MANUAL FOR THE CARE AND NEEDS SCALE (CANS)

Updated version 2 (July, 2017)

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Tables and Figures

Acknowledgements

This manual is an update of the 2011 manual for the Care and Needs Scale (CANS). Since that time we have undertaken further psychometric study of the CANS and updated the recording form. The CANS was developed to address a gap in the availability of a psychometrically sound measure that was able to capture the unique type of support needs experienced by people with traumatic brain injury. Because the nature of disability after traumatic brain injury is commonly manifest in the psychosocial domain, it is less readily apparent than is physical disablement. Consequently, disability after traumatic brain injury is often unrecognized and/or underestimated.

Over the years clinicians and researchers alike have found the CANS to be a valuable instrument to document care and support needs, as well as to plan and implement services and supports to meet these needs. Statutory authorities, such as the Lifetime Care and Support Authority of New South Wales, Australia (now icare lifetime care) have also found the scale useful in costing care for participants.

I thank lifetime care for their interest in the CANS and the Motor Accidents Authority of New South Wales for financial support during 2004-2006 to conduct a comprehensive set of psychometric studies. I am especially grateful to Dr Cheryl Soo, Project Manager of the multi-centre studies. Her expertise and high standards ensured that the seven psychometric studies were conducted in an exemplary manner. Appreciation is expressed to my clinical colleagues in the three Brain Injury Rehabilitation Units in Sydney: Kate Hopman, Marcella Forman, Tanya Secheny, Dr Grahame Simpson and Lauren Gillett from the Liverpool Hospital service; Vanessa Aird, Dr Stuart Browne, Dr Carissa Coulston, Belinda Carr (née Armstrong), Jeanine Allaous, and Dr Clayton King from the Royal Rehabilitation Centre Sydney service; and Dr Kathy McCarthy, Dr Joe Gurka, Jill Hummell, and Louise Diffley from the Westmead Hospital service. Additionally, at times when data collection got out of hand for the psychometric studies, Bridget Myles and Joe Hanna came to the rescue.

During 2004, a working party of clinicians and administrators met on multiple occasions to assist in developing operational definitions for the items from the Needs Checklist. I thank Dr Cheryl Soo, Suzanne Lulham, Neil Mackinnon, Dr Mary-Clare Waugh, Marcella Forman, Vanessa Aird, Claire Forshaw, Dr Carissa Coulston, Jill Hummell, Lindy Williams, Skye Croudace, Louise Marr and Barbara Strettles for their expert advice.

A further study was conducted during 2015-2017 to sub-divide Level 4 of the CANS, and the updated manual contains information from this most recent study. Funding for the project was provided by lifetime care. The task of the study was an overtly simple one, but the technicalities proved to be complex. lifetime care staff facilitated the project, and thanks are due to Suzanne Lulham, Felicity Wotton, Rosie Kettlewell, Megan McDonald, and Jimmy Cvetanovski. Funding provided by lifetime care enabled us to assemble an excellent research team, and I was most fortunate to have Donna Wakim as project manager who oversaw the day-to-day conduct of the project with characteristic skill, competence, high standards, and great attention to detail. As data manager, Ulrike Rosenkoetter reined in the data which was often a daunting undertaking. Data extraction was undertaken with great care and accuracy by Dr Kathryn Higgins, Keri Lockwood, and Dr Kumar Ramakrishnan, as was the data synthesis stage by Michelle Genders. Finally, I am most grateful to Professor John Walsh who provided expert and valued advice at critical stages throughout the project.

RLT
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Background and development

The Care and Needs Scale (CANS; Tate, 2004) is an 8-level categorical scale that is designed to measure the level of support needs of older adolescents and adults with traumatic brain injury. It is intended to be administered by health professionals with experience working in a rehabilitation setting with people with brain injury. The CANS is suitable for people who are 16 years of age and older. A paediatric version of the scale (PCANS-2; Soo, Tate, Williams, Waddingham, & Waugh, 2008; Tate, Soo, & Wakim, 2014) is available for age ranges 5 to 15 years.

Development of the CANS and its conceptual framework has been described elsewhere (Tate, 2004; 2010). In brief, the impetus to develop the CANS arose because there were no suitable scales that adequately measured the variety and extent of support needs experienced by people with traumatic brain injury. It was constructed in accordance with current conceptualisation underlying International Classification of Functioning, Disability and Health (ICF; WHO, 2001). Items from the Needs Checklist map to eight of the nine domains from the Activities/Participation component of the ICF (all domains except d1: learning and applying knowledge). The Support Levels map to three of the five Environmental Factors: e1: products and technology, e3: supports and relationships, and e5: services, systems and policies. The Needs Checklist and Support Levels were derived from the author's clinical and research experience, along with the literature on published scales of disability and outcome. Various configurations of Support Levels were trialled with a group of 67 people with traumatic brain injury, the final version of eight levels being the most clinically informative.

Research findings on the psychometric properties of the CANS are summarised in Tate (2010). It has now been extensively examined and shows excellent levels of inter-rater and test-retest reliability, along with substantial evidence supporting its criterion and construct validity (see Tate, 2004; Soo, Tate, Hopman, Forman, Secheny, Aird, Browne & Coulston, 2007; Soo, Tate, Aird, Allaous, Browne, Carr, Coulston, Diffley, Gurka & Hummell, 2010). Results of these studies are summarised on pages 20 to 22 of this manual.

After the CANS had been in use for several years it became apparent that there was a wide variation in care needs of people scored a CANS level 4. This is understandable given that people who score a level 4 require support daily but within a wide range up to 11 hours per day. Further research was conducted in 2017 resulting in the sub-division of Level 4 into 3 sub-categories (summarized on pages 22 to 23). It was timely then to also make some minor revisions to the score form to make the terminology more person-centred and to facilitate comprehensive completion of the record form. These updates are reflected in this version of the manual.

Scale description

The CANS comprises two sections: a Needs Checklist and Support Levels. (The CANS recording form is reproduced in the Appendix on page 25). The checklist of items (Needs Checklist) that underpins the Support Levels samples the types of activities that research studies and clinical experience have shown are most frequently disrupted after a traumatic brain injury. The two sections are described in more detail below.

Section 1: Needs Checklist – for evaluating the type of care and support need
(Left hand column of the recording form) This 28-item checklist covers the type of care and support need. This ranges from very basic needs (e.g., tracheostomy management, eating) through to instrumental activities of daily living (e.g., domestic) and social participation activities. The focus of the checklist is on functional activities, rather than impairments. See pages 6 to 9 for more details and operational definitions.

Section 2: Support Levels – for assessing the length of time that can be left alone
(Right hand column of the recording form) This section covers the extent, intensity and frequency of care and support need. A rating is made in one of eight categories, which range from very high levels of care and support needs (e.g., 'cannot be left alone', 'can only be left alone for a few hours') to very low levels (e.g., 'can be left alone for more than a week', 'is completely independent'). See page 10 for more details.

Section 1: Needs Checklist - Type of care and support need

In this section (left hand column of the recording form) there is a 28-item Needs Checklist and each of the items is operationally defined on pages 6 to 9. The checklist items are roughly classified into a hierarchy of five groups (A to E) representing decreasing levels of support needs:

Group A
tracheostomy management
nasogastric/PEG[1] feeding
bed mobility (e.g., turning)
wanders/gets lost
exhibits behaviours with potential to harm self or others
difficulty communicating basic needs
continence
eating and drinking
transfers/mobility (including stairs and indoor surfaces)
other

Group B
personal hygiene/toileting
bathing/dressing
preparation of light meal/snack
other

Group C
shopping
domestic, including preparation of main meal
medication use
money management
everyday devices (e.g., telephone, television)
transport and outdoor surfaces
parenting skills
interpersonal relationships
leisure and recreation
employment/study
other

Group D
informational supports (e.g., advice)
emotional supports
other

A final group caters to those people who do not have care or support needs:

Group E
Does not require supports

[1] Percutaneous endoscopic gastronomy

Operational definitions and activities involved in the 24 Specific Needs Checklist items[2]

The following operational definitions of support activities that may be required were developed by the CANS Research Team:

1. Tracheostomy management: This is primarily for dysphagia.

Operational definition of support activities that may be required: preparation for suction, suction process, dressings, cleaning equipment, equipment changes, apply speaking valve (NB: in patients exhibiting agitated behaviour observation may also be required to prevent patient pulling tube out)

2. Nasogastric/PEG feeding: This is primarily for feeding and insertion of fluids for nutrition and/or medication.

Operational definition of support activities that may be required: preparation of fluids/bolus/medications, set up, insertion of fluids, monitoring and prevention of aspiration, flushing, cleaning equipment (NB: in patients exhibiting agitated behaviour observation may also be required to prevent patient pulling out tube; activities may also include PEG wound management in situations where this is required), recording of intake and status

3. Bed mobility: This is primarily for turning and positioning to prevent pressure sores.

Operational definition of support activities that may be required: preparation (splints off and on, hoisting in bed up and down), turning, positioning in bed/chair, use of pressure care mattress and/or cushions (NB: if person has a pressure wound, then management of this complication will also be required)

4. Wanders/gets lost: People designated as those who wander are at risk and they generally require full-time monitoring and supervision.

Operational definition of support activities that may be required: observation, ensuring safety at all times possibly within a restricted area, management of instances when the person becomes unsafe or leaves a safe area, recording of observations

5. Exhibits behaviours with potential to harm self or others[3]: This refers to people currently exhibiting behaviours daily that are of sufficient severity to cause harm to self or others. It includes (but is not restricted to) physical aggression (e.g., hitting, biting, throwing things), impulsive behaviours (e.g., regularly crossing road without caution, regularly turning on water that is too hot), emotional distress (e.g., suicide ideation, major depressive episodes, post-traumatic psychoses). These disorders will either be observed directly or identified via assessment.

Operational definition of support activities that may be required: observation, recording, developing and implementing interventions such as a behavior support plan, dealing with crises

6. Difficulty communicating basic needs: This primarily applies to people who have difficulty expressing their basic needs (when the person is hungry or thirsty, needs to go to the toilet, wants to have a shower, or is tired and wants to rest), including (but not restricted to) people requiring augmented communication devices, those who have severe speech impairment or are unable to initiate speech.

Operational definition of support activities that may be required: attention and response of communication recipient during, at minimum, basic activities of daily living (daily bath/shower, 5 toiletings, 3 meals and snacks, retiring to bed)

This item does not reflect care activities for people with higher level communication difficulties.

[2]There are 28 items in the Needs Checklist on the CANS score form. Four of these items are "Other" which are not included in this list of definitions. These "Other" items occur for items 10, 14, 25 and 28

7. Continence: This refers to the person's bladder and bowel control.
Operational definition of support activities that may be required:
a) For those people on a structured continence program: toilet timing, preparation (e.g., positioning the person, use of a hoist) wiping, cleaning, dressing, recording instances of toileting
b) For those whose impairments are too severe for a continence program (e.g., those in a minimally conscious state): monitoring and changing adult toileting hygiene products, requiring wiping, cleaning, dressing; management of leg-bag (e.g., from supra-pubic catheter, uridome) may need drainage, bowel care (e.g., enemas) may be required
c) A minimal continence program such as reminders to prevent continence accidents

8. Eating and drinking: This refers to activities directly involved in the process of eating and drinking including cutting food, bringing food and drinks to the mouth, chewing, swallowing, finishing a meal. It does not include preparation of the meals or cleaning up the kitchen (rate under Domestic, item 16), nor shopping for food items (rate under Shopping, item 15).
Operational definition of support activities that may be required: set-up, assistance to eat and/or drink, supervision, cueing and monitoring, cleaning the mouth after eating, clearing crockery and cutlery after the meal

9. Transfers/indoor mobility: This refers to activities to assist with transfers and indoor locomotion.
Operational definition of support activities that may be required:
supervision, prompting or assistance with transfers – in and out of chair, bed, bath, toilet and other activities each day (e.g., therapy, shopping, recreational activity). Transfers may involve operation of a hoist, or the assistance of 1 or 2 people.
Prompting, supervision or assistance with indoor mobility – including assistance with stairs, supervision of movement around house, pushing wheelchair

11. Personal hygiene and toileting: This refers to activities including grooming (shaving, combing hair, applying make-up), cleaning teeth, toileting, arranging clothes for toileting, wiping, period management for women, washing face and hands, cutting nails.
Operational definition of support activities that may be required: set-up, reminding, assisting in the conduct of the activities, supervision and monitoring

12. Bathing/dressing: This refers to activities involved in bathing/showering the body and washing hair and dressing the body.
Operational definition of support activities that may be required: set-up, assisting in the conduct of the activities, supervision and monitoring, reminding to perform activities regularly

13. Preparation of light meal/snack: This refers to preparation of snacks and light meals (breakfast, morning tea, lunch, afternoon tea, supper). NB: preparation of the main meal is rated under item 16, Domestic
Operational definition of support activities that may be required: preparation of the food, set-up, supervision, cueing

15. Shopping: Refers to shopping for food, clothes, linen, gifts, whitegoods, furniture, stocking of continence items, equipment, liaising with Trustee and/or Guardian to release funds for purchases, getting quotes for items etc.
Operational definition of support activities that may be required: assistance in generating lists, supervision, completing the activity on behalf of the person. Does not include transport to and from the shopping area, which should be rated separately under item 20, Transport

16. Domestic incl. preparation of main meal: This refers to activities involved in maintaining the home with a clean and orderly environment: cleaning rooms of the house, including vacuuming/sweeping/washing floors, washing/drying/putting away dishes and cooking utensils, washing/ironing/putting away clothes, cleaning bathroom/toilet, putting out garbage; repairs to house interior and exterior, gardening, washing car, etc., as well as preparing the main meal of the day.

Operational definition of support activities that may be required: assistance with planning, prompting, reminding, supervision of these activities or someone else needing to perform these activities because the person needing care is unable to do them. Planning, preparing and cooking main meal

17. Medication use: This refers to administration of tablets, injections, nebulizers, wound management, ointment etc (NB: dressings for tracheostomy and nasogastric tubes are rated in Items 1 and 2 respectively).

Operational definition of support activities that may be required: administration, supervision, crushing tablets, memory prompts, physical assistance (upper limb manipulation, visual impairments), wound dressings, 4 hour nebulizer, checking blood-sugar levels for insulin, etc

18. Money Management: This refers to activities involving financial matters including handling money (e.g., change from purchases), budgeting, reviewing and payment of bills.

Operational definition of support activities that may be required:, organising and/or performing ongoing management of finances, specific management strategies and close liaison with those with special needs (e.g., the person might be impulsive or reckless with their spending, poorly judged expenditures, clients easily taken advantage of etc., all of which result in their financial affairs being in jeopardy)

19. Everyday devices: This refers to operation of everyday devices including operating TV, phone, video, computer, computer tablet, setting the alarm, using an automatic teller machine. Also included are management of environmental controls, wheelchair maintenance, operating hoist, bed, patching air mattress, other assistive technology

Operational definition of support activities that may be required: prompting, supervision, assistance with these activities or operating devices on behalf of the person

20. Transport and outdoor surfaces: This refers to outdoor mobility and getting to and from destinations. Does not include the activity/work at the destination itself.

Operational definition of support activities that may be required: prompting, supervision and assistance with outdoor mobility or using transportation. Assistance with planning a journey, supervision when using public transport or mobilising outdoors, driving the person

21. Parenting skills: This refers to care that parents provide to look after children and adolescents including play, discipline, provision of physical needs (especially for children aged under 2 years), guidance, education and liaison with child care or school. For adolescents: advice, sex education, modelling appropriate behaviour and role-play scenarios.

Operational definition of support activities that may be required: supervision or assistance of parenting role, counselling, or another person having to perform parenting role

22. Interpersonal relationships[3]: This refers to relationships with a) partner, b) family, c) friends and, d) other e.g., work colleagues and neighbours. These relationships may be within the context of: i) work/school, ii) home and, iii) leisure and social activities.

Operational definition of support activities that may be required: education, developing and implementing a plan to address difficulties, counselling, implementing social skills programme, modelling, conflict resolution

23. Leisure and recreation: This refers to activities such as interests, hobbies, social gatherings and outings.

Operational definition of support activities that may be required: support whilst engaged in, monitoring of, assistance to initiate or set up these activities

24. Employment/education: This refers to situations where employment and/or study is an option including paid and volunteer employment, computer training, technical and continuing education courses (school, university, trade courses, up-skilling, specific training).

Operational definition of support activities that may be required: pre-vocational programme, vocational rehabilitation, supported employment, job coaching etc. Supervision or support in an educational setting.

26. Informational support: This refers to practical advice on everyday matters such as managing appointments, dealing with organisations or government departments, time management.

Operational definition of support activities that may be required: assistance with problem solving; support or advocacy when dealing with administration (including correspondence from various organisations); liaising with government organisations such as Centrelink or funders of services; prompting or assistance with timetabling; work done by case manager or social worker. Informational supports may vary widely from occasional reminding or support, through to those who need intensive support for people with major difficulties.

27. Emotional support[3]: This refers to matters focusing on psychological well-being, as well as emotional problems including dealing with adjustment issues, going through 'tough times', mild to moderate degrees of anxiety, depression, low self-esteem, management of feelings and expression of anger and so forth.

Operational definition of support activities that may be required: counselling, coaching, advice with regard to emotions (incl. anger) or mood (incl. anxiety, depression), monitoring mood etc.

[3] Difficulties with interpersonal interactions and emotional regulation span a broad range of severity. These degrees of difficulty are accommodated in the CANS checklist items and CANS levels. At the extreme, are those behaviours that have the potential to cause harm to self or other people. Such behaviours may be excesses (too much)/externalised (e.g., physical aggression) or deficiencies (too little)/internalised (e.g., major depression), each requiring daily monitoring. These behaviours are rated at item 5, exhibits behaviour with potential to harm, on the Needs Checklist. At an intermediate level, are those interpersonal interactions that significantly interfere with everyday function. Again, such behaviours may be excesses/externalised (e.g., anger management) or deficiencies (e.g., difficulties making conversation), but are at such a level that a specialist intervention programme (e.g., in the above examples by a clinical psychologist or speech pathologist respectively) is indicated. Depending on the severity, programs to manage anxiety and depression may fall into this category. These behaviours are rated at item 22, interpersonal relationships, on the Needs Checklist. A third level of difficulty relates to emotional supports required to manage day-to-day issues that may be provided within a general counselling framework. This level of difficulty is rated at item 27, emotional supports, on the Needs Checklist.

Section 2: Support Levels: Extent (frequency) of support needs - Length of time that can be left alone

In this section (right hand column of the recording form) there are eight levels of supports, again grouped hierarchically (see Table 1 below). When the Needs Checklist regarding the person's level of functioning is completed, these responses are used to determine, on the basis of clinical judgement, the level of support needed. The level of support need corresponds to the length of time that the person can be left alone.

Table 1: Support Levels of the CANS[4]

Level of support need	Length of time that can be left alone
Level 7	*Cannot be left alone* Needs nursing care, assistance and/or monitoring 24 hours per day
Level 6	*Can be left alone for a few hours* Needs nursing care, assistance and/or monitoring 20-23 hours per day
Level 5	*Can be left alone for part of the day, but not overnight* Needs nursing care, assistance, supervision and/or direction 12-19 hours per day
Level 4*	*Can be left alone for part of the day and overnight* Needs support each day (up to 11 hours) for assistance, supervision direction and/or cueing for occupational activities, interpersonal relationships and/or living skills
Level 3	*Can be left alone for a few days a week* Needs support for occupational activities, interpersonal relationships, living skills or emotional support a few days a week
Level 2	*Can be left alone for almost all week* Needs support for occupational activities, interpersonal relationships, living skills or emotional support at least once a week
Level 1	*Can live alone, but needs intermittent (i.e., less than weekly) support* for occupational activities, interpersonal relationships, living skills or emotional support
Level 0	*Can live in the community, totally independently* Does not need support.

* CANS Level 4 is sub-divided into three sub-divisions as follows:
- CANS 4.3 indicates that the support level is CANS level 4 with the highest care item endorsed YES in the Needs Checklist being in group A
- CANS 4.2 indicates that the support level is CANS level 4 with the highest care item endorsed YES in the Needs Checklist being in group B
- CANS 4.1 indicates that the support level is CANS level 4 with the highest care item endorsed YES in the Needs Checklist being in group C

[4] In the original publication (Tate, 2004), the eight CANS levels ranged from 1 ("is completely independent") to 8 ("cannot be left alone"), but the scoring system has since been revised with the eight levels ranging from 0 ("is completely independent") to 7 ("cannot be left alone"), in order to anchor "completely independent" (i.e., no supports are required) to zero, rather than 1.

Administration and recording procedures

The CANS is completed by a clinician who has detailed current knowledge of the patient/client. It can also be used in interview format with a knowledgeable informant or the person with the brain injury (although in the latter case the clinician will need to determine whether the person has significant impairments in memory, judgement or awareness that may compromise reliable reporting). Additionally, the CANS can be completed on the basis of information derived from the patient's medical record, scales of disability and so forth.

In situations where the clinician has knowledge of the patient/client and direct interview is not required, the CANS will only take a few minutes to complete. Interview format with an informant generally takes somewhat longer (10-15 mins).

Once the clinician has a thorough understanding of the person's current status and support needs the CANS score sheet can be completed by:

1. For each of the 24 specific items in the Needs Checklist, (left hand column of the recording form; see Appendix, page 25 for the CANS recording form and referring to the item definitions on page 6 - 9) indicate whether care or support is required or not by placing a tick in the appropriate box (either 'Yes' or 'No'). Each of the 24 specific items from the Needs Checklist from Groups A to D is endorsed if the person has a need in that area irrespective of its nature or extent by ticking the YES box. There is space in the middle column where comments can be recorded about any of the specific activities. For each of the four Needs Checklist Groups (A, B, C, D) there is also an "Other" response, in case there are additional needs not covered by the checklist items. This makes 28 items in total.
2. Add up the number of endorsed ('Yes') items in each of the Groups A, B, C, D and enter the number in the space provided ('GROUP subtotal').
3. Sum the total of items endorsed ('Yes') across Groups A-D and enter the total in the space provided at the bottom of the left hand column ('Sum the total number of items endorsed as Yes in Group A + Group B + Group C + Group D = ___ / 28').
4. Next, move to the column that appears under "CANS Level". Here, circle the CANS level that is applicable to the client being assessed. In the far right column under "Length of time that can be left alone?", are scoring cues that should be used to establish the appropriate CANS Level. Also the CANS level should be written into the box provided at the bottom of the form.

There are eight Support Levels (and Level 4 contains 3 sub-levels) and the level allocated must be selected from the option/s which correspond to the highest Group (A-D) of endorsed checklist items. Some degree of clinical judgement is used in synthesising the information from the Needs Checklist and converting it to a Support Level. In addition, it is important to take account of current contextual factors in the individual's life that may have bearing on the level of support required (see section on Rating Decisions, pp. 14-16). The Support Level allocated ranges from 0 to 7 (revised from Tate, 2004, which ranged from 1 to 8), with higher scores indicating greater intensity of support need.

As indicated, if any item from the Needs Checklist in Group A is endorsed ("Yes"), then the range of possible CANS levels are from 7 to 4.3, which appear in inverted order on the record form. Due consideration must be given each of the 24 specific items. Of course, if items in Group A are endorsed, it is likely that items in Groups B, C and D may also require care and support, and any of these items are to be endorsed as outlined in Step 1 above. Similarly, if any item from Group B (and possibly Groups C and D) is endorsed, but no items from Group A, the only CANS Level applicable is 4.2. If items from Group C are endorsed (and perhaps also Group D, but not Groups A and B), the possible CANS levels are 4.1 to 1. If an item is endorsed in Group D (but not Groups A to C), the possible CANS levels range from 3 to 1. Finally, if no items are endorsed, then Group E (Level 0) applies.

It will be noted from the CANS recording form that there is overlap between the CANS levels of support (Section 2) and the grouped hierarchy comprising the needs checklist (Section 1):

Needs Checklist (Section 1)	CANS levels (Section 2)
Group A	Levels 4.3, 5, 6 or 7
Group B	Level 4.2
Group C	Levels 1, 2, 3 or 4.1
Group D	Levels 1, 2 or 3
Group E	Level 0

This is intentional, and is designed to reflect the clinical reality that support needs for any given activity will range from a minimal amount of support through to maximal support. The specific level of support required for a single activity will vary depending on a number of factors, including (but not restricted to) the following:

a) the severity of the activity limitations
b) the combined effects of all the limitations (cf., the whole can be greater than the sum of the parts)
c) the influence of other impairments (e.g., memory)
d) contextual factors, such as the availability of environmental supports (e.g., equipment, aids, services, social supports)

Thus, for people who require supports for eating, for example, their support level will range from Level 4.3 ('can be left alone for part of the day or overnight') to Level 7 ('cannot be left alone') because eating is a Group A item.

The guiding principle in allocating a Support Level is that the level of support required (Section 2) cannot be less than the level indicated by the group in which the highest needs checklist item is endorsed (activity checklist in Section 1), and conversely it cannot be higher.

For example, in rating David's level of support (see below), the highest needs checklist item endorsed came from Group C (specifically, supervision for selected instrumental activities of daily living). Therefore David's rating must be selected from the CANS level that corresponds to Group C items (in this case, CANS Levels 4.1, 3, 2, or 1). His CANS rating cannot be Levels 4.2, 4.3, 5, 6, or 7 (which occur for Group A and B items), nor would it be Level 0 (which refer to Group E). The clinician will judge which of these CANS Levels is most appropriate for David, depending upon his circumstances and other impairments he may experience (see Rating Decisions, pp.14-16).

CANS needs checklist for David

Needs Checklist: Type of care and support need	**Tick yes or no**		**CANS LEVEL***
GROUP A: Requires nursing care and/or support or monitoring of severe behavioural/cognitive disabilities and/or assistance with very basic ADLs:			
1. Tracheostomy management	Yes □	No ✓	Circle
2. Nasogastric/PEG feeding	Yes □	No ✓	
3. Bed mobility (e.g., turning)	Yes □	No ✓	
4. Wanders/gets lost	Yes □	No ✓	
5. Exhibits behaviours with potential to harm self/others	Yes □	No ✓	
6. Difficulty communicating basic needs	Yes □	No ✓	
7. Continence	Yes □	No ✓	
8. Eating and drinking	Yes □	No ✓	
9. Transfers/mobility (incl. stairs and indoor surfaces)	Yes □	No ✓	
10. Other (specify):	Yes □	No ✓	
GROUP A subtotal 0 / 10			
GROUP B: Requires assistance, supervision, direction and/or cueing for basic ADLs:			
11. Personal hygiene/toileting	Yes □	No ✓	
12. Bathing/dressing	Yes □	No ✓	
13. Preparation of light meal/snack	Yes □	No ✓	
14. Other (specify):	Yes □	No ✓	
GROUP B subtotal 0 / 4			
GROUP C: Requires assistance, supervision, direction and/or cueing for instrumental ADLs and/or social participation:			
15. Shopping	Yes ✓	No □	**4.1**
16. Domestic incl. preparation of main meal	Yes ✓	No □	
17. Medication use	Yes □	No ✓	**3**
18. Money management	Yes ✓	No □	
19. Everyday devices (e.g., telephone, television)	Yes □	No ✓	
20. Transport and outdoor surfaces	Yes □	No ✓	**2**
21. Parenting skills	Yes □	No ✓	
22. Interpersonal relationships	Yes ✓	No □	**1**
23. Leisure and recreation	Yes ✓	No □	
24. Employment/study	Yes □	No ✓	
25. Other (specify):	Yes □	No ✓	
GROUP C subtotal 5 / 11			
GROUP D: Requires supports:			
26. Informational supports (e.g., advice)	Yes ✓	No □	
27. Emotional supports	Yes ✓	No □	
28. Other (specify):	Yes □	No ✓	
GROUP D subtotal 2 / 3			
GROUP E: Does not require supports:			
Sum the total number of items endorsed as YES			Enter CANS Level
GROUP A + GROUP B + GROUP C + GROUP D = 7 / 28			

Rating decisions

As noted, allocation of a CANS Support Level involves some degree of clinical judgement. The following points provide guidance on the decision making process:

Rate the present (here and now) circumstances

A rating on the CANS is made with reference to the patient's/client's present circumstances. It is recognised that a change in circumstances (e.g., altered living arrangements, illness of a caregiver) may well affect the level of support needs, thereby requiring reassessment.

It is important to consider what the current needs are and how these may have changed over time. The person may now be independent and no longer still require support for an activity for which they have been previously receiving support. But they may now have other activities for which they do have support needs. For example, a person had been receiving daily attendant care to supervise his medication. However when assessed it was realised that he could actually manage his medication quite independently but that he really enjoyed the attendant carers visit and the social aspect of having someone else to interact with. So he still has care needs, but that these have changed from medication use to leisure/recreation.

Use all sources of information available

When endorsing items on the Needs Checklist and making a classification for the Support Level, take into account not only what has been endorsed by the respondent, but also all other sources of information. Sometimes these will conflict with each other. In that case, take the information judged to be more valid. For example, if the respondent/informant says no support is needed for mobility, but recent entries in the medical file indicate that the person is unsafe using stairs because of mobility problems, then the information from the medical file is probably more reliable to use for the purpose of making a CANS rating.

Support need versus support received

The CANS levels represent a clinical judgement regarding support needed (rather than support received). Some examples of the distinction between care and support needs and level of support actually received are as follows:

(a) It may be the case that the level of support actually received is misleading and does not represent the appropriate need for support for that person. The amount of care and support actually received may be more than is needed. For example, an overprotective family may provide more support than is needed due to their cultural beliefs and practices (cf. Cavallo & Saucedo, 1995; Tate, Strettles & Osoteo, 2003).

(b) By contrast, the level of support actually received may be less than is needed. Reasons for receiving less support than needed include (but are not restricted to) the following:

- support services are not available
- the person is unable to access the supports
- the person rejects supports that are offered
- the person or family does not recognise the need for supports

Met versus unmet need

The issue of whether needs are being met or not met is complex. On the CANS, a rating is made if a person has a need, irrespective of whether the need is met or unmet. Thus, if a person has a need in an area (e.g., shopping) then it is endorsed as a need. Although the need may be met (e.g., the wife does all the shopping) it is still a need.

Using the CANS with adolescents

As noted, a paediatric version of the CANS is available and suitable for those aged 5 to 15 years. It is recognised that the period 16 to 18 years is a transition phase to adult roles and responsibilities. Depending on circumstances, either the CANS or PCANS-2 could be used with these age groups, but developmental level should be taken into account when allocating a Support Level.

For example, if a 16 year-old adolescent has left school and is working, then the CANS is a suitable instrument. Yet many older adolescents still have needs in the informational and emotional areas, and these items are included on the Needs Checklist. In determining whether the adolescent has a need in those areas, clinical judgement should be used to evaluate whether the need is above and beyond that which most adolescents have in the informational/emotional domains.

Conversely, a 17 year-old adolescent may have severe disability arising from his/her brain injury, and function at a level well below his/her chronological age. In this situation, the clinician may decide that the (more extensive) 105-item PCANS-2 may be a more suitable instrument to document support needs.

Using the CANS with people with pre-existing/co-morbid/recently developed conditions

It is not recommended to try to partial out those support needs that are due to the brain injury and those that are due to other health conditions. CANS Support Levels relate to the sum total of support that is needed, irrespective of the reason such support is required. For people with pre-existing, co-morbid or recently developed conditions support needs may well be a mix of brain injury-related needs and other-related needs.

On the CANS recording form there is an "other" response space for each broad grouping of the Needs Checklist. Clinicians are encouraged to endorse the appropriate "other" as YES and write in any notes that may assist in identifying that needs are due to presence of another condition (e.g., pre-existing substance abuse; co-morbid orthopaedic injuries, medical conditions etc). For example, medical conditions, such as post-traumatic epilepsy, may impact upon support needs and if so will require documentation in the appropriate Group reflecting extent/frequency of support. If the epilepsy was uncontrolled it may require Group A level of support versus if its management presented less severe difficulties then a less intense support need would be indicated.

Rating the CANS within the person's context

Lifestyle choices: In some circumstances, particularly those involving lifestyle choices, it can be difficult to determine a support need. For example, if a mother always did the housework and prepared meals (cf. the domestic item from the Needs Checklist) for her (adult) son, who now has a brain injury, clinical judgement would be required to classify the domestic item:

- a need (e.g., the son is very disabled and so is unable to do any domestic tasks independently and needs his mother to prepare meals etc)
- not a need (e.g., the son does not do any domestic tasks but this is lifestyle choice by mother and son and is not related to the injury).

Items that are not applicable: In other circumstances, the checklist item is not applicable and in these cases it would be classified as not a need. For example, in people with poor interpersonal skills arising from the brain injury, which in the past had adversely affected their parenting skills, but now their children have grown up. In this situation, the parenting item is no longer applicable and hence is not endorsed as an area of need.

Opportunity: This factor may need to be taken into account. For example, in people whose disabilities are so severe that work is not a reasonable expectation, the employment item may be classified as not a need (and in such a scenario, the leisure/recreation item takes on added importance in terms of meaningful occupation; see below). Another example may be a person who is not able to drive a car, but is fully independent in using public transport. In this case, the transport item may be classified as not a need.

The special case of employment: Needs in this area are often difficult to determine. Our in-principle position is that if the person is of working age and they are not working, then they have employment needs (Tate et al., 2003). A clinical decision will need to be made in individual cases, such as those who have had multiple failed attempts at resuming work, or others whose injuries occurred so many years previously that work may not be feasible, and so forth. In all the foregoing

and similar scenarios, however, if a person is not working and work is not a feasible option, then such people ought to have a structured program of meaningful occupational activity in lieu of work. If they do not have such a program, then they have recreation/leisure needs.

Role of equipment and aids in determining support needs on the CANS

The focus of the CANS is on supports provided by other people. It is recognised that equipment and aids are, in some situations, essential supports to facilitate functioning, but the use of special equipment does not necessarily indicate the person has a need for care as captured in the CANS. For example, a person may require aids and modifications for mobility (e.g., rails, ramps, walking stick). But if that person was able to use these aids safely and independently, then the mobility item would not be endorsed as an area of need. However, if, in spite of using the aids, the person required the presence of another person for observation to ensure safety (e.g., on stairs), then mobility would be classified as an area of need. Alternately if the person required prompting to use the aids or if they required someone else to set them up with the aid then they would have a care need. This should be indicated in the appropriate item in the CANS. For example if the person needed someone else to remind them to use their walking aid when they were walking outside then they would have a need for care in item 20, Transport and outdoor surfaces.

Experience in using the CANS suggests that in cases where there is a need for equipment and aids (e.g., rails in the toilet) then in the absence of such aids another person is usually required to physically assist and/or supervise, and the need is therefore captured. Thus, with the provision of such aids the person may well not have a need (e.g., independent in toileting), but without such aids then another person is required for functional/safety reasons, and there is a support need.

Illustrative case descriptions

The following fictitious examples are provided to demonstrate application of the CANS.

Level 7: Cannot be left alone: needs nursing care, assistance, and/or surveillance 24 hours per day

Adam sustained severe brain injury at age 20 as the result of a motor vehicle accident. At the time of his injury he was married with children, and was employed as a labourer. Duration of post-traumatic amnesia was 90 days. Adam was hospitalised for 80 days in the acute hospital and had many months of rehabilitation. His tetraplegia and behavioural disturbances made it difficult to find a suitable residential facility. His impairments were such that it was not possible for his family to manage him at home. At admission to a residential facility, Adam was totally dependent in all activities of daily living and mobility. He had limited head control and required another person for bed mobility. At rehabilitation discharge, he was classified as Severe Disability on the Glasgow Outcome Scale.

In terms of the CANS (see checklist of items below), Adam requires virtually the full range of supports. He requires another person to turn him in bed to prevent pressure sores, he has difficulty communicating his basic needs because of phonation problems, and is totally dependent in all basic and instrumental activities of daily living. His challenging behaviours adversely affect his ability to relate with his wife and children. Because of the severity of his disability, employment was not regarded an area of need, although occupational activity in terms of leisure and recreation options are highly relevant.

Needs Checklist: Type of care and support need	**Tick yes or no**		**CANS LEVEL**
GROUP A: Requires nursing care and/or support or monitoring of severe behavioural/cognitive disabilities and/or assistance with very basic ADLs:			
1. Tracheostomy management	Yes □	No ✓	Circle
2. Nasogastric/PEG feeding	Yes □	No ✓	
3. Bed mobility (e.g., turning)	Yes ✓	No □	
4. Wanders/gets lost	Yes □	No ✓	7
5. Exhibits behaviours with potential to harm self/others	Yes ✓	No □	**6**
6. Difficulty communicating basic needs	Yes ✓	No □	**5**
7. Continence	Yes ✓	No □	
8. Eating and drinking	Yes ✓	No □	**4.3**
9. Transfers/mobility (incl. stairs and indoor surfaces)	Yes ✓	No □	
10. Other (specify):	Yes □	No ✓	
GROUP A subtotal **6** / 10			
GROUP B: Requires assistance, supervision, direction and/or cueing for basic ADLs:			
11. Personal hygiene/toileting	Yes ✓	No □	
12. Bathing/dressing	Yes ✓	No □	**4.2**
13. Preparation of light meal/snack	Yes ✓	No □	
14. Other (specify):	Yes □	No ✓	
GROUP B subtotal **3** / 4			
GROUP C: Requires assistance, supervision, direction and/or cueing for instrumental ADLs and/or social participation:			
15. Shopping	Yes ✓	No □	
16. Domestic incl. preparation of main meal	Yes ✓	No □	
17. Medication use	Yes ✓	No □	
18. Money management	Yes ✓	No □	**4.1**
19. Everyday devices (e.g., telephone, television)	Yes ✓	No □	**3**
20. Transport and outdoor surfaces	Yes ✓	No □	**2**
21. Parenting skills	Yes ✓	No □	**1**
22. Interpersonal relationships	Yes ✓	No □	
23. Leisure and recreation	Yes ✓	No □	
24. Employment/study	Yes □	No ✓	
25. Other (specify):	Yes □	No ✓	
GROUP C subtotal **9** / 11			
GROUP D: Requires supports:			
26. Informational supports (e.g., advice)	Yes ✓	No □	**3**
27. Emotional supports	Yes ✓	No □	**2**
28. Other (specify):	Yes □	No ✓	**1**
GROUP D subtotal **2** / 3			
GROUP E: Does not require supports:			**0**
Sum the total number of items endorsed as YES			**7** Enter CANS Level
GROUP A + GROUP B + GROUP C + GROUP D = **20** / 28			

Level 4.2: Can be left alone for part of the day and overnight: needs support each day (up to 11 hours) for assistance, supervision, direction and/or curing for occupational activities, interpersonal relationships, and/or living skills

Sue sustained severe brain injury at age 19 as the result of a fall. At the time of her injury she was single and unemployed. Her duration of post-traumatic amnesia was 134 days and she was hospitalised for 240 days (80 days in acute hospital and 160 days in rehabilitation). Sue had significant cognitive impairments at rehabilitation discharge, however she had no neurophysical disability. At rehabilitation discharge, she was classified in the Moderate Disability group on the Glasgow Outcome Scale.

At 5 years post-trauma, Sue was still single and living with her parents. She was successfully working in supported employment. In terms of the CANS (see checklist of items below), Sue needs supervision for some basic activities of daily living (food preparation, bathing/dressing) and assistance in a number of instrumental activities of daily living (shopping, housework, money management, transport). Sue also requires assistance in social participation as well as informational and emotional supports.

Needs Checklist: Type of care and support need	**Tick yes or no**		**CANS LEVEL**
GROUP A: Requires nursing care and/or support or monitoring of severe behavioural/cognitive disabilities and/or assistance with very basic ADLs:			
1. Tracheostomy management	Yes □	No ✓	Circle
2. Nasogastric/PEG feeding	Yes □	No ✓	
3. Bed mobility (e.g., turning)	Yes □	No ✓	**7**
4. Wanders/gets lost	Yes □	No ✓	
5. Exhibits behaviours with potential to harm self/others	Yes □	No ✓	**6**
6. Difficulty communicating basic needs	Yes □	No ✓	**5**
7. Continence	Yes □	No ✓	
8. Eating and drinking	Yes □	No ✓	**4.3**
9. Transfers/mobility (incl. stairs and indoor surfaces)	Yes □	No ✓	
10. Other (specify):	Yes □	No ✓	
GROUP A subtotal **0** / 10			
GROUP B: Requires assistance, supervision, direction and/or cueing for basic ADLs:			
11. Personal hygiene/toileting	Yes □	No ✓	
12. Bathing/dressing	Yes ✓	No □	
13. Preparation of light meal/snack	Yes ✓	No □	4.2
14. Other (specify):	Yes □	No ✓	
GROUP B subtotal **2** / 4			
GROUP C: Requires assistance, supervision, direction and/or cueing for instrumental ADLs and/or social participation:			
15. Shopping	Yes ✓	No □	
16. Domestic incl. preparation of main meal	Yes ✓	No □	
17. Medication use	Yes □	No ✓	
18. Money management	Yes ✓	No □	**4.1**
19. Everyday devices (e.g., telephone, television)	Yes □	No ✓	**3**
20. Transport and outdoor surfaces	Yes ✓	No □	
21. Parenting skills	Yes □	No ✓	**2**
22. Interpersonal relationships	Yes ✓	No □	**1**
23. Leisure and recreation	Yes ✓	No □	
24. Employment/study	Yes ✓	No □	
25. Other (specify):	Yes □	No ✓	
GROUP C subtotal **7** / 11			
GROUP D: Requires supports:			
26. Informational supports (e.g., advice)	Yes ✓	No □	**3**
27. Emotional supports	Yes ✓	No □	**2**
28. Other (specify):	Yes □	No ✓	**1**
GROUP D subtotal **2** / 3			
GROUP E: Does not require supports:			**0**
Sum the total number of items endorsed as YES			**4.2** Enter CANS Level
GROUP A + GROUP B + GROUP C + GROUP D = **11** / 28			

Level 1: Can live alone, but needs intermittent (i.e. less than weekly) support for occupational activities, interpersonal relationships, living skills or emotional support

Bob sustained severe brain injury at age 39 as the result of a motor vehicle accident. At the time of his injury he was married with children and employed as a labourer. His duration of post-traumatic amnesia was 80 days and he was hospitalised for 170 days (50 days in acute hospital and 120 days in rehabilitation). Although he was making a good recovery in neurophysical terms, he exhibited marked executive impairments, and these contributed to the breakdown of his marriage. At rehabilitation discharge he was functionally independent, but continued to have significant neuropsychological impairments. He was classified in the Moderate Disability group on the Glasgow Outcome Scale.

At 10 years post-trauma, Bob's support needs were evaluated with the CANS. He was living alone in a Department of Housing flat and had not worked competitively since his injury. He did not engage in much in the way of structured occupational activity in lieu of work, although he occasionally worked in a casual capacity at a garage. From time to time, Bob required some assistance with money management, and given his age and ability would benefit from having someone to review his occupational activity. Occasionally he needs emotional supports (eg. at the time of the death of his mother) and has frequent episodes of mild to moderate degrees of depression. Although in the earlier post-trauma stages he required supports for parenting skills, his children are now grown adults and this is no longer an area of need.

Needs Checklist: Type of care and support need	**Tick yes or no**		**CANS LEVEL**
GROUP A: Requires nursing care and/or support or monitoring of severe behavioural/cognitive disabilities and/or assistance with very basic ADLs:			
1. Tracheostomy management	Yes □	No ✓	Circle
2. Nasogastric/PEG feeding	Yes □	No ✓	
3. Bed mobility (e.g., turning)	Yes □	No ✓	**7**
4. Wanders/gets lost	Yes □	No ✓	
5. Exhibits behaviours with potential to harm self/others	Yes □	No ✓	**6**
6. Difficulty communicating basic needs	Yes □	No ✓	**5**
7. Continence	Yes □	No ✓	
8. Eating and drinking	Yes □	No ✓	**4.3**
9. Transfers/mobility (incl. stairs and indoor surfaces)	Yes □	No ✓	
10. Other (specify):	Yes □	No ✓	
GROUP A subtotal **0** / 10			
GROUP B: Requires assistance, supervision, direction and/or cueing for basic ADLs:			
11. Personal hygiene/toileting	Yes □	No ✓	
12. Bathing/dressing	Yes □	No ✓	
13. Preparation of light meal/snack	Yes □	No ✓	**4.2**
14. Other (specify):	Yes □	No ✓	
GROUP B subtotal **0** / 4			
GROUP C: Requires assistance, supervision, direction and/or cueing for instrumental ADLs and/or social participation:			
15. Shopping	Yes □	No ✓	
16. Domestic incl. preparation of main meal	Yes □	No ✓	
17. Medication use	Yes □	No ✓	
18. Money management	Yes ✓	No □	**4.1**
19. Everyday devices (e.g., telephone, television)	Yes □	No ✓	
20. Transport and outdoor surfaces	Yes □	No ✓	**3**
21. Parenting skills	Yes □	No ✓	**2**
22. Interpersonal relationships	Yes □	No ✓	(1)
23. Leisure and recreation	Yes ✓	No □	
24. Employment/study	Yes ✓	No □	
25. Other (specify):	Yes □	No ✓	
GROUP C subtotal **3** / 11			
GROUP D: Requires supports:			
26. Informational supports (e.g., advice)	Yes ✓	No □	**3**
27. Emotional supports	Yes ✓	No □	**2**
28. Other (specify):	Yes □	No ✓	**1**
GROUP D subtotal **2** / 3			
GROUP E: Does not require supports:			**0**
Sum the total number of items endorsed as YES			**1** Enter CANS Level
GROUP A + GROUP B + GROUP C + GROUP D = **5** / 28			

Psychometric properties of the CANS

The CANS has now been subject to thorough psychometric examination with excellent results.

Reliability studies have been reported in Soo et al. (2007) in two independent samples from two brain injury rehabilitation units:

- in a sample of 30 community clients, there was excellent inter-rater reliability between ratings made by different members of a multidisciplinary team (ICC=0.93-0.96),
- as well as in a second independent sample of 40 community clients from a second brain injury rehabilitation unit. Ratings of a multidisciplinary team (based on their knowledge of the person with brain injury) were compared with a clinical researcher who made clinical judgments based on both the ratings by the multidisciplinary team and interview of a relative (ICC=0.92)

- 1-week test-retest reliability in the first sample (n=30) was also excellent (ICC=0.98)

- Proxy ratings were examined in the second sample (n=40): coefficients between clinicians and a relative were fair to good (ICC=0.59-0.72);
- as expected patient-proxy coefficients were substantially lower between clients and either their relatives (ICC=0.49) or clinicians (ICC=0.37-0.52).

Validity studies were first reported by Tate (2004) and further work from a multi-centre study with more representative samples was reported by Soo et al. (2010).

There is good evidence of concurrent validity between the CANS and other instruments assessing handicaps and community participation. Tate (2004) studied a sample of 67 people who sustained severe traumatic brain injury, on average 23 years previously. The CANS was compared with the Supervision Rating Scale (SRS; Boake, 1996), the Craig Handicap Assessment and Reporting Technique (CHART; Whiteneck et al., 1992), and the Sydney Psychosocial Reintegration Scale (SPRS; Tate et al., 1999). The CANS showed strong correlation with the SRS, as well as CHART and SPRS subscales, as shown in Table 2.

Table 2: Spearman correlation coefficients between the CANS and other measures of functional disability

Supervision Rating Scale	0.75
Craig Handicap and Assessment Reporting Technique	
- Physical	-0.80
- Mobility	-0.62
- Cognitive	-0.76
- Occupational	-0.66
- Social	-0.46
Sydney Psychosocial Reintegration Scale	
- Total	-0.79
- Occupational Activities	-0.74
- Interpersonal Relationships	-0.61
- Living Skills	-0.85

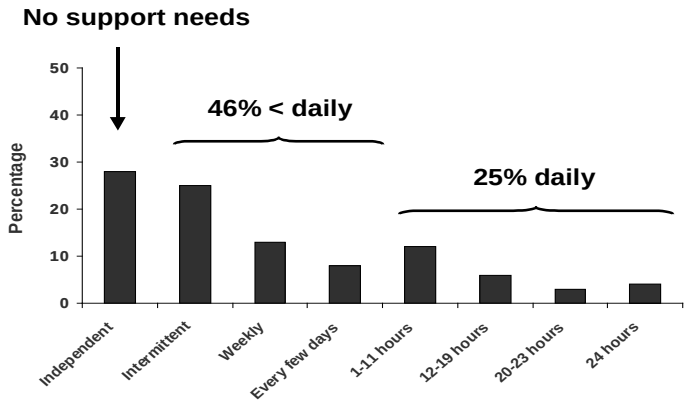

Figure 1: Percentage of the sample in each of the CANS categories

The CANS also showed a good spread across all categories, as shown in Figure 1. In this series, 28% did not have support needs, 46% had needs on less than a daily basis, and the remaining 25% had support needs on a daily basis.

There is also evidence of construct validity. Tate (2004) found that the CANS was able to distinguish among subgroups in terms of functional independence in (i) mobility and basic activities of daily living (ADL) and (ii) domains of the original categorical version of the SPRS (Tate et al., 1989). Levels of mobility and basic ADL were classified as Independent, Assistance (supervision, aids, or standby) and Dependent. Comparisons were made between (1) Independent versus Assistance and (2) Assistance versus Dependent. Levels of the SPRS comprised Good, Limited and Poor for each of the domains of Occupational Activities, Interpersonal Relationships and Living Skills, as well as the Total Score.

Comparisons were made between (1) Good versus Limited and (2) Limited versus Poor. As shown in Table 3, results of the Kruskal-Wallis analyses were significant at $p<0.001$ level, for both functional independence and SPRS. Post-hoc Mann-Whitney U tests showed significant differences for both comparisons on functional independence. For the SPRS, all comparisons were significant except that for Occupational Activity between Limited versus Poor.

Table 3: Descriptive data for CANS subgroups for functional independence in mobility/ADL and SPRS, along with results of Kruskal-Wallis one-way analyses of variance and post-hoc Mann-Whitney U tests

	Median (range)	Median (range)	Median (range)	Kruskal-Wallis (χ^2)	p	Mann-Whitney U (z)	p
Functional independence	Independent (1)	Assistance (2)	Dependent (3)				
Total score	1.0 (0-7)	2.0 (0-6)	6.0 (4-7)	14.0	0.001	1v2: -2.4 2v3:-2.3	0.019 0.018
Categorical version of Sydney Psychosocial Reintegration Scale	Good (1)	Limited (2)	Poor (3)				
Total score	0.0 (0-1)	1.0 (0-5)	4.0 (2-7)	44.6	0.000	1v2: -4.7 2v3: -4.9	0.000 0.000
Occupational Activity	0.0 (0-1)	2.0 (0-5)	2.0 (0-7)	31.6	0.000	1v2: -4.3 2v3: -1.2	0.000 ns
Interpersonal Relationships	0.0 (0-5)	2.0 (0-5)	5.0 (3-7)	34.4	0.000	1v2: -3.6 2v3: -4.2	0.000 0.000
Living Skills	1.0 (0-2)	3.0 (2-5)	5.0 (4-7)	51.3	0.000	1v2: -6.0 2v3: -3.6	0.000 0.000

Soo et al. (2010) further examined the validity of the CANS in three samples (one inpatient; two community) from two brain injury rehabilitation units. Validating instruments included the SRS, Functional Independence Measure (FIM; Keith et al., 1987), SPRS and Disability Rating Scale (DRS; Rappaport et al., 1982). Convergent and divergent validity was examined with the Mini-Mental State Examination (MMSE; Folstein, et al., 1975), Shipley Institute of Living Scale (SILS; Zachary, 1996), and NEO Five Factor Inventory (NEO-FFI; Costa & McRae, 1992).

Results from these studies are summarised below:

- no significant ceiling (12%) or floor (0%) effects were found in the combined community samples (n=68)

- criterion (concurrent) validity in the combined community samples (n=68) was established with all instruments:
  - SRS: r_s= 0.68
  - FIM Total r_s = -0.59 (Motor r_s = -0.55; Cognitive r_s = -0.54)
  - SPRS Total r_s = -0.54 (Occupational r_s = -0.54; Relationships r_s = -0.43; Living Skills r_s = -0.58)
  - DRS r_s = 0.64

- criterion (predictive) validity, examined in the inpatient sample (n=40), was also established between CANS ratings taken at rehabilitation discharge and validating measures taken at 6 months post-discharge follow-up:
  - SRS: r_s = 0.43
  - FIM Total r_s = -0.41 (Motor r_s = -0.38; Cognitive r_s = -0 .40)
  - SPRS Total r_s = -0.47: (Occupational r_s = -0.47; Relationships r_s = -0.42; Living Skills r_s = -0.47)
  - DRS: r_s = 0.42
  - Rehabilitation discharge CANS vs 6 months follow-up CANS: r_s = 0.49

- construct (discriminant) validity in the combined community samples was examined with respect to injury severity (duration of post-traumatic amnesia, PTA; < vs >1 month) and median splits on the FIM (at score 117) and DRS (at score 3). Statistically significant group differences were found on all variables (all $p<0.01$):
  - PTA: z = -2.56
  - FIM: z = -3.73
  - DRS: z = -4.74

- construct (convergent/divergent) validity was examined in one of the community samples (n=38). As hypothesised:
  - there were higher correlation coefficients with similar constructs: MMSE Total: r_s = -0.38, Orientation: r_s = -0.46
  - and lower correlation coefficients with dissimilar constructs: SILS: r_s = -0.26, NEO range from Agreeableness: r_s = 0.07 to Extraversion: r_s = 0.16

- responsiveness was examined in the inpatient sample (n=40). There were significant differences (z=-4.56, $p<0.01$) between CANS Level at rehabilitation discharge (M=4.10 SD=1.69) and 6 months follow-up (M=2.45, SD=1.78), with a large effect size (d=0.95).

The 2017 CANS Level 4 study

Further psychometric study of the CANS was conducted in 2017 (Tate, Wakim & Rosenkoetter, 2017). Users of the CANS had indicated that CANS Level 4 covers a large number of hours (up to 11 hours per day) and queried whether Level 4 could be meaningfully subdivided. Archival data (n=47) from the New South Wales Statutory Authority, the lifetime care Scheme, were used to examine the proposition.

The eight models tested are enumerated in Column 1, including various configurations of information from the CANS Needs Checklist (Models 1, 2a and 2b), and hours of care both for whether attendant care was requested (Model 3), and four different classifications for the number of care hours assessed (Models 4a to 4d). These models were compared against eight validating variables, enumerated in Row 1: three of these variables were proxies for injury severity (duration of post-traumatic amnesia, length of hospitalization, and length of rehabilitation admission), three variables reflected level of

disability (using the Functional Independence Measure), and the final two variables were related to hours of care. Parenthetically, the reason that hours of care was used as both a validating variable and a model was because care hours is a relevant validating variable for models based on the CANS (i.e., Models 1, 2a and 2b).

Table 4 shows the results of Mann-Whitney U/Kruskal-Wallis tests, as appropriate. We used a p-value of <0.05 because of the exploratory nature of the study, but even using a more conservative p-value of <0.01 to address the issue of multiple comparisons, the pattern of the results is comparable. Results indicated that the two models using the CANS Needs Checklist groupings (Models 2a and 2b) performed the best. This dataset did not provide any validating support for models based on hours of care.

Accordingly, the CANS has now been updated and a tripartite division of CANS Level 4 is used, corresponding to the highest group endorsed from the Needs Checklist (Group A = Level 4.3, Group B = Level 4.2, and Group C = 4.1). This distinction among CANS Level 4 will result in a clinically-improved and more sensitive instrument that we anticipate will be useful at administrative, research, and clinical levels.

Table 4: Group comparisons reporting z/χ2 scores (and p values) for each of the models against the validating variables

	Validating variables							
Models	Days of PTA	Days of rehab hospit.	Days of total hospit.	FIM Mot	FIM Cog	FIM Total	No. of care hours assessed	Hours of Attendant care requested
1. CANS: no. of activities (0-7 vs 8+)	-1.56 (ns)	-.96 (ns)	-1.43 (ns)	-1.87 (ns)	-.57 (ns)	-1.75 (ns)	-2.40 (p=0.015)	-1.70 (ns)
2a. CANS: type of activities (ABC vs C only)	-.63 (ns)	-.18 (ns)	-.34 (ns)	-2.86 (p=0.004)	-2.22 (p=0.026)	-3.10 (p=0.002)	-2.09 (p=0.036)	-1.02 (ns)
2b. CANS: type of activities (ABC vs BC vs C only)	.43 (ns)	5.94 (ns)	.30 (ns)	9.33 (p=0.009)	9.14 (p=0.010)	11.87 (p=0.003)	4.53 (ns)	3.36 (ns)
3. Attendant care: (yes vs no)	-1.60 (ns)	-.67 (ns)	-.76 (ns)	-1.47 (ns)	-.30 (ns)	-.72 (ns)	-	-
4a. Care hours assessed #1: (0-20 vs 21+)	.46 (ns)	-.17 (ns)	-.42 (ns)	-.72 (ns)	-.66 (ns)	-.59 (ns)	-	-
4b Care hours assessed #2: (0-28 vs 29+)	.64 (ns)	-.50 (ns)	-.58 (ns)	-.23 (ns)	-.02 (ns)	-.17 (ns)	-	-
4c Care hours assessed #3: (0-35 vs 36+)	.71 (ns)	-.94 (ns)	-.80 (ns)	-1.20 (ns)	-.27 (ns)	-.94 (ns)	-	-
4d. Care hours assessed #4: (0-21 vs 22-49 vs 50+)	.91 (ns)	.36 (ns)	.54 (ns)	1.62 (ns)	.81 (ns)	1.53 (ns)	-	-

Note: PTA = post-traumatic amnesia; FIM = Functional Independence Measure; ns = not (statistically) significant; shaded cells indicate statistically significant results (p<0.05).

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Care and Needs Scale (CANS)

Tate (2003/2017)

Date: Client Name: Age: MRN: Assessed by:

Needs Checklist: Type of care and support need	Tick yes or no	CANS LEVEL*	Comments
GROUP A: Requires nursing care and/or support or monitoring of severe behavioural/cognitive disabilities and/or assistance with very basic ADLs:			
1. Tracheostomy management	Yes ☐ No ☐	Circle	
2. Nasogastric/PEG feeding	Yes ☐ No ☐		
3. Bed mobility (e.g., turning)	Yes ☐ No ☐	7	
4. Wanders/gets lost	Yes ☐ No ☐		
5. Exhibits behaviours with potential to harm self/others	Yes ☐ No ☐	6	
6. Difficulty communicating basic needs	Yes ☐ No ☐	5	
7. Continence	Yes ☐ No ☐		
8. Eating and drinking	Yes ☐ No ☐	4.3	
9. Transfers/mobility (incl. stairs and indoor surfaces)	Yes ☐ No ☐		
10. Other (specify):	Yes ☐ No ☐		
GROUP A subtotal ___ / 10			
GROUP B: Requires assistance, supervision, direction and/or cueing for basic ADLs:			
11. Personal hygiene/toileting	Yes ☐ No ☐		
12. Bathing/dressing	Yes ☐ No ☐	4.2	
13. Preparation of light meal/snack	Yes ☐ No ☐		
14. Other (specify):	Yes ☐ No ☐		
GROUP B subtotal ___ / 4			
GROUP C: Requires assistance, supervision, direction and/or cueing for instrumental ADLs and/or social participation:			
15. Shopping	Yes ☐ No ☐		
16. Domestic incl. preparation of main meal	Yes ☐ No ☐		
17. Medication use	Yes ☐ No ☐		
18. Money management	Yes ☐ No ☐	4.1	
19. Everyday devices (e.g., telephone, television)	Yes ☐ No ☐	3	
20. Transport and outdoor surfaces	Yes ☐ No ☐		
21. Parenting skills	Yes ☐ No ☐	2	
22. Interpersonal relationships	Yes ☐ No ☐	1	
23. Leisure and recreation	Yes ☐ No ☐		
24. Employment/study	Yes ☐ No ☐		
25. Other (specify):	Yes ☐ No ☐		
GROUP C subtotal ___ / 11			
GROUP D: Requires supports:			
26. Informational supports (e.g., advice)	Yes ☐ No ☐	3	
27. Emotional supports	Yes ☐ No ☐	2	
28. Other (specify):	Yes ☐ No ☐	1	
GROUP D subtotal ___ / 3			
GROUP E: Does not require supports:		0	
Sum the total number of items endorsed as YES			
GROUP A + GROUP B + GROUP C + GROUP D = ___ / 28			Enter CANS Level

Length of time that client can be left alone?

* The CANS level must be in line with highest group (A, B, C, D) endorsed YES in Needs Checklist (left column)

7	Cannot be left alone – needs support 24 hours per day
6	Can be left alone for a few hours – needs support 20-23 hours per day
5	Can be left alone for part of the day, but not overnight – needs support 12-19 hours per day
4	Can be left alone for part of the day and overnight – needs support up to 11 hours per day *Note: there are 3 sub-divisions 4.3, 4.2 and 4.1 that correspond to groups A, B and C respectively in the Needs Checklist.*
3	Can be left alone for a few days a week – needs support a few days a week
2	Can be left alone for almost all week – needs support at least once a week
1	Can live alone, but needs intermittent support i.e. less than weekly
0	Does not need support – can live in the community, totally independently with or without aids (e.g., hand rails, diary, notebooks) and allowing for the usual kinds of informational and emotional supports the average person uses in everyday life.

Additional relevant information: