

<b>Outcome Measure</b>	<b>Sydney Psychosocial Reintegration Scale – Children (SPRS-C)</b>
<b>Sensitivity to Change</b>	Yes
<b>Population</b>	Paediatric
<b>Domain</b>	Social Role Participation and Social Competence
<b>Type of Measure</b>	Self-report/parent-report
<b>ICF-Code/s</b>	d710-d729
<b>Description</b>	<p>Since initial publication of the categorical version of the <b>Sydney Psychosocial Reintegration Scale (SPRS)</b> in 1989, there have been many scales of psychosocial functioning developed for people with TBI (see reviews in Tate, 2010; Tate, in press).</p> <p>An advantage of the SPRS in comparison with other scales is that it explicitly measures change from the pre-injury level. This rating format is the method of choice in many situations, both for clinical practice, as well as research, and directly addresses handicap or participation restriction. Respondents, such as family members, can readily relate to the response format and scores are easily interpreted. The individual with TBI thus becomes his or her own control, and this bypasses the need for normative data required to validly interpret scores on some scales. Moreover, scales reliant upon normative data are only able to provide information about the individual relative to the general population, and are not able to indicate whether there has been any change in an individual’s level of functioning from an earlier (viz. pre-morbid) time. As we previously concluded, “having two versions of the scale with comparable item content and scoring format, but with a different focus (change from the pre-morbid level and current competency), gives the SPRS a distinct advantage over other scales that do not have this feature” (Tate et al., 2004, p.543).</p> <p>The SPRS is frequently used in clinical and research studies, particularly in Australia. This includes its application in the following ways:</p> <ol style="list-style-type: none"> <li>1. an outcome measure (Draper, Ponsford, &amp; Schönberger 2007; Ownsworth, Turpin, Carlson &amp; Brennan 2004; Ownsworth, Fleming, Strong, Radel, Chan &amp; Clare, 2007, Ownsworth &amp; Shum, 2008; Fleming, Kennedy, Fisher, Gill, Gullo &amp; Shum, 2009)</li> <li>2. in intervention research (Bornhofen &amp; McDonald, 2008a, 2008b; Fleming, Shum, Strong, &amp; Lightbody, 2005; Fleming, Kuipers, Foster, Smith, &amp; Doig 2009)</li> <li>3. in predictive and correlational studies (Gould, Ponsford, Johnston &amp;</li> </ol>

	<p>Schönberger, 2011; Kervick &amp; Kaemingk, 2005; Ownsworth &amp; Fleming, 2005; Whelan-Goodson, Ponsford &amp; Schönberger, 2008; Winkler, Unsworth &amp; Sloan, 2006; Wise, Ownsworth &amp; Fleming, 2008).</p> <p>The <b>Sydney Psychosocial Reintegration Scale – Children (SPRS-C)</b> is suitable for children between 5 &amp; 16 years of age (Soo et al. in preparation). The scale has been adapted from the adult version (Tate et al, 1999) to a child-appropriate form. The SPRS-C is appropriate for child self-ratings or parents are able to complete the scale on behalf of their children. The SPRS-C investigates psychosocial function by addressing participation in the following domains of everyday functioning commonly disrupted after TBI:</p> <ul style="list-style-type: none"> <li>(1) school / leisure (occupational activities),</li> <li>(2) interpersonal relationships (with friends, parents and siblings) and</li> <li>(3) living skills (social skills and home living).</li> </ul> <p>The scale consists of 12-items, with higher scores indicating better psychosocial outcome. The items are rated on a 4-point scale ranging from very good (4) to very poor (0) and request a comparison to children of the same age.</p> <p>An adolescent version of the scale has been developed (Newitt, 2002) and used in research studies (Anderson, Brown, Newitt &amp; Hoile, 2009; Anderson, Brown &amp; Newitt, 2010; Anderson, Brown, Newitt &amp; Hoile, 2011; Muscara, Catroppa &amp; Anderson, 2008). In further development it has been adapted for children (referred to as SPRS-C; Soo et al., in preparation), suitable for those between 5 and 16 years of age. The adaptation focused on <u>Form B</u> evaluating ‘current status’, using parent and self-report versions. A number of items were reconfigured to accommodate developmental stages in children (E.g., item 5 in the adult version “How do you rate your relationship with your spouse?” was replaced with “How do you rate your relationship with your parents/caregiver?”), and the rating scale also uses a developmental criterion, performance being compared with children of the same age. Normative data for the SPRS-C have been collected for the parent version of Form B in approximately 200 children aged between 5 and 14 years.</p>
<b>Properties</b>	<p><b>FORMS OF THE SCALE</b></p> <p>The SPRS has two forms:</p> <ul style="list-style-type: none"> <li>1. Form A examines changes that have occurred since the injury; and</li> <li>2. Form B examines current status of functioning.</li> </ul> <p>Selection of Form A or Form B will usually be determined by the reason for collecting the information. There are no hard and fast rules, but Form A may be appropriate in circumstances when a comparison with the person’s pre-morbid lifestyle is required, particularly in the early to medium term</p>

after the injury. Alternatively, Form B may be more appropriate in circumstances where the injury occurred a long time ago and so comparison with the pre-morbid lifestyle is not so relevant. Rather, it may be more helpful to have information regarding the current level of functioning. Additionally, in situations such as program evaluation, it may also be more appropriate to take measures of 'current status' as provided by Form B at two independent points in time.

### **RESPONSE FORMATS FOR THE SCALE**

Three response formats of each form of the SPRS are available:

1. Self ratings – designed for self-administration by the injured person;
2. Informant ratings – designed for administration to someone who knew the person well both before and after the injury, such as a close relative; and
3. Clinician ratings – designed for ratings to be made by a clinician.

### **ADMINISTRATION PROCEDURES**

Administration is generally conducted by a clinician in a face-to-face interview with an informant / patient. Alternatively, clinicians can make ratings based on their knowledge of the patient. The SPRS can also be independently completed by informants or patients, although as previously noted it is not suitable for people with significant degrees of cognitive impairment affecting memory, judgement or awareness.

SPRS administration is very straight forward. It takes about 15-20 minutes when administered to a relative of a person with TBI, and about the same amount of time for a person with such an injury. Sometimes some of the items may prompt a person to talk about issues surrounding the particular item, and in this case administration time may be longer; sometimes respondents need to be redirected back to the questionnaire. When clinicians use the SPRS to rate individuals they know well, without direct interview, the scale takes less than 5 minutes to complete.

Generally, respondents take a few items to catch onto the administration format of the SPRS, but quicken as they get used to the response format, which is the same for every item. The clinician usually works through the SPRS with the respondent, so that they can answer any questions, or can

be helped if they seem to be getting stuck. In administering the SPRS, however, it is important that it is the respondent who selects the answer that most closely corresponds to their situation. One assists the respondent in completing the SPRS when necessary by rephrasing the question, or helping them to narrow down the alternative responses, but not by suggesting a response for them.

Like all test instruments, it is important that rapport is established with the respondent before commencing administration. And also, that rapport is maintained. Very occasionally, a respondent may become distressed. If this occurs, it is best to stop and check out how they are feeling. You may say something like: "I can see that this question is making you upset. Do you want to talk about it more?" Or it could be appropriate to suggest something along the lines of: "It seems that there are a lot of issues arising from these questions. Perhaps when we are finished this task we can discuss these further or work out a plan of action" and so forth. In other words, it is important to use clinical judgement in administering the SPRS and acknowledge and meet the respondent's needs. In the vast majority of instances, however, people complete the SPRS without difficulty or distress.

### **SCORING PROCEDURES**

In the past, the traditional method of scoring the SPRS has used the summation of raw scores. This method, however, is subject to the limitations of ordinal data, which is the level of measurement produced by many instruments in the behavioural sciences, particularly those using likert-type rating scales, as in the SPRS. Our recent work has used logit scores derived from Rasch analysis (Tate et al., 2011). An advantage of logit scores is that they provide data at the interval level of measurement, and interval level data are appropriate for use in parametric statistics. Thus it is advised that when using the SPRS total score, the raw scores are converted to logit scores.

In the published literature on the SPRS, three types of scores have been used and these may be useful for comparability purposes:

1. Summation of scores: The most common method of scoring the SPRS uses the simple summation of scores (even though this transgresses assumptions for ordinal-level data). Items are summed to obtain a total SPRS score (range 0-48), and the four items for the individual domain scores for occupational activity, interpersonal relationships, and independent living skills (range 0-16 for each domain). Higher scores reflect

better levels of functioning. As noted, total scores can be converted to Rasch logit scores which provide interval-level measurement (see Table 1 above).

2. Mean scores: In clinical practice, the total and domain scores can be anchored back to the original descriptors by dividing the total score by 12 and each of the domain scores by 4. The resulting score will then range from 0 to 4 and correspond to the rating scale (0=extreme change/extremely poor to 4=no change/very good).

This procedure enables the SPRS score to be readily interpreted in relation to the rating scale, and is the procedure that Kervick and Kaemingk (2005) used with the SPRS. For example, Patient A has a total SPRS-2 score of 28/48, corresponding to a mean score of 2.3/4 on the rating scale, which falls between 'a little' and 'a moderate' degree of change.

3. Score bands: In our previous clinical and research work with Form A (Lammi, Smith, Tate & Taylor, 2005) we have also grouped the total and domain scores into three broad bands. Using the SPRS-2, these groupings correspond to the following: average scores 0 to 1 = major change/poor outcome, average scores 2 to 3 = some change/limited outcome, and average score 4 = no significant change/good outcome. Thus, Patient A's mean score of 2.3/4 on the SPRS-2 is equivalent to 'some change' or 'a limited outcome'.

4. Reliable change index: When a person is assessed on multiple occasions, use of the reliable change index provides a rigorous test of whether a change in scores is reliably different. Logit scores derived from the Rasch analysis on Form A were used to calculate the minimum difference (in logit scores) required to determine whether a change in scores in an individual patient/client (either improvement or deterioration) was statistically significant. Calculation of the reliable change index for Form A (change since injury) is described in detail in Tate et al. (2011). The reliable change index formula 4 of Ley (1972; see Perdices, 2005 for review of reliable change index formulae) was applied to the Rasch- derived logit scores for the SPRS-2. The minimum difference of 8.23 logit scores is required to establish whether a change in scores is reliable. We use the logit score of 8.23 for both Form A and Form B.

The procedure is very easy to apply: first convert the Time 1 SPRS-2 total raw score to a logit value, using Table 1 and add the constant of 8.23. This new logit score is the minimum score required to determine whether the change in score is reliable. Then convert the Time 2 SPRS-2 total raw score to a logit value, using Table 1. If the Time 2 score exceeds the minimum difference score (i.e., Time 1 score + 8.23), then the change in score is

significant.

The following two examples demonstrate the application of the procedure:

**Example 1:** At Time 1, Patient A has a SPRS-2 total score of 28. Consulting the table, a SPRS-2 raw score of 28 corresponds to 51.18 logits. When assessed on the SPRS-2 at Time 2, Patient A scored 35, corresponding to 58.01 logits. The required minimum score, however, is 59.41 logits (i.e.,  $51.18 + 8.23$ ), and thus we conclude that the SPRS-2 improvement of 7 points was not a reliable change.

**Example 2:** At Time 1, Patient B has a SPRS-2 total score of 45, corresponding to 77.25 logits. At Time 2, Patient B scored 47, corresponding to 88.8 logits. The required minimum difference is 85.48 logits (i.e.,  $77.25 + 8.23$ ), and thus we conclude that the improvement of 2 points was a reliable change.

These two examples demonstrate the importance of using logit scores which provide an interval level of measurement – at the extremes of the scale a smaller minimum difference of raw scores is required to demonstrate reliable change than in the mid ranges of the scale. Patient B who scored highly on the SPRS-2 at Time 1, with a raw score of 45 (out of a possible 48), required a change of only 2 SPRS-2 raw score points to meet requirements for reliable change, but Patient A who scored in the mid range of the scale at Time 1, with a raw score of 28, required a change of 9 SPRS-2 raw scores to meet requirements. Thus Patient B's SPRS-2 raw score change of 2 was reliable, yet Patient A, who had a numerically higher SPRS-2 raw score change of 7 points, did not demonstrate reliable change.

### **PSYCHOMETRIC PROPERTIES (for SPRS)**

Initial studies to date, using the 7-point rating scale and seven independent samples from multiple centres in Australia, indicate that the SPRS has very good psychometric properties. Results from Samples 1 and 2 are reported in Tate et al. (1999). Results from Sample 3 are reported in Tate et al. (2004), from Sample 4 in Tate et al. (2011), from Sample 5 in Simpson, Secheny, Lane-Brown, Strettles, Ferry and Phillips (2004), from Sample 6 in Kuipers, Kendall, Fleming and Tate (2004), and from Sample 7 in Tate, Cameron, Winstanley, Myles and Harris (2004).

Psychometric properties in other neurological groups are reported in De Wolf, Lane-Brown, Tate, Middleton & Cameron (2010) for spinal cord injury and in Tate, Simpson, Lane-Brown, Soo, De Wolf and Whiting (in submission) for primary brain tumour.

**Sample 1** examined Form A (Change since Injury), using clinician interviews

of 40 close relatives of people with TBI recruited from Liverpool Hospital and who were living in the community.

- Internal consistency was high, with Cronbach's alpha coefficient = 0.90; although internal consistency of the individual domains was more variable: Occupational Activity  $\alpha=0.89$ , Interpersonal Relationships  $\alpha=0.69$ , Living Skills  $\alpha=0.77$
- Ratings from different clinicians showed high inter-rater agreement, both for the total score (ICC=0.95), as well as the three domains ranging from ICC=0.86 for Interpersonal Relationships to ICC=0.94 for Living Skills
- Temporal stability over a one-month period was high, both for the total score (ICC=0.90), as well as the three domains ranging from ICC=0.77 for Interpersonal Relationships to ICC=0.93 for Occupational Activities
- Concurrent validity was established with standard instruments, for example,
  - $r_s = -0.77$  with the 8-level Glasgow Outcome Scale (Jennett et al., 1981)
  - $r_s = -0.85$  with the London Handicap Scale (Harwood et al., 1994)
  - $r_s = 0.76$  with the Katz Adjustment Scale – Form R2 (Katz & Lyerly, 1963)
  - Kuipers et al. (2004) reported a correlation coefficient of  $r=0.60$  between the SPRS and Community Integration Questionnaire (Willer et al., 1993)
- Construct validity was established with the Sickness Impact Profile (SIP) (Bergner et al., 1981). Convergent validity was demonstrated by high association between hypothesised similar constructs, such as the Psychosocial Dimension of the SIP and Interpersonal Relationships domain of the SPRS ( $r_s = -0.76$ ,  $p < 0.001$ ). Divergent validity was demonstrated by low and non-significant association between hypothesised dissimilar constructs, such as the Physical Dimension of the SIP and Interpersonal Relationships domain of the SPRS ( $r_s = -0.23$ ,  $p > 0.05$ ).
- Group differences were found among Glasgow Outcome Scale subgroups on the SPRS scores, both between Good Recovery and Moderate Disability subgroups ( $U = 28.0$ ,  $p < 0.001$ ), as well as

between Moderate Disability and Severe Disability Subgroups ( $U = 52.0, p < 0.03$ ). See Figure 1 below.

**Sample 2** examined Form A (Change since Injury), using clinician ratings of 20 patients at admission to and discharge from the Liverpool Hospital brain injury inpatient rehabilitation program.

Responsiveness of the SPRS was demonstrated by significant improvement of the scores between admission and discharge ( $z = -3.82, p < 0.001$ ).

**Sample 3** examined the comparability between Form A (Change since Injury) and Form B (Current Status), using clinician ratings of 66 people being discharged from the Liverpool Hospital inpatient rehabilitation unit after brain injury. The psychometric properties of Form B were comparable to those reported for Form A using Sample 1. Additionally, the very good psychometric properties reported for Form A in Sample 1, were also replicated in Sample 3 using Form A. For Form B:

- Internal consistency was high, with Cronbach's alpha coefficient = 0.90
- Inter-rater reliability was high, both for the total score ( $ICC = 0.84$ ), as well as the three domains ranging from  $ICC = 0.63$  for Occupational Activities to  $ICC = 0.82$  for Living Skills
- Temporal stability over a one-week period was high, both for the total score ( $ICC = 0.90$ ), as well as the three domains ranging from  $ICC = 0.76$  for Interpersonal Relationships to  $ICC = 0.93$  for Living Skills
- Concurrent validity was established with relatives' ratings on the SPRS and London Handicap Scale ( $r_s = -0.71$ )
- Comparability with Form A was excellent ( $ICC = 0.97$ )
- Comparability between relative and clinician ratings was good ( $ICC = 0.67$ )

The similarly good psychometric properties reported for Form A in Sample 1 were documented in Sample 3, with:

- high internal consistency (Cronbach's alpha coefficient = 0.90)
- high interrater agreement (total score  $ICC = 0.82$ )
- high stability over a one-week period (total score  $ICC = 0.90$ )

**Sample 4** examined group comparisons for Form B between healthy controls ( $n = 105$ ) and a TBI community sample ( $n = 150$ ) using the 5-point

	<p>SPRS. Significant differences were found, with the mean scores indicating that the TBI group experienced more difficulty with psychosocial functioning than did the healthy controls. This was the case for the total score (<math>z=-6.41</math>, <math>p=0.000</math>), and each of the domains (Occupational Activity <math>z=-8.48</math>, <math>p=0.000</math>; Interpersonal Relationships <math>z=-4.58</math>, <math>p=0.000</math>; and Living Skills <math>z=-2.18</math>, <math>p=0.03</math>).</p> <p><b>Sample 5</b> comprised 50 people with TBI who were assessed before and after participation in the Liverpool Hospital transitional living program. Significant changes were observed on the total score and all domains. The effect sizes were large (<math>d&gt;0.8</math>) for the total score and two of the three domains, providing further evidence of the responsiveness of the SPRS.</p> <p><b>Sample 6</b> examined the underlying structure of the SPRS in a community sample resident in Queensland (<math>n=91</math> people with acquired brain impairment and <math>n=121</math> proxy respondents). Results of multidimensional scaling identified a two- dimensional solution. Items 1 to 5 and item 7 contributed to the dimension of Productivity versus Personal Life and items 6, and 8 to 12 contributed to the second dimension: Independent versus Dependent.</p> <p><b>Sample 7</b> examined the measurement model of the SPRS using path analysis with the AMOS statistical package<sup>5</sup>. Data were used from a state-wide, inception cohort of 144 people with TBI recruited from the 11 specialist adult brain injury rehabilitation units in New South Wales, and followed-up at 18 months post- trauma. Item analyses revealed that no items showed restriction of range and Cronbach alpha coefficients were high for the total score (0.90), and ranged from 0.76 to 0.87 for the domains. The measurement model for the three subscales produced very good fit statistics for the measurement models.</p>
<b>Advantages</b>	<ol style="list-style-type: none"> <li>1) Australian norms</li> <li>2) Strong psychometric properties of the SPRS</li> <li>3) Explicitly measures change from the pre-injury level</li> </ol>
<b>Disadvantages</b>	Still awaiting publication
<b>Additional Information</b>	<p>The SPRS is most appropriate for people with acquired brain impairment who are living in the community, although it can be used at any stage post-trauma, including in the earlier post-acute stages of recovery (E.g., inpatient rehabilitation). In the post-acute stages, however, some of the items may be difficult to rate because of lack of opportunity (E.g., item 11: travel around the community). Nonetheless, early administration can provide a comparison standard against which functioning at a later stage can be compared (and in such a case Form B (current status) may be more appropriate than Form A (change since injury)).</p>

<b>Reviewers</b>	Vicki Anderson Cathy Catroppa
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**In submission:**

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