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Reliability of the Addiction Severity Index self-report form (ASI-SR): a self-administered questionnaire based on the Addiction Severity Index composite score domains

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\textbf{ABSTRACT}

\textbf{Objectives:} The Addiction Severity Index (ASI) is a standardized interview used to assess problems associated with substance use. Although widely used, the time required for the interview remains an obstacle to its acceptance in many clinical settings. We examined if a self-administered questionnaire based on the composite score (CS) items, the ASI Self-Report form (ASI-SR), offers a reliable alternative to the ASI in assessing current substance use and related problems.

\textbf{Methods:} Participants were 59 treatment seeking individuals entering outpatient programs at the Addiction Psychiatric Clinic at Uppsala University Hospital who were assessed with Swedish versions of the ASI and ASI-SR. Agreement between the ASI interview’s CS and ASI-SR’s CS was evaluated on the individual basis by intraclass correlation analysis (ICC) and on group level with the Wilcoxon signed rank test. Reliability and internal consistency were evaluated using Cronbach’s alpha.

\textbf{Results:} For 6 out of 7 CS domains, the ICC for the ASI interview and ASI-SR were good to excellent. Internal consistency was acceptable for 6 out of 7 CS domains on the ASI interview and for 5 out of 7 CS domains on the ASI-SR.

\textbf{Conclusions:} The present study suggests that the ASI-SR is a reliable alternative to the ASI interview for assessing current patient functioning and evaluation of problems related to alcohol and drug use.

\textbf{Introduction}

Addiction, hereafter equated with moderate-severe substance use disorder (SUD), is a complex chronic condition that involves impairments in physiological, psychological and social functioning [1,2]. Obtaining valid, quantitative measures of problem severity in these domains allows treatment interventions to be matched to the needs of individuals seeking treatment and makes it possible to evaluate treatment outcomes over time [3,4].

The Addiction Severity Index (ASI) is a standardized semi-structured interview used to assess the severity of problems in seven functional domains associated with substance use: physical health, employment/support status, alcohol use, drug use, legal status, family/social functioning and psychiatric symptoms. The ASI is mostly used in persons with known substance abuse for assessment of the severity of the substance use, and also for identifying other problems that usually are important for deciding upon appropriate setting and content of care [3].

The ASI was developed in the USA by Thomas McLellan and his research team in the 1970s [3]. It was implemented in the USA in the 1980s and after some minor modifications the ASI-5 version was developed [5] which is the most commonly used version of the interview [3,6]. The ASI interview is widely used internationally, in research, for clinical assessment and treatment evaluation [3,6–9]. The ASI is designed to evaluate patients’ recent, past 30 days, and lifetime functional status in the different domains [3,5]. The most commonly used summary measures are the interviewer severity rating (ISR) and the composite score (CS). The ISR measures problem severity on a 10-point scale where the interviewer makes the rating based on current and life-time ‘objective’ items (i.e. items indicating type and frequency of the problem) and ‘subjective’ ASI items (i.e. patient ratings on how troubled or bothered s/he is and her/his rating of need for treatment). The ISR is widely used in clinical settings, even though it can be less reliable than the CS since it requires well trained interviewers [10]. The CS is a mathematically calculated quantitative measure based on combinations of thirty-day questions within specific domains and is suitable for evaluating change over time. The CS is mostly used for research purposes [5].

Several specialized assessment instruments are available to assess severity and treatment needs in specific problem...
domains, but the ASI offers a tool for systematic, multidimensional assessment that can guide treatment efforts, additional diagnostic work, or both. However, the time required to carry out the interview remains an obstacle to its acceptance in many clinical settings. To conduct an interview takes 45–60 min and is followed by 20 min of administrative work [3,11]. In settings where this is considered prohibitive, the real-world alternative is delivery of care that is not systematically personalized i.e. based in individual patient needs, and that is not systematically evaluated for outcomes.

Addiction care delivery often illustrates the dilemma outlined above. Based on the extensive data available, the ASI is recommended by several guidelines and health organizations to be used for assessment of treatment seeking individuals with SUD [12–15]. Despite these recommendations, clinical implementation remains scarce, with staff resource availability being the real or perceived reason.

Self-report of substance use can be reliable if it does not lead to negative consequences for the patient [16–18], and studies imply that self-reported data on socially undesirable behavior are more reliable when assessment is self-administered [19]. Furthermore, while interviewer-administered assessment tools are typically psychometrically superior to self-administered questionnaires under research conditions with trained interviewers [20], adherence to methodological standards is less reliable in regular clinical practice [10,20,21]. A self-administered questionnaire could therefore eliminate the obstacle to systematic, quantitative assessment, with little if any penalty in terms of psychometric performance [20].

Here, we therefore translated the ASI-Self Report form (ASI-SR) [22] to Swedish and adapted it to Swedish conditions. The ASI-SR is a self-administered form based on the CS items, developed to gather information about current problem severity in the different domains covered by the ASI. We hypothesized that the ASI-SR is a reliable alternative to the ASI interview for assessing current substance use and related problems measured by the CS.

Thus, the main objective of the study was to examine agreement between the CS of the domains of the Swedish ASI interview and a Swedish version of the ASI-SR. A secondary aim was to examine the acceptability of the ASI-SR.

Method

Sample

The participants were recruited from individuals referred to or seeking outpatient care at the Addiction Psychiatric Clinic at Uppsala University Hospital between June 2016 and August 2017.

Eligible individuals were ≥18 years of age, Swedish speaking, and had not yet commenced treatment. Exclusion criteria were severe cognitive impairment, intoxication that would limit the reliability of the answers provided, lack of Swedish literacy, and inability to give informed consent.

This study was approved by the Regional Ethical Review Board in Uppsala, Sweden.

Measures

The psychometric properties of ASI are well investigated and it has been found to have satisfactory validity and reliability [3,23]. The Swedish ASI interview is a translation of the ASI 5 and has been revised for language several times. In the latest major revision in 2013 some changes were made to update the interview. For instance, the interview was revised regarding type of drugs and includes screening for common prescription drugs for medical- and non-medical use. In the family/social domain items on problems with loneliness were added [24]. Current functional status is assessed by the CS which can range from 0.0 to 1.0, with a higher score indicating greater problem severity.

The ASI-SR is based on the items used to calculate the CS domain values, with additional instructions for a few questions [22]. In the Swedish version of the ASI-SR, items assessing prescription drugs used as medically prescribed were added to the drug domain, to separate medical from non-medical use, and maintain consistency with the latest version of the Swedish ASI interview [24].

Two additional items were added to the Swedish ASI-SR, pertaining to the respondent’s legal status (item F12 of the ASI and 32 of the ASI-SR and item D17 of the ASI and 33 of the ASI-SR). They were left out of the original English version [22], but are necessary for calculating legal problem severity CS [25].

Finally, for the purposes of this study, three items on acceptability were added. Participants were asked whether it was easy to understand the ASI-SR items, to fill out the form and whether the items were relevant. Response alternatives were Yes, No and No Opinion.

The ASI-SR was translated by one translator to Swedish, and back translated by another independent native speaking professional English translator following the specifications provided by RAND Health [26]. The first Swedish translation was considered to differ too much from the original English version of the ASI-SR when back translated, and a more literal translation was therefore made. This version was then back translated and assessed for correctness by two bilingual individuals with relevant clinical expertise. The Swedish version was then modified to have similar wording of the corresponding items in the in the Swedish ASI interview [24].

We used the Alcohol Use Disorders Identification Test (AUDIT) and the Drug Use Disorder Identification Test (DUDIT) for descriptive purposes. AUDIT is a WHO-recommended sensitive and specific tool for assessment of current alcohol use, widely used within health care settings [27,28]. Cutoff values of 8 and 6 points for men and women respectively indicate hazardous alcohol use and a score of ≥19, indicates alcohol-related problems including dependence [29]. DUDIT is a screening tool for assessment of non-medical drug use. Cutoff values of 4 and 2 points for men and women respectively indicate hazardous drug use [30,31].

Procedures

Participants were recruited randomly from the consecutive influx of patients to the clinic. There was no intended selection due to choice of drug. A sample of 168 persons,
representing about 20% of the eligible patient group, was approached by mail before the first visit to the clinic, given information letters, an appointment for interview, and offered to participate in the study. Immediately prior to the interview the study was explained verbally, a consent form was filled in, and the self-report was distributed.

Of the 168 individuals approached, 59 chose to participate (35%). The most common reasons for nonparticipation (107 individuals) were not showing up for the interview (53%) or canceling the appointment for unknown reasons (41%). Two individuals explicitly declined participation and one was psychotic at the time of the interview and was therefore not included. One individual was excluded because of illiteracy, and one died before the appointment. There was a larger proportion of individuals with illicit substance use among the non-participants than participants (18.3 vs. 6.8%, \( p = 0.04 \)) and a larger proportion of self-referrals among the participants than non-participants (42.4 vs. 13.0%, \( p < 0.001 \)).

When completing the ASI-SR the participants had no assistance from staff. Participants also completed the AUDIT [28] and the DUDIT [31] on the same occasion as the ASI and ASI-SR. All interviews were conducted by the same interviewer, who had appropriate ASI training, and previous clinical experience of conducting ASI interviews. The interviewer was blinded to the participants’ ASI-SR answers while conducting the interviews. The order of the two different ASI assessments was counterbalanced (ASI interview first: \( n = 31 \); ASI-SR first: \( n = 29 \)).

**Statistics**

Statistical analyses were conducted with SPSS (Version 23, IBM SPSS Statistics for Windows, IBM Corp, Armonk, NY). Calculation of the CS followed standard procedures \([5,24,25]\). When calculating the drug CS, only illicit drug use or non-medical prescription drug use were used. Agreement between the ASI interview’s CS and ASI-SR’s CS was evaluated on the individual basis by intraclass correlation analysis (ICC) and on group level with the Wilcoxon signed rank test since data were not normally distributed. For the ICC analyses we chose the strict cutoff values, suggested by Hahn et al. \([32]\), since individual clinical decisions require more precise instruments than research circumstances when the interest is that of differences between groups. The ICC coefficient was considered poor if lower than 0.70, moderate or good between 0.71 and 0.89, and excellent between 0.9 and 1.00. We used average measures ICCs since we were not assuming an interaction effect between raters because the interviewer was blinded to the answers generated in the ASI-SR. Internal consistency was evaluated using Cronbach’s \( \alpha \). The \( \alpha \) coefficient is considered acceptable above 0.70 \([33]\). Descriptive data for ASI CS items is presented as mean and standard deviations.

**Results**

**Participants**

All 59 participants were used in the analysis, with pairwise deletion of missing data. Fifty individuals (85%) answered all items in both the ASI interview and the ASI-SR, the missing data was mainly generated in the ASI-SR.

Fifty percent of the participants reported prior experience of treatment for alcohol problems and 29% for drug problems, with an overlap of 7%, i.e. 28% had no prior experience of SUD treatment.

A majority of the participants were male (66%), had alcohol as their primary drug (63%), had completed high school or higher (75%), were employed (64%) and lived alone (68%) (Table 1).

A vast majority of the participants had hazardous alcohol use (73%) and almost half of the sample (44%) met the criteria for alcohol dependence. Further, 36% had hazardous drug use.

**Agreement**

Data comparing the ASI interview and the ASI-SR CS respectively are presented in Table 2. The ICCs were good to excellent for all CSs except the family/social domain where the correlations were low. ICCs varied from 0.98 for the alcohol CS to 0.61 for the family/social domain. There were no significant differences between the ASI interview and ASI-SR CSs. There were no differences based on whether participants completed the ASI-SR before or after the ASI interview.

**Internal consistency**

The internal consistency measured by Cronbach’s \( \alpha \) is presented in Table 2. Cronbach’s \( \alpha \) for the ASI interview CS domains varied from 0.92 to 0.64 with the highest \( \alpha \) for the alcohol and medical domains and the lowest for the family/social domain. For the ASI-SR CSs, Cronbach’s \( \alpha \) varied between 0.92 for the alcohol domain and 0.50 for the family/social domain. If the item on satisfaction with marital status...
Table 3. Descriptive statistics for items of the ASI and ASI-SR composite score (CS) domains and mean CS for each domain are described in Table 3. There were no differences in mean CS for any of the domains. Participants endorsed more days with some medical problem in the ASI interview than in the ASI-SR. The CS items in the drug section suggested few drug-related problems. Using more than

<table>
<thead>
<tr>
<th><strong>Domains</strong></th>
<th><strong>ASI</strong></th>
<th><strong>ASI-SR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical CS (0–1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Days experienced medical problems (last 30 days) (0–30)</td>
<td>67.8</td>
<td>50.9</td>
</tr>
<tr>
<td>Possession of a valid driver’s license (0–1)</td>
<td>61</td>
<td>61</td>
</tr>
<tr>
<td>Automobile available for use (0–1)</td>
<td>49.2</td>
<td>52.5</td>
</tr>
<tr>
<td>Days paid for work (last 30 days) (0–30)</td>
<td>59.3</td>
<td>57.4</td>
</tr>
<tr>
<td>Money received from employment (last 30 days) (kSEK)</td>
<td>52.5</td>
<td>54.7</td>
</tr>
<tr>
<td><strong>Alcohol CS (0–1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol consumption: moderate use (last 30 days)</td>
<td>78.0</td>
<td>76.8</td>
</tr>
<tr>
<td>Days experienced alcohol problems (last 30 days) (0–30)</td>
<td>61.0</td>
<td>53.4</td>
</tr>
<tr>
<td>Treatment importance for these alcohol problems (0–4)</td>
<td>64.4</td>
<td>64.4</td>
</tr>
<tr>
<td>Money spent on alcohol (last 30 days) (kSEK)</td>
<td>65.5</td>
<td>64.8</td>
</tr>
<tr>
<td><strong>Illicit drug use CS (0–1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heroin use (last 30 days) (0–30)</td>
<td>8.5</td>
<td>8.5</td>
</tr>
<tr>
<td>Methadone/buprenorphine use (last 30 days) (0–30)</td>
<td>15.3</td>
<td>19.0</td>
</tr>
<tr>
<td>Other opiates use (last 30 days) (0–30)</td>
<td>10.2</td>
<td>10.5</td>
</tr>
<tr>
<td>Sedative/hypnotics/tranquillizer use (last 30 days) (0–30)</td>
<td>11.9</td>
<td>13.6</td>
</tr>
<tr>
<td>Cocaine use (last 30 days) (0–30)</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Amphetamines/other stimulants use (last 30 days) (0–30)</td>
<td>8.5</td>
<td>6.8</td>
</tr>
<tr>
<td>Cannabis use (last 30 days) (0–30)</td>
<td>13.6</td>
<td>8.8</td>
</tr>
<tr>
<td>Hallucinogens/ecstasy use (last 30 days) (0–30)</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Use of more than one substance (last 30 days)</td>
<td>18.6</td>
<td>37.5</td>
</tr>
<tr>
<td>Days experienced drug problems (last 30 days) (0–30)</td>
<td>33.9</td>
<td>30.4</td>
</tr>
<tr>
<td>Treatment importance for these drug problems (0–4)</td>
<td>33.9</td>
<td>30.3</td>
</tr>
<tr>
<td>Money spent on heroin, cocaine, and other illegal drugs (last 30 days)</td>
<td>65.5</td>
<td>64.8</td>
</tr>
<tr>
<td><strong>Legal CS (0–4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious driving/racing convictions (last 30 days)</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Serious driving/racing convictions (last 30 days)</td>
<td>3.4</td>
<td>3.4</td>
</tr>
<tr>
<td>Treatment importance for these legal problems (0–4)</td>
<td>37.3</td>
<td>35.7</td>
</tr>
<tr>
<td><strong>Legal situation CS (0–1)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Money received from illegal activities (0–1)</td>
<td>5.1</td>
<td>6.9</td>
</tr>
<tr>
<td>Engaged in illegal activities for profit (last 30 days) (0–1)</td>
<td>8.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Severity of present legal problems (0–4)</td>
<td>6.8</td>
<td>1.9</td>
</tr>
<tr>
<td>Money received from illegal activities (0–1)</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Family/social relationships CS (0–1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Satisfied with marital status (0–1)</td>
<td>79.3</td>
<td>79.3</td>
</tr>
<tr>
<td>Money received from illegal activities (0–1)</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Money received from illegal activities (0–1)</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Psychiatric CS (0–4)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experienced serious depression (last 30 days)</td>
<td>41.4</td>
<td>48.2</td>
</tr>
<tr>
<td>Experienced serious anxiety or tension (last 30 days)</td>
<td>54.2</td>
<td>54.2</td>
</tr>
<tr>
<td>Experienced hallucinations (last 30 days)</td>
<td>6.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Experienced trouble understanding, concentrating, or remembering (last 30 days)</td>
<td>57.6</td>
<td>50.8</td>
</tr>
<tr>
<td>Experienced trouble controlling violent behaviour (last 30 days)</td>
<td>11.9</td>
<td>11.9</td>
</tr>
<tr>
<td>Experienced serious thoughts of suicide (last 30 days)</td>
<td>8.5</td>
<td>11.9</td>
</tr>
<tr>
<td>Attempted suicide (last 30 days)</td>
<td>1.7</td>
<td>3.4</td>
</tr>
<tr>
<td>Prescribed medication for any psychological/emotional problem (last 30 days)</td>
<td>44.1</td>
<td>29.8</td>
</tr>
<tr>
<td>Days experienced psychological or emotional problems (last 30 days) (0–30)</td>
<td>76.3</td>
<td>64.2</td>
</tr>
<tr>
<td>Treatment importance for these psychological or emotional problems (0–4)</td>
<td>76.3</td>
<td>67.2</td>
</tr>
</tbody>
</table>

1Any answer different from ‘zero,’ i.e., ‘more than 0 days’, ‘earning money’, ‘taking heroin’, etc; $p<0.05$; $p<0.01$.
one substance was most common and was more frequently reported when using the ASI-SR than the ASI interview. Most of the participants were troubled by family/social issues according to both the ASI interview and the ASI-SR, reporting a higher degree of being troubled by family/social problems when completing the ASI interview than the ASI-SR. The psychiatric symptom domain indicated that a large proportion of the participants were experiencing psychological or emotional problems. The most common symptoms were anxiety, trouble understanding, concentrating or remembering, and feeling depressed. This was consistent over both formats.

**Participant acceptance**

Participant acceptance was good. Only two participants (3%) did not find the ASI-SR easy to understand, three participants (5%) did not find the ASI-SR easy to complete and one participant (1.5%) did not find the ASI-SR items relevant. Fifty participants (85%) found the ASI-SR easy to understand, 46 participants (78%) found the ASI-SR easy to complete and 40 participants (68%) found the ASI-SR items relevant. The remaining participants were either neutral to, or did not answer, these questions.

**Discussion**

The aim of this study was to examine the reliability of the ASI-SR compared with the ASI interview for assessment of substance use disorders and related problems. Our results suggest that a self-administered form of ASI is a reliable alternative to the ASI interview with respect to all CS domains, except for the family/social domain. Furthermore, participant acceptance was good; the majority found the ASI-SR easy to understand, easy to complete, and relevant.

The ICC coefficient for the ASI interview and ASI-SR CS was good to excellent for six out of seven CS domains. The highest intraclass correlation coefficients were found for the alcohol, drug and employment domains. For the family/social domain the intraclass correlation was low. This could be a consequence of that domain being modified when the Swedish ASI was revised in 2013 [24]. Since then, the domain for family/social of the Swedish ASI version is less consistent with the ASI-SR. An example of this is that respondents are to consider ‘loneliness’ when rating severity and need for treatment when completing the ASI interview, but not when completing the ASI-SR, where only inter-personal relationships and problems are rated.

The low internal consistency for the family/social domains is consistent with previous findings [9,23]. The Cronbach’s α coefficient for the employment domain was consistent with previous findings regarding the employment domain of the ASI interview [9,22,34,35]. The employment domain of the ASI may be less valid in cultural settings outside the USA, for two reasons. First, having a valid driver license or access to a car may be less relevant for the ability to work in other countries [9,23]. Second, a comprehensive social safety net is present in many developed countries but not the USA, making the item ‘receive money for work’ less relevant. Among our participants, some were retired, while others had sickness benefits and therefore did not receive money for work but were not troubled by this and did not want any help regarding their financial support and occupation. This could not be captured by the CS items.

Our results must be interpreted with some methodological limitations in mind. First, the ASI is mostly used in persons who have a substance use disorder. In this study, the participants’ substance use disorder had not yet been clinically established since data was collected before they entered treatment. Even so, 72% had prior experience of SUD care and all participants were referred to, or sought, specialist treatment for SUDs, why we consider our sample to be a SUD population, ranging from early remission to severe SUD. Second, the large proportion of approached eligible persons that did not consent to participate, and the small sample size of comparably well-educated treatment-seeking participants [36], recruited at a single site, limits generalizability. However, compared to other Swedish ASI samples our participants reported similar severity regarding substance use, and psychiatric symptoms, although they reported less problems regarding employment, legal and family and social relationships [36–38]. Concerning our participation rate, it is fairly typical for what is seen in this type of population [39] and recruitment was made consecutively to enable variation in the sample. Fifty-nine participants were considered sufficient to investigate the aim of this study, generating adequate variation and distribution within the sample. To ensure statistical validity we did a posteriori power calculation and with an ICC of 0.85, assuming power (1-β) of 0.80, α = 0.05 and acceptable ICC (φ0) set to 0.70 is achieved, a sample of 53 persons would be sufficient [40].

Third, the ASI interview and ASI-SR were completed on the same occasion, which could bias the responses. Even so, because the order of the questions is not the same in the ASI-SR as in the ASI interview, and the number of items and questions asked in the interview is much larger, we believe this confound is less likely. This is supported by the observation that there was no order effect on the outcomes.

Further, the original ASI-SR is from the year 2000 and changes have been made to the ASI interview since then [6]. In the USA, a new version, the ASI-6, has been developed with new summary scores replacing the CS domains [23,41]. The CS domains have been criticized for statistical weakness, and unsatisfactory psychometrical performance [9]. Nevertheless, the ASI CS domain measures are the most widely reported summary scores [17] and have consistently demonstrated sensitivity to change in substance use [8].

Finally, there was internal attrition because of unanswered ASI-SR items. However, the ASI-SR was tested under strict conditions, where the participants were not allowed to ask any questions about the questionnaire or go back and fill out or change answers after it was submitted. Under less strict circumstances, it would be possible to ask the patients to go back and fill out unanswered questions or help them filling out the form. Even though 15 percent failed to answer...
all items, no specific item had a response rate below 90 percent and the great majority of the participants found the ASI-SR relevant and feasible.

Conclusions
The present study suggests that the ASI-SR is a reliable alternative to the ASI interview for a structured assessment of current patient functioning and evaluation of problems related to alcohol and drug use. With some exception, the consistently high agreement between the ASI and ASI-SR CS domain measures suggest that the ASI-SR captures dimensions similar to those assessed by the ASI interview. The ASI-SR offers an opportunity to overcome the obstacle – real or perceived – to a broad implementation of structured, quantitative assessment of patients seeking treatment for substance use problems in regular clinical care. Broadly implementing this type of strategy is critical for allowing treatment interventions to be matched to individual patient needs, and for evaluating to what extent these interventions result in an improvement.

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Disclosure statement
The authors declare no conflicts of interest.

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Notes on contributors
All authors participated in planning the study, interpreting the results and writing and revising the manuscript, and have given final approval for the version to be published. Hanna Ljungvall was responsible for collecting data and running analyses and had the main responsibility for the writing and revising process.

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