reliability in the present study (Cronbach's $\alpha=0.91$ at T1, 0.92 at T2).

### 2.4.2 PANAS-C

The 5-item positive affect (PA) dimension of the 10-item PANAS-C (Ebesutani et al., 2012a) was selected to measure participants' emotional well-being, as reflected by the extent to which they felt enthusiastic and active. This measure was available only at T1. Respondents rated the frequency with which they felt joyful, cheerful, happy, lively and proud on a 5-point scale (1=very little, 5=a lot). Item scores were summed to derive total scores. The PA dimension of the PANAS-C has been shown to measure PA markers well among 6–18-year-olds (Ebesutani et al., 2012a, b). In the present study, the Cronbach's $\alpha$ value for this measure was 0.73.

### 2.4.3  Cantril's Ladder

This single-item instrument (Cantril, 1965), a general cognitive evaluation of well-being, was used to assess participants' current life satisfaction. Respondents were asked to grade their lives on a scale ranging from 0 to 10. Higher scores indicate greater life satisfaction. Cantril's ladder is used worldwide and has been validated with adolescents in Scotland (Levin & Currie, 2014).

### 2.4.4  RCADS-25

The RCADS-25 (Ebesutani et al., 2012b) was used to assess mental illness symptoms as indicators of negative well-being. This 25-item inventory was designed to measure depressive ($n=10$; e.g. 'Nothing is much fun anymore') and anxiety ($n=15$; e.g. 'I worry about things') symptoms. Item responses are structured by a 4-point scale ($0=$never, $3=$always) and summed to yield total scores; higher scores indicate more severe depressive and anxiety symptoms. The RCADS-25 was developed for use with 8–18-year-olds, and its internal consistency has been supported in a school-based, clinic-referred juvenile sample (Ebesutani et al., 2012b). In the present study, the Cronbach's $\alpha$ values for the depressive and anxiety symptoms subscales were 0.85 and 0.84, respectively, at T1 and 0.88 and 0.86, respectively, at T2.

## 2.5  Socio-Demographic Variables

The questionnaire also solicited information about the participants' gender, age, grade in school (7–9 at T1, 7–10 at T2), educational level (pre-vocational, senior general or preuniversity) and ethno-cultural background. The educational level and ethno-cultural background variables were dichotomised [low (pre-vocational) and high (senior general and preuniversity) and Western and non-Western, respectively].

## 2.6  Analyses

The analyses involved the following seven steps. For all analyses, the significance level was set at 5.0% ($p<.05$). First, descriptive statistics for the sample characteristics were calculated using SPSS (version 27; IBM Corporation, Armonk, NY, USA). Second, the SPF-ILs item data were screened by examining the means, standard deviations and numbers of missing values. Third, CFA was performed to test the validity of the SPF-ILs using the *lavaan* package (Lavaan, 2012) in R (version 4.3.1; R Core Team, 2017). Structural equation modelling enabled us to specify a five-factor measurement model by loading each item on its respective latent factor (stimulation, comfort, affection, behavioural confirmation and status). The CFA models were fitted by robust maximum likelihood estimation (MLE), which provides a test statistic that is asymptotically equivalent to the Yuan-Bentler (2000) T2 test statistic with standard errors that are robust against violations of multivariate normality (Lei, 2009). In addition to Satorra-Bentler $\chi^2$ tests, which appropriately accompany MLE, the root mean square error of approximation (RMSEA) (Steiger & Lind, 1980), comparative fit index (CFI) (Hu & Bentler, 1999) and standardised root mean square residual (SRMR) (Hu & Bentler, 1999) were used to evaluate the absolute fit of the T1 and

T2 models. RSMEA < 0.06, CFI > 0.95, and SRMR ≤ 0.08 indicated a good model fit, and RSMEA < 0.08 and CFI > 0.90 indicated a satisfactory fit (Bentler & Bonett, 1980; Hu & Bentler, 1999).

Fourth, the gender and age invariance of the SPF-ILs factor models (for T1 and T2) were examined in multigroup CFAs. The configural (similarity of model configuration), metric/weak (similarity of factor loadings), scalar/strong (similarity of intercepts), and strict invariance (similarity of residual variances) invariances were examined across genders (boys and girls) and grades (7–9 at T1, 8–10 at T2[1]), as age group indicators. Configural invariance was confirmed by RSMEA and SRMR < 0.08 and CFI > 0.95 (Cheung & Rensvold, 2002). A relative change of ≤ 0.010 in the CFI, supplemented by a relative change of ≤ 0.015 in the RMSEA or ≤ 0.030 in the SRMR, was taken to indicate that the null hypothesis of invariance should not be rejected (Chen, 2007).

Fifth, we calculated descriptive statistics (Table 5) and Cronbach's $\alpha$ values (Table 6) for the (sub)scale data to evaluate the internal consistency of the SPF-ILs and assessed conceptual relatedness among (sub)scales by performing correlation analyses with SPSS. Cronbach's $\alpha > 0.70$ was taken to indicate good internal consistency (Nunnally & Bernstein, 1995).

Sixth, Pearson correlation analyses were performed to examine the construct validity of the SPF-ILs in terms of convergent validity relative to the alternative measures of well-being (MHC-SF, PA scale of the PANAS-C, and Cantril's ladder) and divergent validity relative to the RCADS-25 as well as correlations between change scores of the SPF-ILs and these measures. Correlations in the range of 0.10–0.29, 0.30–0.49, and ≥ 0.50 were considered to be weak, moderate, and strong, respectively (Cohen, 1988). In the seventh and final step, we performed independent $t$ tests using SPSS to test the study hypotheses.

## 3 Results

Participant characteristics are summarised in Table 1. 67% of the adolescents participated at both timepoints. Missing value rates for the SPF-ILs items were very low (< 1.5%; Table 2).

The measurement model yielded a significant $\chi^2$ value for overall goodness of fit at T1 and T2, reflecting the sensitivity of this value to the sample size. The SRMR was well below 0.08, suggesting good overall model fit. The RMSEA was < 0.06, reflecting small differences between the estimated and observed models. The CFI was > 0.95, indicating that the data supported the specified relationships between variables (Table 3). Similar results were obtained at T1 and T2. The completely standardised solution of the confirmatory factor model for T1 and T2 is presented in Table 2. All factor loadings were > 0.40, except that for item 13 ('Are your activities challenging to you?'; $\lambda = 0.35$).

The multigroup CFA results are presented in Table 4a and b. The five-factor model fit the data satisfactorily across genders and grades, supporting its configural invariance. Equality constraints were imposed on all factor loadings for all gender and grade groups, and the ΔRMSEA, ΔCFI and ΔSRMR indicated full metric invariance (< 0.01). Equality constraints were then imposed on all intercepts, and the three measures also indicated full scalar invariance. Finally, equality constraints were imposed on all residual variances, and the ΔCFI,

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[1] One participant had to repeat grade 7, but was included in the similarly-aged grade 8 group for the age invariance analysis of the T2 data.

ΔRSMEA and ΔSRMR supported full strict invariance. Thus, the SPF-ILs structure, factor loadings, intercepts and residual variances were the same, enabling well-being measurement with the same degree of accuracy, across genders and age groups.

Cronbach's $\alpha$ values were good for the overall SPF-ILs and all subscales except stimulation ($\alpha=0.56$), likely because of the weak factor loading of item 13. All associations between subscale scores, and between subscale and overall scores, were significant at T1 and T2 ($p<.001$). Associations between T1 and T2 (sub)scale scores ranged from 0.44 for stimulation to 0.60 for comfort (all $p<.001$).

## 3.1 Construct Validity

Correlations of SPF-ILs scores with those for the other measures of well-being and mental illness are provided in Table 7a and b. SPF-ILs scores correlated positively with PANAS-C (PA dimension at T1), MHC-SF and Cantril's ladder scores, confirming convergent validity at both timepoints. Most of the correlations were moderate to strong. At T1, the correlation between Cantril's ladder and the SPF-ILs status subscale score was weak. SPF-ILs scores correlated negatively with RCADS-25 scores, supporting divergent validity. The correlation with the status subscale score was weak, whereas the other correlations were moderate to strong. SPF-ILs change scores were moderately strong correlated with the change scores of the other measures of well-being further supporting construct validity ($r=.383$, $p<.001$ for MHC-SF; $r=.463$, $p<.001$ for Cantril's ladder; $r=-.420$, $p<.001$ for RCADS-25; $r=-.428$, $p<.001$ for Depression; and $r=-.325$, $p<.001$ for Anxiety).

Table 8 provides an overview of boys' and girls' SPF-ILs scores. As expected, boys had higher status, comfort and stimulation levels than did girls at T1 and T2. Over time, the realisation of affection, behavioural confirmation, comfort and stimulation, but not status, declined (Table 9).

## 4 Discussion

Given the deterioration of well-being levels among adolescents, the examination of how this population achieves well-being has become increasingly important. This study was conducted to validate the SPF-ILs, a theory-driven instrument for the measurement of well-being needs realisation, with a sample of Dutch adolescents. It showed that the SPF-ILs is a reliable and valid instrument for the assessment of adolescents' realisation of well-being needs, with the same degree of accuracy in boys and girls and across age groups. CFAs yielded good fit indices for the SPF-ILs, providing support for the use of SPF theory to assess adolescents' well-being. All SPF-ILs items loaded on corresponding latent dimensions, with only item 13 (regarding whether respondents' activities are challenging to them) raising concern because its factor loading was below the threshold of 0.40 at T2. Clear consensus on the threshold for acceptable factor loading values is lacking; some researchers have suggested that factor loadings ≥ 0.3 are acceptable (Hair et al., 2010; Tavakol & Wetzel, 2020), but we find this value to be low. As we pointed out in a previous article on SPF-ILs validation for older Turkish migrants, item 13 should be rephrased to more clearly assess respondents' engagement in stimulating and enjoyable activities, with the avoidance

of the negative misinterpretation of 'challenging' as overly demanding or stressful (Nieboer & Cramm, 2018).

Regarding *construct validity*, the study results support H1, as they demonstrate higher levels of status, comfort and stimulation among boys than among girls. These results support the finding of Booker and colleagues (2018) that girls have greater difficulty realising status than do boys, possibly because they tend to compare themselves socially with others, whom they perceive as 'better' than themselves. As expected, we found no difference in the realisation of affection or behavioural confirmation between boys and girls. Girls may try to compensate for lower status levels via the realisation of these needs, although this may be more difficult for them than for boys given their sensitivity to their peers' distress and greater fear of rejection (McDonald et al., 2010; Rose & Rudolph, 2006; Yoon et al., 2023). Physical comfort, conceptualised as feeling relaxed, in excellent health and physically comfortable, has been found to differ clearly between genders, in alignment with adolescent girls' more frequent health complaints and greater risk of poor health (Cavallo et al., 2006). As expected, girls' stimulation levels were also lower than those of boys, as girls have been consistently found to be less physically active (Ekelund et al., 2012; Hallal et al., 2012; Telford et al., 2016; Trost et al., 2002).

The study findings also support H2, confirming that the fulfilment of affection, behavioural confirmation, comfort and stimulation deteriorates over time in adolescence. We did not expect to find a deterioration in status over time, as adolescents try to increase their popularity (Allen et al., 2005; Bravo et al., 2024). The small but consistent decline in need satisfaction between T1 and T2, except for status, raises the question about its impact on well-being measures. Even though the decline is minor, it can still be significant. We only investigated the change during a 1-year timeframe. Over longer periods, these small changes might add up, impacting overall life satisfaction and mental health. A small decline, if persistent over time, could accumulate and lead to a more substantial negative effect on well-being. The research of Muraven and Baumeister (2000) indeed shows that small, continuous demands on resources (like need satisfaction) can deplete an individual's capacity to maintain well-being over time. Positive experiences and emotions build resources over time, implying that small deficits can similarly accumulate to reduce these resources, impacting well-being (Fredrickson, 2001).

The SPF-IL scale could be a valuable tool for both diagnosing areas where intervention is needed and designing effective, tailored interventions for adolescents. By providing a detailed assessment of well-being across multiple dimensions, it helps identify specific needs, understand underlying causes, and prioritize resources. Also because the measurement of need fulfilment is linked to underlying satisfiers of the different well-being needs (Nieboer et al., 2005; Steverink & Lindenberg, 2006). It facilitates the creation of customized and holistic interventions that are responsive to the evolving needs of adolescents, thereby enhancing their overall well-being. Examples of interventions are Social and Emotional Learning Programs in schools to improve social and emotional skills, attitudes, and behaviour that help the realization of affection (see Durlak et al., 2011). For behavioural confirmation, praise is important when it enhances competence without an overreliance on social comparisons, and conveys attainable standards and expectations, which can be improved thru Positive Reinforcement Programs that validate adolescents' behaviours and promote a positive self-concept (Henderlong and Leppe, 2002). A study by Wolfson and Carskadon (2003) examined the impact of sleep education programs on adolescents' sleep

patterns and found that such programs lead to improved sleep quality and daytime functioning. Educating adolescents about good sleep practices promotes better physical comfort. Physical comfort in the classroom can be improved thru ergonomically designed environments that reduce physical discomfort and enhance learning experiences (stimulation) (Hedge & Puleio, 2007). A study by Catterall et al. (2012) explored the impact of arts education on adolescent development and found that participation in arts and music programs enhances sensory stimulation, creativity, and emotional expression. Engaging in arts and music provides physical and sensory stimulation. In terms of evaluation, the SPF-IL scale could be used to establish a baseline of well-being before interventions are implemented and to measure progress over time (see for example Goedendorp et al., 2017). This helps in evaluating the effectiveness of interventions and making necessary adjustments. It also allows for more personalized interventions addressing the unique needs of each adolescent, rather than applying a one-size-fits-all approach. This individualized support is more likely to be effective and meaningful as it allows outcome-based adjustments in interventions, ensuring they remain relevant and effective as the needs of adolescents evolve.

## 4.1 Limitations

The combination of the three social and two physical well-being needs into one total SPF-ILs score assumes the same weight for each need, although appropriate weights may vary among populations. A theory that could support the distinction of weights for the five needs remains lacking (Nieboer et al., 2005). Theoretically, the overall measure of well-being is defined by a Cobb–Douglas function of these goals (Lindenberg, 1996), which are assumed to be 'needs' up to a certain point, after which they become 'wants' (a paucity of one need can be compensated by the acquisition of more of another). For this reason, this measure must allow a low score for any need to reduce the overall well-being score. We do not know the extent to which the substitution of satisfaction in well-being needs, which SPF posits can occur to a limited extent (Lindenberg, 1996; Nieboer & Lindenberg, 2002), took place in our sample. Losses in resources or activities can have minor or temporary effects on the overall level of well-being if alternative sources for well-being need fulfilment are available (Nieboer et al., 2005). For example, adolescents experiencing difficulties with the achievement of status (e.g. by excelling in school or sports) may choose to intensify their social contacts to acquire affection and behavioural confirmation. Adolescents can also create buffers for the achievement of well-being by increasing the number and diversity of resources. For example, affection from family and friends is important, but having numerous friendships outside the realm of close friends, family members and a boyfriend/girlfriend may contribute only marginally to the achievement of affection (Nieboer et al., 2005). With regard to the relatively low association of status with the other well-being indicators, people are more likely to feel awkward about questions referring to status differences as compared to questions regarding the underlying satisfiers of other well-being needs. Moreover, in addition to fulfilment of the other well-being needs, status did not contribute significantly to overall life satisfaction but did contribute to positive affect in the 2005 study by Nieboer and colleagues suggesting differences in associations with different well-being measures (also see Steverink et al., 2020 for similar findings). The SPF-IL combines cognitive and affective components. Lower associations between status and other well-being measures may also be the result of differences in marginal returns. People build more buffers for affection than for

behavioural confirmation and least buffers for status (Nieboer & Lindenberg, 2002). People with low status-levels use fulfilment of the other needs (i.e., affection, behavioral confirmation, comfort and stimulation) much more (or more effectively) for the production of their overall level of subjective well-being than people with high-status. Moreover, different need fulfilments make unique contributions to different types of well-functioning, implying that a mix of need satisfiers are needed for individuals to function well showing up in the strength of associations with different well-being measures (Steverink et al., 2020). Another study limitation concerns the study sample. To examine the representativeness of this sample, a comparison was made to the Health Behaviour in School-age Children (HBSC) study, where the sample is considered to be representative of the general Dutch adolescent population (Stevens et al., 2018). This comparison showed that our sample may be considered representative with respect to gender and age, but it differed from the HBSC study regarding ethnicity in that our cohort had over-representations of participants with a non-Western ethno-cultural background (also see Luijten et al., 2019) which may have biased our results. We did not validate the SPF-ILs for adolescents of different ethnocultural backgrounds in the current study. We did validate the SPF-IL instrument among older Turkish migrants in an earlier study (Nieboer & Cramm, 2018). Finally, we used SPF theory to assess realisation of well-being needs while other theories could be of interest. The work of Ryan and Deci (2000; Deci & Ryan, 2000), for example, (particularly within the framework of Self-Determination Theory (SDT), is relevant. SDT categorizes social needs under the broad term "relatedness," which refers to the need to feel connected to others, to love and care, and to be loved and cared for. It encapsulates the desire for meaningful relationships and a sense of belonging in social contexts. While both SDT and SPF theory provide valuable insights into the underlying mechanisms that contribute to well-being, they differ in their emphasis on the nature of needs/goals and the mechanisms through which well-being is achieved. SDT highlights intrinsic motivation and psychological needs, emphasizing the importance of autonomy, competence, and relatedness for psychological health and personal growth. In contrast, SPF theory focuses on the efficient allocation of resources to fulfil physical (comfort and stimulation) and social (affection, behavioural confirmation, and status) well-being needs, detailing how individuals strive to achieve ultimate goals of physical and social well-being. Needs in SPF theory refer to a restricted set of basic physical and social needs that must be at least minimally fulfilled for a person to experience overall well-being. Rather than lumping social needs together under one overall need for relatedness, it differentiates three substantive social needs and two physical needs as well as their satisfiers. A thorough discussion of different need theories has been done elsewhere (see Steverink et al., 2020; Steverink & Lindenberg, 2006).

# 5 Conclusions

In a time of increasing mental health problems and deteriorating well-being, especially among adolescent girls, the examination of adolescents' ability to achieve well-being has become increasingly important. Valid, reliable instruments for the assessment of the well-being of adolescent boys and girls across all ages of this phase of life are needed. This study showed the SPF-ILs is valid and reliable for the assessment of adolescents' realisation of well-being needs. The comparison of findings across gender and age groups and over time

provided clear insight into differences in adolescents' realisation of physical (comfort and stimulation) and social (affection, behavioural confirmation and status) needs. These findings can guide efforts to maintain and address the deterioration of adolescents' well-being, as they increase our understanding of unmet well-being needs, especially among adolescent girls.

## Declarations

**Competing Interests** The authors have no competing interests to declare that are relevant to the content of this article.

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