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An Interview with Dr. Jerry Burgess: SPANS (Short Parallel Assessment of Neuropsychological Status)

Michael F Shaughnessy*, Aaron Johnson and Bryan Moffitt

Eastern New Mexico University, New Mexico

***Corresponding author:** Michael F Shaughnessy, Eastern New Mexico University, Portales, New Mexico.

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Assessment of Neuropsychological Status

First of all, can you briefly tell us about your education and experience?

I am an American from the San Francisco Bay Area but have lived in the United Kingdom for the past 16 years. My professional career started in the Shenandoah Valley of Virginia where I was a master's level mental health counselor working with people with a range of difficulties, including addictions, psychosis, intellectual disability, child and family, etc. – in a state funded agency. In 2001, I returned to graduate school to earn my doctorate in clinical psychology, and though it was a generalist degree, I took all the opportunities available to engage in intensive study, take placements and be supervised in clinical neuropsychology. In my doctoral 'internship' year, I took three placements over 18 months in London, with older adults/dementia, neurological movement disorders, and intellectual disabilities. After graduating, I took a post in the NHS (UK National Health Service), in an acute and rehabilitation hospital in the East Midlands where I came to develop the SPANS while working as a clinical psychologist with people with a wide range of brain injuries. From here I moved back to a London hospital to work with patients with multiple sclerosis and other long-term neurological conditions, all the while undertaking the process of knowledge and practice components of the UK's post doc qualification in clinical neuropsychology. I am now a Senior Lecturer at Canterbury Christ Church University where I train clinical psychologists and clinical neuropsychologists.

What first got you interested in head injury/brain damage/neurology?

As a doctoral student, the main focus of my work was with people with movement disorders and dementia, so when I came to work with people with brain injuries I was frankly out of my depth. But being in a situation that feels out of one's depth can provide an impetus for growth, and I came to love working with acute and neurorehabilitation patients. As a clinician I felt there could be a better way to assess the impact of people's brain injuries, and so I began the development of the SPANS.

In my work we saw patients from being in a coma to transition back to home and community. The vast and multiple types of brain injury affect any combination of cognitive/neuropsychological functions, not to mention just the ability to walk and talk again, that most people successfully transitioned into. To help patients and their families understand the changed person, and what to expect potentially in the months/years ahead, was very rewarding and sometimes heartbreaking work.

Since the development of SPANS, is there anything you would add or change to the assessment? Are there any plans to revise it?

I think a lot of things work well with the SPANS as is, and it was developed through trial and error, and any (sub)tests that seemed to 'tell' me something about a patient and help me to address referral questions were retained, while other (sub) tests were trialed and rejected. After a prototype test, I came to understand that psychomotor or visuo-motor processing speed is an exceptional early predictor of many later outcomes in a brain-injured person's life. So, I needed to start over in order to add this crucial skill into the test – wrenching to throw out test items and data and start over, but really I needed to get this right and be able to analyze the correlations of all subtests together to understand what the SPANS was telling me and could do. I wish I could make the SPANS design and its use clearer to clinicians, so they see how it has been designed to work on a sensitivity/ specificity paradigm, and the brevity but effectiveness this brings. Some clinicians have told me it's too long and hard for their patients, while others have said it's too short and easy for theirs. The SPANS is a brief test with high accuracy and low error in determining the existence of

a problem or not in several cognitive domains, with patients from mild-moderate to severe cognitive impairment. Item difficulty is set to be challenging but that can be passed if there is no underlying neurological problem. If I was to make alterations now it would be that I would shorten subtests still further, now knowing that the SPANS would still remain just as sensitive and specific. New UK norms up to age 90 are about to be released, and a study investigating the youngest age that the SPANS would be reliable and valid is now under way. The SPANS is unique in this way. It is possible that too much neuropsychological testing is happening in health services than is needed (i.e. a six-hour battery), but also that too little neuropsychological testing is happening elsewhere (i.e. a 10-minute screen). The SPANS attempted to redress this balance.

What would you say is its primary purpose?

The primary purpose of the SPANS is to be a comprehensive, reliable and valid, performance-based parallel pair of assessments. With the parallel version, changes in an individual can be reliably tracked over time, very useful for tracking decline in dementia, no change, or improvements / trajectory of recovery. It is a standalone assessment, useful for clinicians or patients who that is all they can do or when the SPANS is sufficient to the referral question, or as a comprehensive reliable screen to begin to inform formulation and hypothesis-driven further assessment. It has been used, and studies undertaken, with people with acute/post-acute brain injury, long-term neurological conditions, older adults, intellectual disability, and as yet potentially many other unstudied conditions.

With the SPANS being normed for patients aged 18-74, what would make this assessment suitable for patients under 18? How would the content change?

Pediatric neuropsychologist colleagues have suggested that the SPANS, in its current form, may have utility down to age 8. A study examining this potential is currently under way, driven and guided by theories of childhood cognitive development. The study focuses on the research question, how young a healthy norm group is the 'typical' (i.e. negatively skewed) SPANS profile still evident? We may discover that its standardized instructions and/or content is too 'adult'. The SPANS contains a grocery shopping list to learn, monetary mental calculations, and instructions that can be somewhat complex and need patience. Whether this is suitable for children we will see. But the advantages are that the SPANS contains multiple, short, subtests; that no activity lasts for very long, and it changes continuously. It is reasonably visual, but has tests designed to measure language, which many adults find fun. And it can have natural 'breaks' built in without known adverse effects on standardization. This alongside the comprehensive assessment make it appealing to those who work with children with brain injuries.

How did other assessments, if any, influence the development of SPANS?

The best way to design an assessment is to look at theory, empirical data, and testing procedures with already known utility; so I studied other tests widely, the theoretical cognitive models used as the basis of their item development, norms, item difficulty' sensitivities and specificities, predictive validities, and how standardized instructions were given. Secondly I aimed to improve upon psychometric properties in existing tests of a similar genre, by, for example, adding more items purported to measure a singular construct for the effect or result of greater reliability. From these two lines of enquiry or curiosity, I created new original items to pilot in my clinical work. The most useful and effective items were then retained.

How would the SPANS translate its efficiency in the U.S? What cultural considerations were taken when creating this test (if any)?

I wanted the SPANS to translate across English speaking countries, so cultural considerations and minimizing any particular effect, were part of the original design. For instance the naming objects subtest accepts either American or British English terms as correct, and an item on political leadership provides the option of 'president' or 'prime minister', for example. And as far as I can tell there is no British cultural reference in the test, and empirical data appears to support this. As an American living in England I was perhaps well placed to use my own cross-cultural experience in the design to achieve cultural neutrality. However, bias in regard to participants with English as their second language appears unavoidable in all tests, and something all clinicians should be aware of. In neuropsychology one of our jobs is to assess language impairment, and naming objects or comprehending correct but unusual syntax, by definition, needs to be passable but 'challenging' to native English speakers to be worth the salt to detect aphasia. And of course this also taps into the same language vulnerabilities as healthy, but non-native English speakers, so results in false positive detections of a language problem.

What motivated you in studying memory loss?

It's an interesting question. I was privileged to work clinically with a man with an unusual and unexplained profound amnesia, that appeared to amount to a late-stage memory storage or 'consolidation failure' that crossed both memory of events and acquisition of new motor skills or otherwise known as 'procedural' memory. This broke with textbook definitions of known amnesias. I met him while working in my first year in the NHS. Publishing this man's case with a psychiatrist colleague led to other people contacting me with similar problems saying how 'no one' in their community health services knew what was wrong with them. A 'thing' gets a diagnostic label by first having a case, then a critical mass of cases that share common characteristics. This has been my story, to be able to piece together an extended version, beyond the hippocampi, of how permanent memories get made. What seemed a perfunctory topic to me next to say, the flashiness and intrigue of executive functioning for example, memory as a topic of study is much more interesting than I ever imagined and has since endlessly fascinated me.

We noticed that you started as a counselor in the mental health field, what prompted you to make the jump to Clinical Psychology?

It wasn't so much of a jump than a career progression, but came at a time of crisis of meaning in career for me. As a master's level counselor I felt under-skilled, not able to understand or help or be as effective with my clients as much as I wished to, and I had a real sense that there was way more to learn. I was a good counselor, but challenges of that career, or job I was in, nearly drove me to pick up and learn a new profession entirely. I spoke to my wife and we were preparing how I could do this, learn a trade or some new career, when I got a call out of the blue to rejoin my alma mater university in a new doctorate they were offering (in clinical psychology). Neuropsychology was in the curriculum, and the opportunity to work with great clinical neuropsychologists on this new course, plus a promise to assist my wife and I to get to England for an internship year, lured me (to stay) in. It was the second time in this career that doors opened for me that I didn't expect, but kept me going. Now I have had the best teachers/supervisors in this work, including ones who encouraged me to pursue my interest in developing the SPANS. I found the work really suited me, and transferring over to teaching, training clinical psychologists and neuropsychologists, when I did, also suited me.

What were some challenges that you've overcame when creating this assessment? How were you able to find a solution?

To make SPANS a truly 'parallel' set of tests, A & B, was much more challenging than it may now appear. From the specifications of SPANS A we created SPANS B. I had a collaborator in this venture and our aim was for precision in category, vernacular, syllable length, abstraction, number, Gestalt or representation, concept, whatever the 'equivalent' subtest required. These are or can be very complex constructs to be thinking 'difference but equivalency' in creating a second test that is supposed to tap exactly the same underlying ability or construct with different content. It also requires same instructions, same time limits, same prompts – same everything technical and practical – with construct and content equivalency. This was shear determination and time and hard work and reading about and theorizing how the brain 'works' was involved in this process. The result now seems very good, with excellent alternate-version test-retest reliability in the SPANS.

Can you briefly describe the various subtests of the SPANS

The SPANS has seven index scores: orientation; attention/concentration; language; memory/learning; visuo-motor performance; efficiency, and conceptual flexibility. Thirty brief subtests distribute across these seven index scores, producing reliable measures of the construct thought to be represented in the label or name given to the index (e.g. memory/learning). Validity starts with good theory and empirical evidence. I tried to 'map the brain' via single subtests that amass to produce a reliable, several subtest, index score. Attention, for example, is thought to be composed of different elements, including arousal/alertness, span or 'amount' of information that can be held in mind at any given moment, sustainability or vigilance of attending, divided or splitting one's attention, ability to switch attention when needed, mental control to repress automatic or trained responses, and working memory. Subtests in each index tapped, it is thought, one or two of these sub-constructs, that together compose the wider domain we call attention/concentration, reliably measured. Each SPANS index has such a story behind it such as this in its creation.

What was your purpose in lessening the amount of manipulatives included?

This had to do with making the SPANS conducive to bedside assessment. The SPANS is useful for those who might be bed bound. If blocks or other pieces or fiddly things were needed to assess a cognitive skill, to do this with a patient confined to a bed, would be impossible. An entire index score would be incomplete and compromised, with the inability to administer just one subtest in a set. The manipulatives of the SPANS are confined to the stimulus book, and clipboard handed to the patient.

Additionally, however, there is guidance and psychometric data contained (i.e. each subtest is individually normed) in the manual for patients who are profoundly impaired in the motor, language, and/or visual domains, or if they have very limited means of communication, such as only the ability to blink to communicate 'yes' or 'no'. The SPANS was designed to measure a multitude of cognitive constructs in the possible absence of one or more of these skills, norm referenced, whilst also allowing the particular impairment to be revealed in the task or the score of the SPANS.

Please talk about the length of time of the test in relation to patients with Traumatic Brain Injury (TBI)?

The SPANS takes on average 25 to 30 minutes administration time with a healthy norm participant and experienced SPANS administrator. Administrations that take longer than this are tantamount to clinically relevant observation or information about a TBI patient, such as their arousal level and vigilance, capacity to sustain perseverance, ability to attend, ability to understand spoken instructions that most others do easily, processing and response time, tendency or not to get things right the first time, understanding of the social mores of a formal assessment by a health professional and the health situation they're in, and so forth. A cognitive assessment mirrors everyday demands placed upon a person, it is an observation of capabilities and capacities, and reflected is the effectiveness and vocational aptitude of the person for life demands. A SPANS assessment that takes longer than 30 minutes is indicative of at least some of the difficulties for the person listed above and is itself an important assessment variable. That said, the longest SPANS administration I experienced in my career was 70 minutes. I learned a tremendous amount about this patient.

What strategies have you found helpful in the interview of TBI patients?

It's difficult to categorize TBI patients into one group, as they experience such a wide variety of difficulties in combination and with relative severity, however what I feel from my own personal experience having worked with a multitude of patients emerging from a coma, and their families, is that the family members experience more psychological trauma than the patient him or herself is ever aware of. The patient has a memory blank spot, whereas the family experienced the near death, bloody experience of their loved one's injury. The TBI patient emerges into consciousness and lucidity, that may or may not subsequently ever be remembered by that patient. If they can walk and talk, their perception is usually that nothing is wrong, for rather a lot of months this is often the case anyway. And they are, however, different from their former selves in important ways that their self-concept does not yet know or see, whilst the changes strike the family members sharply.

The family's trauma and patient change engenders the tendency to come to expect very little from the injured person, to be upset that they can't see the changes in themselves, and to become overly protective. The family members don't understand the change either, often blame it on the person being intentionally difficult. This is a recipe for conflict, and potentially unhelpful long-term norms and routines get established. As a clinician seeing this unfold, you can recognize the pattern, so by building a relationship with the patient and all members of the family, by conducting a thorough assessment and developing a neuropsychological formulation, you help the family understand, come to know what to expect, co-create strategies for more harmonious living, make changes to environments and set up relevant accommodations.

What is the time involved in developing an instrument?

It took nine years to get from first concept principles and sketches to publication in its current form. Since publication, further validation and norming studies have continued, so in this sense the SPANS has been in development and revealing its use now for 14 years. During most of the first nine years I worked full-time and was a part-time post-doc graduate student with significant family illness thrown into the mix as well. So this needs to be told in context of these facts and extra time commitments – but still it's an incredibly time consuming thing to do, with a thousand subtle decisions and developments, background learning, norming people one-by-one, 10% inspiration and 90% perspiration. But the process has taught me so much. Having developed the SPANS, I believe I have a unique and privileged look into the measurement of, even existence of, cognitive constructs that we as clinicians take for granted or debate about, and that patients only experience as a continuous experience of consciousness, and categories so esoteric as to be deemed irrelevant by them – as they should be!

What was the population that helped with norming?

There exist two norming samples, the first were my patients, mostly with brain injuries of wide variety, that I worked with as a matter of clinical routine in my NHS hospital jobs. Their identities were anonymized and classified into groups, and I gained ethical permission to use these, now 'data', to begin to understand the psychometric performance of the SPANS, test-retest reliability, convergent validity, and such like.The second group, healthy control norms, were collected across the UK from myself and student volunteers who I trained to administer the SPANS, 20 such volunteers to date, who administered the SPANS to their friends, family, and other recruits. I administered the SPANS out of work hours to members of my patients' families, and NHS employees. From all of these individuals their education, age, ethnic identity, language (factors known to influence cognitive performance), were gathered systematically – and for a large proportion, an IQ estimate was also taken. The more educated, positive about cognitive 'games', and women are most likely to agree/volunteer to be a 'norm', so not actually representative of the majority of people.

Furthermore, most of my clinical patients were less educated, struggled in some arenas of life, and male. It was then, of particular intent and effort, to recruit such men, also less educated, who perhaps had trouble in and did not like their school experience, did not consider themselves 'normal' (but they are/were), to be norms. The volunteers and I therefore, were set on this task to recruit accordingly. I believe what we achieved, then, and is reasonably understood as a consequence, is an apples-to-apples comparison of very typical people who are more prone to becoming TBI patients, compared to a good understanding of healthy others like them. The SPANS provides, I believe, a fair representation.

What have we neglected to ask?

In clinical neuropsychologists' line of work, we use psychometric tests to help us evaluate such things as patients' rehabilitation potential, trajectory or progression of disability, accommodations needed, and capacity to make decisions. Performance-based and norm-referenced tests are a helpful part of this process.

I've found the SPANS useful in answering these questions. Included among the items is the potential to evaluate learning ability, and most effective mode of learning the patient still has intact. It also assesses the ability to abstract and reason with novel material or not previously known, to follow directions and understand spoken language. It is possible to judge the reliability of their yes or no responses, their ability to mentally calculate sums and subtractions, to write, to estimate patient's understanding of time, place, and situation, and how precise their perceptions of objects or space in the environment, and much more. The SPANS is a brief but clinically useful comprehensive battery, not paralleled in a time-efficient assessment.

Acknowledgement

None.

Conflict of Interest

No conflict of interest.