

Hayes Ability Screening Index-  
Nonverbal

**HASI-NV**

**MANUAL**

**SUSAN C HAYES**

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# About the Author

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She has published widely in the field, having been author or co-author of over 100 publications including peer reviewed journal articles, books, monographs and chapters in books. She has presented more than 80 conference papers at national and international conferences. She has been the recipient of over 27 research grants to fund research in the area of rights of people with intellectual disabilities; she has supervised many post-graduate students undertaking projects in this and other areas.

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# Acknowledgements

I am grateful to many people for their important contributions to the development of the HASI-NV. Development of the HASI-NV began in 2009, following on from the Hayes Ability Screening Index (HASI) which was first published in 2000 (Hayes, 2000). With the success of the HASI internationally, and following its translation into a number of languages including Norwegian, French and Dutch, it became apparent that there was a need for a nonverbal version which needed little or no translation and was as culture-fair as possible.

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# Chapter 1 – Introduction

## **Purpose and Use of the Hayes Ability Screening Index-Nonverbal (HASI-NV)**

The *Hayes Ability Screening Index-Nonverbal (HASI-NV)* is a brief, individually administered screening index of intellectual abilities. The HASI-NV is intended for use with people aged between 13 and late adulthood. It has been developed primarily to provide a short and effective instrument to indicate the possible presence of intellectual disability amongst persons in contact with the justice system and to determine those who need to be referred for further full-scale diagnostic assessment. In police settings, the HASI-NV is designed to identify those accused persons or interviewees who may be vulnerable during detention or police interviews, so that appropriate provisions (including presence of an independent third party and adapted interview techniques) for vulnerable interviewees may be implemented.

Development of the HASI-NV followed from the Hayes Ability Screening Index (HASI) (Hayes, 2000) which was created in response to difficulties experienced by professionals in the criminal justice system in recognising the presence of intellectual disabilities. As the HASI began to be used in non-English speaking environments and in jurisdictions that did not have welfare and educational provisions similar to those existing in Australia and other Western nations, it became apparent that some items and sub-tests were not universally appropriate. The HASI was translated into other languages, including Dutch, Norwegian, and French Canadian, but the translation process was difficult owing to verbally-based items such as being able to spell a word backwards, or translating questions about welfare benefits or special education. Hence, it was clear that there was a need for a screening test which was minimally dependent upon verbal or literacy skills, and did not refer to support systems for people with intellectual disabilities such as welfare payments and special education.

The HASI-NV has been designed for use by professionals working at every stage of the justice system, especially the criminal justice system, as well as in mental health and other community settings. Provided appropriate training in the administration and scoring of the test has been undertaken, non-psychologists can administer the Index. The test is useful to police, solicitors and barristers, probation and parole personnel, juvenile justice workers, justice health professionals, corrective services staff, drug and alcohol counsellors, forensic, community and correctional mental health professionals, and service providers in other community settings such as health care, supported housing and immigration. The HASI-NV is brief, and easy to administer and score.

The Manual includes instructions for administration of the Index, scoring criteria, and test development and validation data. The HASI-NV can be administered as a pencil-and-paper test, or as a computerised on-line version, using two tablets, one for the tester and one for the test taker. This Manual describes the administration of the pencil-and-paper version of the

HASI-NV; information about the web-based application can be found on the website (enter “HASI-NV” into a search engine).

The final score on the HASI-NV indicates whether the person tested should be referred for further full-scale psychological assessment of intellectual and adaptive behaviour functioning. They may be referred also for psychiatric or other assessments. In police settings, the score indicates that special provisions for vulnerable interviewees may need to be implemented to ensure their safe detention, respect their rights during interviews, adapt interviewing techniques, and allow for the presence of and support from an independent third party during police interviews.

The HASI-NV itself is **not** an instrument suitable for making a **diagnosis** of intellectual disability or any other mental abnormality. The Index is suitable only for indicating which test takers should be referred for further psychological, psychiatric or other diagnostic assessment, or should have special provisions implemented during police interviews or detention.

## Requirements for Testing

### Test materials

Each HASI-NV pencil-and-paper kit includes the following materials:

- Manual
- Transparent marking sheet for the Puzzle, Match the Pictures and Odd One Out sub-tests
- Record Booklets for recording the answers and scoring the Index

The Record Booklet has space to record identifying information, responses to individual items, and scores. The final score becomes an indicator for referral for further full-scale assessment of possible intellectual disability, psychiatric symptoms, or other conditions which may render the person "at risk" in the criminal justice system or community settings. The Booklet provides a simple method of computing whether or not to refer the individual for further assessment.

The various sub-tests require the test taker to join dots in a puzzle, draw a clock face, draw lines to match pictures, and make a cross to indicate which picture does not fit with other pictures. These sheets remain attached to the Record Booklet, whilst being written on by the test taker. Since the tester must read out some instructions while the test taker is completing these sub-tests, the Instruction Page is designed to be removed, by tearing along the perforation. The tester can read out the Instruction Page, and then transfer information, such as the time taken to complete the sub-test (after checking whether the response is correct or incorrect), onto the scoring page, whilst the pages that the test taker writes upon remain as part of the Record Booklet. This prevents the important test answers from becoming separated from the rest of the Booklet. This tear-off Instruction Page is used, rather than requiring the tester to read from the Manual, in order to minimise the amount of material



needed for test administration, and to ensure that the HASI-NV can be administered even if the Manual is not to hand.

### **Materials not included in the test kit**

Materials which are NOT included in the test kit, but which are needed for effective administration of the HASI-NV include the following:

- Two pencils or pens, one for use by the test administrator to record the answers and score the results and one for use by the test taker when undertaking the drawing tasks.
- A stopwatch; if the test administrator does not have access to a stopwatch, a wristwatch with a second hand or a stopwatch facility, or a smart phone with a stopwatch timer must be used. It is vital that during the timed section of the test, the exact time taken to complete the item is recorded accurately.

### **Testing time**

The Index is designed to be administered within a few minutes, usually less than 10 minutes.

### **User qualifications**

The HASI-NV is designed to be administered by examiners who may not have psychological or psychometric qualifications. Training in the administration of the Index, knowledge of scoring criteria specified in the Manual, and practice administrations are essential, however. The examiner should conduct practice administrations until s/he is familiar with the test materials and can administer the Index smoothly, using a stopwatch (or equivalent) and reading the instructions accurately. Examiners who have any questions about the administration of the test or the interpretation of results should consult the Manual and if questions still remain, then seek assistance from a psychologist experienced in psychometric test administration. Examiners who administer the Index infrequently need to take time to re-acquaint themselves with the test materials and procedures prior to entering a new testing session.

Effective interpretation of the score, that is, the decision to refer or not refer the test taker, or to implement special provisions during police detention or interviewing, requires no sophisticated understanding of the principles of psychometrics. Nevertheless, it must be emphasised that interpretation and use of test results, and optimisation of referrals for further assessment are reliant upon effective administration of the test. The results may be biased, or rendered invalid by a careless testing situation, for example, where rapport has not been established with the test taker, or where a sub-test has not been accurately timed, perhaps owing to interruption of the testing session or another distraction. If the results are inaccurate, individuals who have an intellectual disability or other mental condition may not be referred for full-scale assessment and therefore may not be afforded the protections and assistance that they need in their encounters with the justice system. On the other hand, poor testing practice may result in individuals who do not have an intellectual disability or other condition being referred for further assessment, thus needlessly using valuable and often scarce resources.

## **Interpretation of HASI-NV Results**

Performance on the HASI-NV provides only two descriptive categories – "Refer for further assessment" or "No referral". There are no age-based normative scores. The score obtained is not equivalent to an IQ score and should not be used to categorise test takers as to their level of ability. A diagnosis of intellectual disability cannot be made solely on the basis of the HASI-NV.

The results of the test do not indicate whether a person is unfit to be tried, or whether there is any other defence or legal strategy which would be relevant to their court matter. This test alone does not provide a basis for placing test takers into special units within correctional institutions.

The results are designed to:

- identify those individuals who need to be referred for further diagnostic testing, or
- identify those who are vulnerable during police questioning or detention and who require safe custody provisions to be implemented, the presence of an independent third-party, or special consideration during interviews.

## **Features of the HASI-NV**

### **Covers a wide age range**

The HASI-NV provides a means of assessing people from early adolescence (age 13+) through to late adulthood.

### **Can be administered by non-psychologists**

The HASI-NV is designed to be administered and scored by non-psychologists such as correctional officers, police, probation and parole personnel, lawyers, welfare and mental health workers, drug and alcohol workers, service providers, nurses and medical practitioners, including psychiatrists. It is essential that the examiner receives proper training in the use of the Index, understands the scoring procedures and criteria, and undertakes some practice sessions.

### **Offers validity data**

This Manual provides details of the validity of the HASI-NV in determining which test takers are "at risk" of being intellectually disabled or having another condition which affects their ability to understand and cope with the criminal justice system or within other justice or community environments.

### **Statistical procedures have been used in the design**

This Manual gives details of the analyses which were performed to determine those items having the strongest ability to predict intellectual disability or other mental conditions that may affect the test taker's capacity to understand their legal situation. Details are given concerning how the final scoring template was arrived at.

# Chapter 2 – Rationale and Content

## Rationale for the Development of the Hayes Ability Screening Index-Nonverbal

A major difficulty facing professionals working in the criminal justice system and community/health sectors is the problem of identification of people with an intellectual disability. The interests of the individual with an intellectual disability (including victims, witnesses, detainees, service users, health care clients or suspects/accused persons) and the interests of the system itself cannot be well-served if the presence of intellectual disability goes undetected. When vulnerable individuals are not identified as having an intellectual disability, it is likely that they will not receive the appropriate and available protections of the system; furthermore, within the criminal justice system, justice may not be well-served and valuable time and resources may be wasted by all of the agencies involved (Hayes & Craddock, 1992). In community or health settings, and indeed any setting where the rights of people with intellectual disabilities may be compromised if their condition is not identified (for example, gaining access to public housing, obtaining parenting support, in immigration centres, or in primary health care and hospital environments) it is also vital to recognise those individuals who have an intellectual disability.

In 2013, the Australian Human Rights Commission conducted a wide-ranging consultation process to identify how people with disabilities deal with the barriers they experience to equality before the law (Australian Human Rights Commission, 2014) (p. 5).

*“The consultation process revealed:*

- *Inability to access effective justice compounds disadvantages experienced by people with disabilities.*
- *Many people with disabilities are left without protection and at risk of ongoing violence.*
- *People with disabilities experience a relatively high risk of being jailed and are then likely to have repeated contact with the criminal justice system.*
- *Many offenders with disability have themselves been victims of violence and this had not been responded to appropriately, contributing to a cycle of offending.*
- *There is widespread difficulty identifying disability and responding to it appropriately.*
- *Necessary supports and adjustments are not provided because the need is not recognised.*
- *When a person’s disability is identified, necessary modifications and supports are frequently not provided.*
- *People with disabilities are not being heard because of perceptions they are unreliable, not credible or incapable of being witnesses.*

- *Erroneous assessments are being made about the legal competence of people with disabilities.*
- *Styles of communication and questioning techniques used by police, lawyers, courts and custodial officers can confuse a person with disability.*
- *Appropriate diversionary measures are underutilised, not available or not effective due to lack of appropriate supports and services.*
- *People with disabilities are less likely to get bail and more likely to breach bail because they have not understood the bail conditions”.*

A diagnosis of intellectual disability is made on the basis of the following criteria (American Psychiatric Association, 2013) (p. 33):

*“A. Deficits in intellectual functions, such as reasoning, problem solving, planning, abstract thinking, judgment, academic learning, and learning from experience, confirmed by both clinical assessment and individualized, standardized intelligence testing.*

*B. Deficits in adaptive functioning that result in failure to meet developmental and socio-cultural standards for personal independence and social responsibility. Without ongoing support, the adaptive deficits limit functioning in one or more activities of daily life, such as communication, social participation, and independent living, across multiple environments such as home, school, work, and community.*

*C. Onset of intellectual and adaptive deficits during the developmental period.”*

Intelligence quotient (IQ), a concept familiar to most people, has been the accepted way of measuring intelligence. The term “standard score” (SS) is now used more frequently, to express the principle that an individual’s abilities are compared, using a standard test, with the range of abilities in the general population. The average IQ or SS in the general population is 100, with the average range extending from 90-109. Most definitions of intellectual disability operationally define deficits in functioning as commencing at two standard deviations below the mean of 100, that is, a standard score of less than 70, although some diagnostic categories or services specify a standard score of less than 75. Borderline intellectual functioning is in the range of 70-79, whilst low average is 80-89. Population prevalence of intellectual disability is generally reported as being less than 3%.

### **Over-representation of people with ID in the justice system**

The difficulty of identifying the presence of intellectual disability in accused persons or offenders is implied in numerous studies where over-representation of this group in the criminal justice system has been reported, and yet little provision has been made to meet the needs of this group (Fougere, Thomas, & Daffern, 2013). The prevalence of intellectual disability among offenders is greater than is generally estimated by those involved in the justice system. In Australia, attention was initially focused on the problem of over-representation by research in New South Wales prisons and Local Courts (Magistrates

Courts) which found the prevalence of intellectual disability to be 12% in prisons (Hayes & McIlwain, 1988), and 25% in Local Courts, with a further 14% falling in the borderline range of ability (Hayes, 1993; Hayes, 1996). More recently in NSW Local Courts, over 10% of accused persons were shown to have deficits in cognitive reasoning and adaptive behaviour, with the percentage varying from 2–18%, according to the socio-economic area in which the court was located (Vanny, Levy, Greenberg, & Hayes, 2009). A NSW prison inmate health survey found that 8.1% of prisoners had an intellectual or borderline intellectual disability (Butler & Milner, 2003).

Over-representation of people with intellectual disabilities at various stages of the criminal justice system has been found in other jurisdictions including the United Kingdom (Hayes, Shackell, Mottram, & Lancaster, 2007; Mason & Murphy, 2002; Talbot, 2012), USA (Davis, 2009), Canada (Crocker, Cote, Toupin, & St-Onge, 2007), Norway (Sondena, Rasmussen, Palmstierna, & Nottestad, 2008) and Finland (Mannynsalo, Putkonen, Lindberg, & Kotilainen, 2009). Other nations are alert to the likelihood of over-representation in the justice system and are developing policies to address the issue and educate justice professionals in identifying individuals with intellectual disability.

There is considerable debate about the extent of over-representation of people with intellectual disabilities coming into contact with the justice system, and research has found a wide variation. Three important principles need to be borne in mind, however. First, the finding that the percentage of people with intellectual disability who are defendants before courts varies according to the socio-economic level of the area from which the court draws, and therefore, variation across any jurisdiction is to be expected (Vanny et al., 2009). Secondly, the prevalence of people with intellectual disabilities in prisons may be affected by whether or not diversionary options exist in the form of secure units/hospitals or other community based programs, allowing offenders with intellectual disabilities to be diverted from the criminal justice system. Thirdly, the prevalence of people with intellectual disabilities facing difficulties in the justice system is to some extent irrelevant, if even one person's rights are compromised.

Law Reform Commissions and enquiries into people with intellectual disabilities in the justice system reveal a common theme, namely the difficulty experienced by non-psychologists in identifying the presence of intellectual disability ("The Bradley Report") (Bradley, 2009), resulting in a significant level of under-identification (New South Wales Law Reform Commission, 2012). The Bradley Report expresses concern about the current assessment of detainees in United Kingdom police stations and recommends that screening services in police stations need to be more consistent, and include better availability of information about a detainee's previous contact with services. An inspection of the treatment of offenders with intellectual difficulties in the criminal justice system found that offenders with these disabilities were not always afforded the level of service appropriate to the risk of harm they presented or their needs, and that problems included failure to recognise an intellectual disability, and failure to refer the offender to specialist services for assessment (HMI Probation, HMI Constabulary, HM Crown Prosecution Inspectorate, & Care Quality Commission, 2014). This report recommended that it is important to make effective

screening tools available in all custody suites, to assist custody staff in identifying detainees with intellectual disabilities (often referred to as “learning disabilities” in the UK).

The rights of people with intellectual disabilities cannot be respected when their disadvantage in the system is not recognised. In response to the need for better methods of identifying people with an intellectual disability in the criminal justice system – perpetrators, victims and witnesses – this nonverbal screening test for intellectual disability has been developed. The Hayes Ability Screening Index-Nonverbal (HASI-NV) is designed for use by a wide range of criminal justice personnel, who may have little or no psychological training or expertise. As emphasised throughout this Manual, the HASI-NV is not designed to provide a definitive diagnosis of intellectual disability, but indicates that a person should be referred for further full-scale diagnostic and/or psychometric evaluation. In police settings, the HASI-NV indicates that the detainee or witness may be vulnerable during detention and interviews, and allows supports and special interviewing techniques to be implemented.

The Index is designed to be over-inclusive and may identify those who have other types of learning difficulty, are functionally innumerate, are intoxicated by some substance, have a visual or hearing impairment, or have a mental condition, the symptoms of which impede their ability to concentrate on and complete the test. Over-inclusion is preferable to under-inclusion, since many of those in the groups mentioned would benefit from a full-scale assessment, which may be conducted for the purposes of:

- ensuring appropriate supports are present during an interview, for example, a deaf interpreter for an individual with a hearing impairment;
- ensuring that they can understand the police caution, and the interview questions;
- assessing their ability to participate in their trial (fitness to be tried);
- providing information concerning appropriate mitigation in sentencing;
- providing special support and assistance in the prison system; and
- providing appropriate supports and resources during a term of probation or parole.

## **Description and Rationale of Test Items**

The HASI-NV consists of four sub-tests:

- Puzzle
- Clock Drawing
- Match the Pictures
- Odd One Out

### **Puzzle**

The Puzzle test is in some ways similar to the Trail Making Test which is now more than 50 years old (Army Individual Test, 1944), and which is in the public domain (Lezak, 1995). Trail Making has been widely used to assess visual-conceptual and visuo-motor tracking and is sensitive to the effects of neurological impairment (Tombaugh, 2004). The original test consists of two parts. In Part A, the test taker joins together some sequentially numbered

circles, whereas in Part B, the test taker joins a circle with the number “1” in it, to a circle with the letter “A”, then circle “2” followed by circle “B” and so on. The significance of Part B of the test is that the test taker has to change mental set, from numbers to letters, whilst continuing to maintain the sequence in each set.

The original test administration required the examiner to record the time taken and the number of errors made. There are a number of ways of scoring Trail Making, including time-for-completion, and derived indices allowing comparison between Parts A and B (Lamberty, Putnam, Chatel, Bieliauskas, & Adams, 1994). The time-for-completion method means that the test timing is open-ended. During the development of the original Hayes Ability Screening Index (HASI) (Hayes, 2000), it was found that some test takers took over five minutes to complete Part B. The administration of the HASI was re-designed to eliminate Part A (which was found not to be a useful discriminator in this context) and to incorporate a cut-off score, so that the test taker “fails” the test if they not only do not complete within a certain time, but also if they complete incorrectly. Some information is lost with this method, as the very severe cases of difficulty with the test are not discriminated from the less serious “failures”. Nevertheless, the advantages are that the test is completed in a given time, essential for a short screening instrument, and the test taker does not lose motivation, as they tend to do if they sit there for a long time attempting to complete the test.

In developing the HASI-NV it was important to maintain the concept of changing set, whilst on the other hand avoiding the use of the English or so-called Latin alphabet, in order to avoid difficulties for individuals who are literate in other forms of alphabet. Because the so-called Arabic number system based on “1”, “2”, “3” and so forth is fairly universal, numbers were retained in the Puzzle. The change of mind set was achieved by placing numbers in different coloured circles, so that the test taker starts with a yellow circle containing “1” and draws a line to a blue circle containing the number “1”, followed by a yellow circle with a number “2” and so forth until they complete 13 circles in each colour in correct order. Thus, the individual has to hold the sequence of numbers in their memory, as well as the yellow/blue sequence.

The test taker is allowed to practise on a sample page consisting of yellow and blue circles numbered “1” to “4” before commencing the actual Puzzle test.

A potential problem that was addressed in designing the test was the issue of colour vision deficiency, usually known as colour-blindness. About 8% of men and 0.5% of women have colour vision deficiency; the condition is less frequent amongst African people than in non-African populations. Whilst it is likely that the test taker would inform the tester if they were colour-blind, in any event the colours in the Puzzle are not likely to be confused by individuals with most types of colour-blindness. The most frequent form of colour blindness is red/green colour blindness which does not affect the Puzzle because it uses yellow/blue. Some of the other types confuse various other colours, the most relevant and prevalent being confusion of blue with red, purple or dark pink, or green with yellow. However, there does not seem to be a type of colour blindness that confuses blues with yellows.

Total colour blindness, or monochromatic vision when an individual sees only greys, black and white (similar to an old television set) is very rare, occurring in about 1 in 33,000 people. Usually these individuals have to wear tinted glasses in normal light conditions, and this would be apparent to the tester. For these test takers, the density of the colours would appear different, as would occur if the page was photocopied in black and white instead of colour. The blue circles would look darker than the yellow circles.

Hence, the colours of blue and yellow were chosen as being unlikely to cause problems for those with colour vision deficiency.

### **Clock Drawing**

Clock Drawing is a simple and quick screening test for visual-spatial and constructional deficits, which can be used as part of a neurological screening procedure. In this Clock Drawing sub-test, the test taker is presented with a blank sheet of paper on which they are asked to draw a large face of a clock with all the numbers on it. The person is then told to draw the hands at a particular time. Different methods of administration and time limits for the drawing have been reported (Richardson & Glass, 2002), and different scoring systems can be used (Brodarty & Moore, 1997; Eknoyan, Hurley, & Taber, 2012). Using the 10-point scoring system, scores of 7 to 10 represent normal functioning (Berg, Franzen, & Wedding, 1994) whereas scores of 5 or lower are rare in normally functioning test takers. Clock Drawing can be administered quickly, without elaborate testing equipment, and to a wide range of participants (elderly participants, those who are poorly educated, and those who may have hearing impairments or poor English skills). The face of a clock is a universal image, school education systems focus on teaching students how to tell the time on analogue clocks, and the image is standardised (Pinto & Peters, 2009).

Research on inter-rater reliability of scoring of the Clock Drawing, using three different scoring methods, found “almost perfect” inter-rater reliability; the researchers recommend brief training in order to achieve consistent scores between raters (Hubbard et al., 2008). The high level of inter-rater reliability of Clock Drawing is supported by other research, some of which has been conducted in non-English speaking countries (such as Taiwan and Germany) (Chui, Li, Lin, Chiu, & Liu, 2008; Schramm et al., 2002).

### **Match the Pictures**

This is a novel sub-test developed specifically for the HASI-NV. The test taker is presented with two columns of seven pictures; each picture in the left hand column has a picture that it can be paired with, in the right hand column. The test taker is asked to draw a line linking those pictures which go together. The pictures were especially created for the HASI-NV test, and include pictures of objects which would be recognisable to persons living in the most remote areas of any country.

The sub-test assesses executive functioning and planning because if the test taker does not scan both columns before starting to draw the lines, he or she is likely to impulsively match two pictures which do not go together, and therefore have “leftover” pictures at the end of the test. Test takers are not permitted to go back and correct mistakes. For example, the top



picture on the left hand column is a tree, which is correctly matched with the fourth picture down in the right hand column, which is an apple. However, if the test taker responds impulsively without scanning the columns first, he or she may incorrectly match the tree with a picture of a bird at the top of the right hand column. Subsequently, there will be no opportunity to match the bird with the bird's nest.

Test takers are allowed to practise on a sample page consisting of three pictures in each column.

### **Odd One Out**

This sub-test was specifically developed for the HASI-NV and again is designed to assess executive function and planning, as well as reasoning skills. The test taker has to decide on similarity of pictures on the basis of the intrinsic qualities of the objects pictured, for example, their use or the material they are composed of, rather than other attributes such as shape or size.

The sub-test consists of four rows, each containing four pictures which again were specifically designed for the HASI-NV test, and were chosen to be recognisable in any culture and in the most remote of areas. Each row contains three pictures with similarities, and one picture which differs from the others. For example, one row may contain pictures of a boot, the moon, a shoe and spectacles. The odd one out is the moon because the other pictures are of items which can be worn by people. A test taker who matches according to shape may erroneously consider that the moon, the spectacle and a rounded shoe are most similar.

The test taker has the opportunity to practise on a sample page with two rows of pictures, before commencing the timed test.

# Chapter 3 – Testing Environment and Practice

## The Testing Environment

The HASI-NV is an individually administered test. The test administrator needs to be in an environment with the test taker where there are a minimum of distractions and interruptions. The tester sits at a desk, opposite the test taker. It is inadvisable for the tester to stand whilst administering the test, as this can intimidate the test taker. The tester should check that s/he has all the equipment needed, including the Record Booklet, pencils or pens, and stopwatch or other means of accurately recording the time taken. The setting should be a private room where neither person can be overheard by others, if this is possible given security considerations. The test **must** be administered out of the hearing of other test takers who may be awaiting their turn. Similarly, other test takers should not be close enough to see what is happening, through glass screens, for example. If a third party has to be present during testing (owing to security requirements, for example) that person should be seated in a location off to the side, and not in the direct line of sight of, or directly behind the test taker. The third person must adhere to good testing practice and not give feedback by way of facial expression, body language, grunts, laughter or comments, or provide distractions, such as through conversation with the tester. Whilst it is acknowledged that the HASI-NV, like any psychometric test, may be difficult to administer in a custodial environment, the tester must attempt to create some degree of rapport with the test taker, if the test results are to be valid. This can best be done by explaining the purpose of the assessment in general and positive terms, adopting a pleasant, calm demeanour and giving only neutral feedback about the test taker's achievements on the test.

## Testing Practice

The HASI-NV must be administered in accordance with the set procedures. It is important that the examiner:

*Follow directions* – the wording must be exactly adhered to, except when substitute phrases are permitted, as indicated on the instruction page. Timing must be precise. All sections of the HASI-NV must be administered. Examiners must understand the importance of exact adherence to testing procedure, and realise that deviation from standard procedures renders the HASI-NV results inexact. Further down the line, the consequences of poor test administration procedures will be serious. "Failing" too many test takers because of poor rapport or inexact timing, for example, and referring them on for further assessment is likely to have ripple effects. In a prison, psychological and mental health services will react negatively to their time being devoted to what they may perceive as unnecessary assessments. "Passing" a test taker inappropriately can have repercussions, too. A police officer who administers the test inexactly or incompletely, thus missing out on the presence of a factor

which makes the person vulnerable during police questioning, may find that the police Record of Interview later becomes inadmissible in court because the individual did not understand the caution, or because an independent third party was not present during the interview, and the police case against this suspect may collapse.

*Avoid giving feedback* – giving feedback on the correctness or otherwise of a response is not permissible during or after the test. Some very practical reasons dictate this. A test taker may undergo the test on a subsequent occasion and perform better if they have been told the "right" answers. A test taker may be asked by other suspects or offenders to give them the "right" answers. Alternatively, "faking bad" becomes easier if the test taker receives feedback about their performance. A few test takers may, erroneously, perceive that there is an advantage to "faking bad"; they may think they will be treated better or differently by the system if they fake a disability. Test takers are quick to pick up on nonverbal cues such as sighs, frowns, or signs of impatience on the part of the tester and therefore a tester must be aware of their own behaviour and minimise these cues. Remarks such as "Good" or "Right" are to be avoided and replaced by remarks such as "I can see you are trying your best" or "You are concentrating well" or other neutral comments. If the test taker asks how they did, a non-committal answer such as "I cannot tell until I score the test" is the best response. Depending upon the situation and purpose of the administration of the HASI-NV, it may or may not be appropriate for the tester prior to the screening situation to tell the test taker what the consequences of a particular direction of test result will be, that is, whether they will be referred for further diagnostic examination, or have special procedures implemented during police detention. The examiner can simply advise the test taker that they will be told privately at a later time whether there needs to be any follow up or further assessment, and that the HASI-NV results will not be detrimental their situation in any way.

## **Observing the Test Taker**

An advantage of this individually administered Index is that it gives the examiner the opportunity to observe the behaviour and demeanour of the test taker in a one-to-one situation. The tester may note that the test taker appears to be incapacitated by anxiety or intoxication, for example, and postponement of the administration of the HASI-NV would be advisable if possible (there must be an established procedure for testing this person at a later time, however, so they do not "fall through the system"). The tester may note lack of cooperation, which could require further explanation to the test taker of the importance of the test. Erratic behaviours and answers may emerge, consistent with thought disturbance. Such observations should be noted on the Record Booklet, to assist the subsequent full-scale assessment. A space for noting these observations is provided, as well as for noting the test taker's facility in English or any other factors which may be pertinent to the full-scale assessment.

## **Rapport**

The test takers undertaking the HASI-NV are likely to be quite anxious. In the most extreme circumstances they will be in a prison reception area or a police station, perhaps for the first

time. A number of concerns will be distracting them, including apprehension about what will happen to them, the presence of other people, both officers and inmates, procedures such as distribution of prison clothing and removal of their own possessions, and separation from family and their normal environmental supports. Under these circumstances, the establishment of rapport during the testing procedure becomes vitally important.

Rapport can be enhanced in a number of ways. Important factors are:

- Tone of voice – the voice should be calm and moderate and should provide no indication of how the test taker is performing.
- Attention – the administrator of the test must pay attention to the test taker and not be distracted by other people or occurrences, especially when timing the sub-tests.
- Privacy – it is important that the test taker does not feel that they are being observed or overheard by others.
- Explanation of the purpose of the test – this should be non-threatening. The explanation will differ according to the environment and so a standard explanation needs to be developed by each service/agency and become part of the protocol followed by test administrators in each testing situation. The focus of the explanation needs to be on the fact that the results of the test will assist the test taker and ensure fairness to them. It is also important to stress the confidentiality of results within clearly specified guidelines which are made apparent to the test taker.
- Reassurance – it is important that the test taker be reassured that the results will not threaten them in any way, and will not make their situation worse.
- Sincerity and respect – the tester needs to see the HASI-NV as an opportunity to benefit both the test taker and that section of the criminal justice system or service which they represent.
- Relaxed mode of administration – testers need to practise administration of the HASI-NV until they can undertake the process fluidly, without being stilted or awkward.

# Chapter 4 – Administering and Scoring the HASI-NV

## The Test Setting

As mentioned previously, it is important for the test setting to be private so the test taker's responses cannot be overheard or viewed by others. In the rare and unfortunate situation where a private room is not available, the tester must ensure that subsequent test takers are not close enough to see or hear the testing procedure, and that other people in the environment are not distracting the test taker.

The tester should sit across the desk from the test taker, or if that is not possible, on an adjacent side of the desk at right angles to the test taker. The tester should not stand while administering the test, nor sit on the same side of the desk. A desk or table is essential – the test taker should not have to complete the test on their lap, or on a bench-top, or standing up at a counter.

The tester should check that they have:

- Record Booklet
- Transparent marking sheets for the Puzzle, Odd One Out and Match the Pictures sub-tests
- Two pencils or pens
- A stopwatch, or a watch with a second sweep hand, or a smart phone with a stopwatch facility

The desktop should be bare of all other materials which might distract the test taker or give clues (for example, a clock should not be visible to the test taker). If using a stopwatch, make sure the face is not visible to the test taker when Clock Drawing is being completed.

## Administering the Test – Instructions for the Tester

The test administrator must write his/her own name on the top section of the first page, so that the professional subsequently conducting the full-scale diagnostic assessment can ask questions if necessary, or validate different referral rates emanating from various testers.

The tester then fills in the section on location, for example, name of police station, name of prison or wing, health service or legal office. Abbreviations which may not be familiar to subsequent assessors should be avoided. This is important because in some services, the HASI-NV results may follow the test taker around to various prisons or health services, for example, and an abbreviation known to professional staff locally may be incomprehensible to staff in another area.

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If the test taker has an identification number (ID No.), such as a health care number or prison inmate number, the tester writes that in the space provided, again for later reference and to ensure that this test taker is not confused with another individual.

The tester asks the test taker's Family Name/Surname and Given Names, and ensures that the correct spelling is recorded on the Record Booklet, to avoid confusion between individuals' results.

The tester now fills in the section on gender. In the case of trans-gender test takers, they can be classified as the gender with which they currently identify, or that with which they will be identified in the testing facility (that is, male or female holding cell or prison). Gender is important primarily for identification of the test taker, and is not a factor which may substantially influence the outcome of the test.

The section on ethnic background is completed if the tester regards this as relevant, or if it is part of the protocol developed by the organisation administering the HASI-NV. This may be useful information, although it is not directly relevant to the results of the HASI-NV.

The date of testing is inserted in the space provided, in a two digit format, that is, the first month of the year is "01". The date is written in the format of Year, Month, Day, consistent with common practice in other psychometric tests, and also because this format makes it easier to calculate the age of the test taker. The test taker is then asked their date of birth and that section is completed. As a double check on the test taker's cognitive abilities, the tester asks the person their age at time of testing and enters that in the appropriate spaces. If the test taker does not know their age or date of birth, try to obtain the information from another source and note this on the Record Booklet. The tester must then **calculate the age, as a check**, or use an on-line age calculator. Sometimes, people with an intellectual disability will not be able to provide their correct age or date of birth, and if this occurs it should be noted at the bottom of the scoring page, as it is an important piece of information.

The questions must be asked using the exact words written on the Record Booklet Instruction Pages. The double-sided Instruction Page is detached and the tester reads from this while the person completes each of the sub-tests in the Record Booklet. The entire Record Booklet has been designed so that the Instruction Page is torn off, whilst the rest of the test booklet remains intact. DO NOT throw the Instruction Page away, however, because the times that the test taker needs to complete the sub-tests are recorded there. The full instructions are included in each Record Booklet in order that the test can be administered without the need to carry around a Manual or a laminated sheet giving the instructions. The Record Booklet is designed to stand alone, and contains all relevant instructions for the administration and scoring of the HASI-NV (although the transparent scoring sheet will be needed for scoring some sub-tests).

As the test proceeds, the tester turns the Record Booklet pages back so that the test taker sees only the **Sample** page for the Puzzle, Match the Pictures and Odd One Out sub-tests.

As noted above, it is vital to follow the instructions in the Record Booklet exactly. It is especially important that all the sub-tests except Clock Drawing are accurately timed and the time is recorded.

**The scores for the Puzzle, Match the Pictures and Odd One Out are calculated later** after the tester has checked whether there are errors in the responses. This check is done by placing the transparent marking sheets over the relevant completed sub-tests and making sure the person's test sheets match the marking sheets exactly. If the transparent marking sheets are unavailable or lost, the marking can still be completed in a few minutes by the tester tracing over the correct answers in a different colour pen. The tester must **under no circumstances** just glance at the Puzzle, Match the Pictures or Odd One Out sub-tests and assume that “they look correct”.

The instructions for the **Clock Drawing** sub-test must be followed exactly, using the form of wording as printed in the Record Booklet Instruction Page. The Clock Drawing can be scored later, according to the scoring guidelines, after the testing session is concluded.

## **HASI-NV Scoring Guidelines**

Specific guidelines for scoring the HASI-NV are included in the Record Booklet and are reproduced in Appendix A of this Manual. The TIME taken to complete each of the timed sub-tests is transferred to the Scoring Page, the tester checking to make sure that the time recorded on the Instruction Page is the same as that on the Scoring Page. Then the tester records whether the sub-test has been completed correctly or incorrectly, and circles the appropriate score for that sub-test, which is the SCALED score. Each sub-test has a different SCALED score. For example, if the person achieves a time of less than 55 seconds for Puzzle and the response is correct, the tester runs their finger from “Correct, under 55 seconds” across to the SCALED score of 40 and circles that, before entering this SCALED score in the green box in the right-hand column.

The tester then adds up the scores in the green boxes in the right-hand column and records that in the yellow box.

If the total score is less than 90, the tester ticks the pink box. Remember, this score is **less than 90**, that is, up to and including 89, and is not a score of 90 or above.

If the score is 90+, the grey box is ticked. A tick in the pink box means “Refer for further assessment” whilst a tick in the grey box means “No referral”.

## **Translating the instructions from the English language to other languages**

The test has been designed so that it can be readily translated into languages other than English, since only the instructions need to be translated and the sub-tests themselves do not need any alteration.

However, in order to adhere to the meaning of the English instructions as closely as possible, the translation needs to be done in the accepted manner, after written permission is obtained from the copyright owner, HASI Publications. A copy of the translated HASI-NV must be lodged with the copyright owner.

The accepted manner of translation is to use independent, bi-lingual translators, to minimise the risk of linguistic, psychological, cultural, and both theoretical and practical understanding biases, and to enable the translation to encompass the nuances of the language (Borsa, Damasio, & Bandeira, 2012). One accepted manner of translation is for one or more translators to translate from the English version of the HASI-NV to the non-English language, and for an independent translator to then undertake a reverse translation. If there are differences in the wording, the translators need to collaborate to work out how best to convey the original English version.

It is vital that a professional translation be obtained; under no circumstances should the task be undertaken by a non-professional interpreter who is considered to be “good” at English. The translation needs to be completed by translators who are fluent in the source language and preferably native speakers of the second language.

It is also essential that a validated version of the translated HASI-NV be used, and not an “on-the-spot” interpreter. An interpreter may not be conversant with the rules pertaining to psychometric assessments and may alter the language of the instructions, repeat sections of the instructions, or inadvertently give hints or clues which give an advantage to the test taker.

If a translated version of the HASI-NV is required and a local organisation which wishes to use the HASI-NV does not have the resources to ensure a professional translation, contact can be made with the copyright holder, HASI Publications, and every attempt will be made to undertake a professional translation following the guidelines outlined above.

If the person is hearing impaired, a professional deaf interpreter can be used. In this circumstance, it is likely that a standard translation will not be possible because of variations in forms of sign language, and also the possibility that the test taker may use lip-reading. The tester or service agency may decide that it is preferable to use a different form of test with hearing impaired individuals. Furthermore, the service undertaking the screening process may decide that being hearing impaired is in itself a factor which renders the individual likely to be vulnerable, say, in a prison or police interview.

It is very helpful to record any relevant observations about the person, as these may be of great assistance during the follow-up diagnostic assessment, especially if the individual appears to be under the influence of drugs or alcohol at the time, is in an extremely distressed or anxious state, or shows signs of other serious disturbance or illness.



## Item Scoring

The guidelines for item scoring are given clearly in the Record Booklet, on page 2.

Once the test taker's score has been circled, the circled score is then transferred to the green shaded box to the right of the scoring table.

The Puzzle sub-test has five scoring levels, according to whether or not the result is correct or incorrect, and if correct, the time which was taken.

The highest score is given for a correct response, in under 55 seconds, whilst the lowest score is given for an incorrect answer.

The Clock Drawing sub-test is scored according to the guidelines on the second page of the Record Booklet using one of 10 possible scoring levels, in increments of 5 points (the SCALED SCORE). Only **one** of the scoring levels is used, according to the test taker's best attempt. It is incorrect to, say, give a score of 30, and then add up all the lower scores and include them in the total.<sup>1</sup>

The scores are as follows:

- 5 No attempt, or attempt is not recognisable.
- 10 Clock Drawing shows some evidence that instructions were understood but is only a vague representation; inappropriate arrangement of numbers (in lines, or random on page).
- 15 Numbers and face are no longer connected in the drawing, or hands are not recognisably present.
- 20 Some numbers are absent, written outside the clock, distorted in sequence, or hands are not clearly represented.
- 25 Inappropriate arrangements which persevere, e.g. use of dots instead of numbers, or the hands are represented but do not clearly point to a number.
- 30 Inappropriate use of clock hands (digital display, or circling of numbers) or the crowding of numbers at one end of the clock, or reversal of numbers.
- 35 Hands are placed significantly off the mark by more than one number, or inappropriate spacing of the numbers (all numbers on one side of clock).

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<sup>1</sup> Chi-square statistical analyses were undertaken of age of participants and the original Clock Drawing scores and the amended scores used in the HASI-NV where the scores are at intervals of 5 points. This was done because of suggestions that younger participants may not be as familiar with an analogue clock face as older participants. Two versions of age divisions were used. The first used the categories of under 18, 18–24.99 years, 25–39.99 years and 40+ years analysed against the 10 categories of Clock Drawing scoring. The second analysis used the same age groups cross-tabulated according to the statistical mean score of <40 and 40+. No statistical differences were found between the age groups on Clock Drawing scores, indicating that older age groups do not differ from younger age groups on performance on this sub-test. Similar statistical analyses were undertaken during development of the HASI, and no significant differences were found between age groups.

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- 40 More noticeable errors in placement of hour and minute hand (off by one number), or if number spacing shows a gap.
- 45 Slight errors in placement of hands (not exactly on the 8 or just before the 4, but not on one of the adjoining numbers), or one missing number from the face of clock.
- 50 Normal drawing with the numbers and the hands in roughly the correct positions; hour hand should be distinctly different from the minute hand and approaching 4 o'clock.

The Match the Pictures sub-test is scored on a five-point scale, with the lowest score being “1” for an incorrect answer and the highest score being “40” for a correct answer completed in less than 40 seconds.

The Odd One Out sub-test is scored in a manner similar to both the Puzzle and Match the Pictures sub-tests, on a five-point scale according to the two criteria of correct/incorrect, and time taken.

# Chapter 5 – Development and Standardisation

## Developing the Screening Tests

### Methodology

Following upon the widespread use of the HASI, it became apparent that translating the HASI into other languages was a difficult undertaking and some cultural differences emerged, such as variations in the welfare systems of different nations which made questions about receiving a welfare payment related to a disability irrelevant. Furthermore, the relative difficulty of chosen words for backwards spelling was difficult to evaluate in different languages. Therefore, a test battery needed to be developed which relied as little as possible upon the English language and literacy, or upon questions which may have had cultural implications.

A series of pictures was commissioned especially for the HASI-NV sub-tests, chosen for their universality.

The benchmark tests against which the HASI-NV were compared were a well-known and validated cognitive reasoning test, which was the Kaufman Brief Intelligence Test, Second Edition (KBIT-2) (Kaufman & Kaufman, 1997), and the Vineland Adaptive Behavior Scales, Second Edition (VABS-II) (Sparrow, Cicchetti, & Balla, 2005).

The **KBIT-2** was chosen because it is easily administered, reliable, and tends to be effective in maintaining the test taker's motivation. The KBIT-2 is a brief, individually administered measure of verbal and nonverbal intelligence, and can be used on age groups between four and 90 years. The test is composed of verbal and nonverbal sub-tests.

The Verbal score contains results from two sub-tests, Verbal Knowledge, and Riddles, and the raw scores on the two sub-tests are added together to yield the Verbal raw score. Verbal Knowledge is a 60-item measure of receptive vocabulary and a range of general information about the world. The test taker chooses the correct answer from an array of six coloured illustrations; the test taker can point to the picture which they choose. The Riddles sub-test has 48 items that measure verbal comprehension, reasoning and vocabulary knowledge. The examiner asks a riddle and the test taker either points to a picture that shows the answer (for the first few items), or responds with a one-word answer for subsequent items.

The Nonverbal sub-test consists of 46 items composed of a range of visual stimuli (people and objects, as well abstract designs and symbols) which require an understanding of the relationships among the stimuli. Each item is multiple choice and requires the person to either point to the correct answer or say the corresponding letter.

This test is reliable and valid and correlates highly with other tests of intelligence (Bain & Jaspers, 2010). The KBIT-2 sub-tests do not require manipulation of objects such as blocks, a useful feature when testing a client with a physical disability, or when testing occurs in settings which are not ideal for psychometric assessments, such as police stations or prison visiting areas. Similarly, the fact that the sub-tests are not strictly timed is also an advantage in difficult testing environments.

The **Vineland Adaptive Behavior Scales, Second Edition (VABS-II) (Survey Edition)** are a set of scales which are designed to assess an individual's ability to function in the general community, from birth to adulthood. They assess abilities in three major domains: Communication, Daily Living Skills, and Socialization. The items are scored depending on exhibited competencies: 2 (*Usually*), 1 (*Sometimes or Partially*), 0 (*Never*), NO (*No Opportunity*), and DK (*Don't Know*). The Scales may be administered by interviewing, in a conversational data-gathering format, a third party who knows the individual well, such as a caregiver or family member. This option was not available for many participants during the research for the HASI-NV, and thus the VABS-II was administered directly to the participant as a structured interview. For some items, demonstration of the relevant skill, such as reciting the alphabet, or knowing one's date of birth, was sought from the participant. The items were not administered in a "Yes/No" format, but rather incorporated into conversation and interview, with the participant being asked to describe their daily life, the tasks they were adept at and those with which they needed help, and how they maintained their household, managed their finances, and conducted their social life and relationships. Research has demonstrated that self-report yields results which are highly consistent with third party information (Voelker et al., 1990). Nevertheless, even third party information from separate sources (for example, teachers and parents) may differ significantly, and this instrument is not as reliable as a test of cognitive ability where the test taker performs all the tasks and is scored directly (Voelker, Shore, Hakim-Larson, & Bruner, 1997). The VABS-II Scales are most widely used as an ancillary diagnostic tool in the assessment of individuals with intellectual disability. Acceptable reliability and validity data for the VABS-II are available and there is adequate evidence of the effectiveness of this instrument in differentiating disabled and non-disabled samples (Sparrow et al., 2005).

### **Participants**

Participants in the evaluation were recruited from within forensic samples and the general community in Australia.

### **Administration of the battery**

The screening battery was administered by a qualified, registered forensic psychologist.

### **Results**

#### **The sample**

This was a purposive sample, selected to include adequate numbers of participants with intellectual disability (ID) and without intellectual disability, as well as some participants who were "offenders" (that is, charged with or convicted of a criminal offence) and some

who were not charged with or convicted of a criminal offence and who are referred to as non-offenders.

The sample consisted of 107 participants, of whom 88 were males and 19 were females. Included were 57 offenders and 50 non-offenders. The mean age of the total group was 28.2 years; the mean age of the offender group was 26.5 years whilst the mean age of non-offenders was 30.1 years. The difference was not significant.

**Table 1** – Gender ratio of offender and non-offender groups

<b>Group</b>	<b>Males</b>	<b>Females</b>	<b>Total</b>
Offenders	49	8	57
Non-Offenders	39	11	50
Total	88 82.2%	19 17.8%	107 100%

There was no significant difference in the proportion of males and females in the offender and non-offender groups.

Table 2 shows that 47.7% of the sample had both intelligence and adaptive behaviour scores of less than 70 (shown as <70 in the Table), 52.3% were under 75 (<75) on both tests, and 62.6% scored less than 80 (<80) on both. (The “<70” notation means up to and including 69, that is, a score **less than** 70, whereas the notation 70+ means a score of 70 and upwards.) Because this was a purposive sample, no conclusions can be drawn about the proportion of people with ID in the criminal justice system generally.

For the offender sub-group, 33.6% scored less than 70, compared with 14.0% for non-offenders, with the relevant percentages for less than 75 being 36.4% compared with 15.9%, and for scores of less than 80, 44.9% compared with 17.8%.

**Table 2 – Levels of ability as percentage of the total sample**

<b>Ability Level</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
IQ score <70	38 35.5%	17 15.9%	55 51.4%
IQ score <75	42 39.3%	17 15.9%	59 55.1%
IQ score <80	50 46.7%	18 16.8%	68 63.6%
AB* score <70	40 37.4%	16 15.0%	56 52.3%
AB score <75	48 44.9%	17 15.9%	65 60.7%
AB score <80	50 46.7%	18 16.8%	68 63.6%
IQ and AB <70	35 32.7%	16 15.0%	51 47.7%
IQ and AB <75	42 39.3%	14 13.1%	56 52.3%
IQ and AB <80	49 45.8%	18 16.8%	67 62.6%
	<b>Offender</b>	<b>Non-offender</b>	<b>Total</b>
IQ score <70	38 35.5%	17 15.9%	55 51.4%
IQ score <75	42 39.3%	17 15.9%	59 55.1%
IQ score <80	49 45.8%	19 17.8%	68 63.6%
AB score <70	39 36.4%	17 15.9%	56 52.3%
AB score <75	47 43.9%	18 16.8%	65 60.7%
AB score <80	48 44.9%	20 18.7%	68 63.6%
IQ and AB <70	36 33.6%	15 14.0%	52 47.7%
IQ and AB <75	39 36.4%	17 15.9%	56 52.3%
IQ and AB <80	48 44.9%	19 17.8%	67 62.6%

\*AB refers to adaptive behaviour

The majority of the sample (81.3%) consisted of non-indigenous Australians and/or competent English speakers, with the remainder of the participants being of Aboriginal or

Torres Strait Islander background (13.1%), Pacific Islander or Maori (0.9%), and other nationalities with English as a second language (4.7%).

### **Developing the scoring system for optimum accuracy in screening**

The major aim of the development phase of the screening index was to determine which of the screening test items correlated sufficiently with the benchmark tests of ability to be included in the final screening instrument, and how the items could best be scored to provide optimum discrimination between disabled and non-disabled groups. Many classification formulae were devised and tested, selection of the criteria items being made on the basis of correlations with measures of ability including the KBIT-2, and VABS-II, and the ability of the criteria to classify the two groups with a minimum of false positives and false negatives.

A major change was made in the Puzzle sub-test of the HASI. As described in Chapter 2, the original version used the English alphabet, and asked the test taker to draw lines linking a letter to a number. This created limitations for test takers from cultures where the English alphabet is not used. Because the Western or Arabic numeral system is almost universal, it was decided to use only numerals, and to create the change of mind-set through changes in colour rather than the change from alphabet letters to numbers.

This Manual will not provide details of all of the scoring systems which were trialled, as they are too numerous. However, as an overview, initially each of the sub-tests was subjected to ROC curve analyses, using IQ scores, adaptive behaviour scores and a combination of both scores. The results are shown in Table 3. It can be seen that each sub-test had a ROC curve results with significant area under the curve (AUC). Use of only one or two of the sub-tests was considered, on the basis of these results; however, the extra information obtained by using the entire battery was thought to be of value, as each sub-test appeared to assess a slightly different aspect of the test taker's ability. Discriminant analyses and cross-tabulations were also used to assist in developing the final scoring system. It became apparent that there were two important considerations – whether or not the answer produced by the test taker was correct, and the time taken. Clearly, a completely open-ended method of timing was not practical because some test takers could obtain a correct answer if given unlimited time, up to 15 minutes for a sub-test, for example. However, the purpose of the HASI-NV is its use as a rapid screen and therefore open-ended timing is not feasible. Furthermore, if a test taker takes 15 minutes to correctly finish one sub-test, that process in itself is indicative of serious deficits in cognitive reasoning compared with other test takers.

**Table 3** – ROC curve results for individual sub-tests

<b>Individual Sub-test</b>	<b>Cut-off Criteria</b>	<b>Area Under Curve (AUC)</b>
Puzzle score	IQ<70	.800
	IQ<75	.834
	AB<70	.745
	AB<75	.820
	IQ and AB <70	.769
	IQ and AB <75	.800
	IQ and AB <79	.871
Clock Drawing score	IQ<70	.866
	IQ<75	.874
	AB<70	.810
	AB<75	.890
	IQ and AB <70	.841
	IQ and AB score <75	.865
	IQ and AB score <79	.917
Match the Pictures	IQ<70	.737
	IQ<75	.757
	AB<70	.692
	AB<75	.738
	IQ and AB <70	.695
	IQ and AB score <75	.739
	IQ and AB score <79	.765
Odd One Out	IQ<70	.731
	IQ<75	.728
	AB<70	.647
	AB<75	.711
	IQ and AB <70	.701
	IQ and AB score <75	.726
	IQ and AB score <79	.740

Analyses revealed that the most accurate screening cut-off score was obtained by weighting the results of each sub-test, and an extensive series of statistical procedures was undertaken to determine the optimum weighting systems for each sub-test, combining to a total HASI-NV score with a cut-off of less than 90 (which meant “Refer for further assessment”) and 90+ (“No referral”).

As with the HASI, an important scoring principle is that the test is designed to be slightly over-inclusive rather than under-inclusive. It is believed that it is better to include in the “Refer for further assessment” group some test takers who may not have ID, rather than to



miss out on test takers who may have ID, but not be identified as such. Another group who may not perform well on the HASI and HASI-NV and would benefit from further assessment may include those with a serious mental condition, but no intellectual disability, for example.

### **Cross-tabulations**

Table 4 shows the cross-tabulations using both IQ and AB scores of less than 70, and less than 75, and a cut-off score on the HASI-NV of less than 90. The table shows that using an IQ/AB score of <70, 4.7% of the total sample with a HASI-NV score above the cut-off point for referral would not be referred for a full assessment, whilst 15.9% would be referred for full assessment, despite having IQ and AB scores above 70. When an IQ/AB score of <75 is used (as is the case in many services for people with ID), the false positive rate remains the same at 4.7% of people with ID not being referred for further assessment, whereas the proportion of those who do not have ID and yet are referred for further assessment falls to 11.2%. When the IQ/AB score cut-off point is raised to <80, the percentage of participants with an IQ/AB score of <80 who are not referred for further assessment increases to 8.4%, whereas those with IQ/AB scores of 80+ who would be referred for further assessment reduces to 4.7%, reversing the aim of being over-inclusive. These results are consistent with the aim of setting the HASI-NV score at an over-inclusive level. Chi-squares for <70, <75 and <80 analyses were significant at 0.00.

**Table 4** – Cross-tabulation of IQ and AB <70, <75 and <80, with HASI-NV score <90

<b>Cut-off Score</b>	<b>IQ and AB &lt;70</b>	<b>IQ and AB 70+</b>	<b>Total</b>
<90	46	17	63
Percent of row	73.0%	27.0%	100.0%
Percent of total	43.0%	15.9%	58.9%
90+	5	39	44
Percent of row	11.4%	88.6%	100.0%
Percent of total	4.7%	36.4%	41.1%
Total	51	56	107
Percent of row	47.7%	52.3%	100.0%
Percent of total	47.7%	52.3%	100.0%
<b>Cut-off Score</b>	<b>IQ and AB &lt;75</b>	<b>IQ and AB 75+</b>	<b>Total</b>
<90	51	12	63
Percent of row	81.0%	19.0%	100.0%
Percent of total	47.7%	11.2%	58.9%
90+	5	39	44
Percent of row	11.4%	88.6%	100.0%
Percent of total	4.7%	36.4%	41.1%
Total	56	51	107
Percent of row	52.3%	47.7%	100.0%
Percent of total	52.3%	47.7%	100.0%
<b>Cut-off Score</b>	<b>IQ and AB &lt;80</b>	<b>IQ and AB 80+</b>	<b>Total</b>
<90	58	5	63
Percent of row	92.1%	7.9%	100.0%
Percent of total	54.2%	4.7%	58.9%
90+	9	35	44
Percent of row	20.5%	79.5%	100.0%
Percent of total	8.4%	32.7%	41.1%
Total	67	40	107
Percent of row	62.6%	37.4%	100.0%
Percent of total	62.6%	37.4%	100.0%

Whilst the internationally accepted diagnostic criteria for intellectual disability are a combination of both cognitive and adaptive behaviour assessment, it is useful to examine the HASI-NV performance against cognitive testing and adaptive behaviour testing separately.

Table 5 shows the results of the HASI-NV cut-off score of 90 as compared with various IQ cut-off levels. Chi-squares for <70, <75 and <80 analyses were significant at 0.00.

**Table 5 – Cross-tabulation of IQ scores of <70, <75 and <80, with HASI-NV score <90**

<b>Cut-off Score</b>	<b>IQ&lt;70</b>	<b>IQ 70+</b>	<b>Total</b>
<90	50	13	63
Percent of row	79.4%	20.6%	100.0%
Percent of total	46.7%	12.1%	58.9%
90+	5	39	44
Percent of row	11.4%	88.6%	100.0%
Percent of total	4.7%	36.4%	41.1%
Total	55	52	107
Percent of row	51.4%	48.6%	100.0%
Percent of total	51.4%	36.4%	100.0%
<b>Cut-off Score</b>	<b>IQ&lt;75</b>	<b>IQ 75+</b>	<b>Total</b>
<90	53	10	63
Percent of row	84.1%	15.9%	100.0%
Percent of total	49.5%	9.3%	58.9%
90+	6	38	44
Percent of row	13.6%	86.4%	100.0%
Percent of total	5.6%	35.5%	41.1%
Total	59	48	107
Percent of row	55.1%	44.9%	100.0%
Percent of total	55.1%	44.9%	100.0%
<b>Cut-off Score</b>	<b>IQ&lt;80</b>	<b>IQ 80+</b>	<b>Total</b>
<90	59	4	63
Percent of row	93.7%	6.3%	100.0%
Percent of total	55.1%	6.3%	58.9%
90+	9	35	44
Percent of row	20.5%	79.5%	100.0%
Percent of total	8.4%	32.7%	41.1%
Total	68	39	107
Percent of row	63.6%	36.4%	100.0%
Percent of total	63.6%	36.4%	100.0%

Using a cut-off score of 70 for cognitive testing, the results indicate that 12.1% of the participants would be referred for further assessment when they had an IQ of 70+. Of those participants with an IQ score of <70, 4.7% would not be referred for further assessment. This result is consistent with the design objective of the HASI-NV to be over-inclusive. For example, of the 12.2% with IQ 70+, five had a diagnosed mental illness/condition AND an IQ score of <80, indicating that further assessment to determine the individual's support needs would be beneficial and appropriate.

It can be seen from the percentages in each row that at every level of IQ score (<70, <75 and <80), the majority of participants with a score below that level are correctly classified by the HASI-NV as needing further assessment (or as being vulnerable during police interviews), and the majority of those over the cut-off score are correctly classified as not requiring

further assessment, or supports. For those with an IQ of <70, 79.4% are referred for further assessment, whilst 88.6% of those with an IQ score of 70+ are classified as not needing to be referred. When an IQ score of <75 is used, 84.1% of those falling below that level are referred for further assessment whilst 86.4% with a score of 75+ are not referred. With the higher score of <80, 93.7% of those falling below that level are referred whilst 79.5% above that level are not referred.

The question might be raised as to why a cut-off score of 90 on the HASI-NV is deemed optimum. The answer lies in the numbers of those falling below these various IQ levels, but who are deemed to be false negatives by the HASI-NV cut-off of 90, that is, they have a low IQ but are not referred for further assessment (falling in the cells labelled 90+ for HASI-NV and <70 IQ or <75, or <80). The percentage who have low IQ and who would be missed is 11.4% with an IQ <70, 13.6% with an IQ of <75 and 20.5% with IQ of less than 80.

The other important consideration is the proportion of participants referred for further assessment, although they do not have a low IQ, that is, false positives because they are assessed as “positive” for the condition of ID whilst not actually having the condition. The false positive rate for <70 is 20.6%, for <75 it is 15.9% and for <80 it is 6.3%. Whilst this could be considered to be a waste of resources, that is, referral of so many participants for further assessment when 1 in 5 may not have the condition of ID, these results are consistent with the stated design aim of the HASI-NV to be over-inclusive, and as indicated above, a fair proportion of the false positives have other significant difficulties including a mental health diagnosis or very low adaptive behaviour which may in part contribute to offending behaviour.

It needs to be remembered that this sample had a roughly 50:50 proportion of people with ID and non-disabled participants. If, as would be expected in a general population study, or a specialist population such as a prison or health facility, the actual proportion of people with ID was lower, possibly less than 20%, the percentage of false positives may remain at the same level, but the absolute number of false positives referred for further assessment may be increased. Clearly, this needs to be borne in mind when allocating resources for follow-up assessments. However, the increase in absolute numbers of false positives referred may have a positive outcome, by identifying individuals with other impairments or mental conditions who would benefit from further follow-up and support.

Determination of an appropriate cut-off score is a fine balancing act between maximising real positive cases and minimising false positives and false negatives.

A similar process was undertaken for adaptive behaviour (AB), independent of IQ score, as shown in Table 6. Chi-squares for <70, <75 and <80 analyses were significant at 0.00.

**Table 6** – Cross-tabulation of AB scores of <70, <75 and <80, with HASI-NV score <90

<b>Cut-off Score</b>	<b>AB&lt;70</b>	<b>AB 70+</b>	<b>Total</b>
<90	47	16	63
Percent of row	74.6%	25.4%	100.0%
Percent of total	43.9%	15.0%	58.9%
90+	9	35	44
Percent of row	20.5%	79.5%	100.0%
Percent of total	8.4%	32.2%	41.1%
Total	56	51	107
Percent of row	52.3%	47.7%	100.0%
Percent of total	52.3%	47.7%	100.0%
<b>Cut-off Score</b>	<b>AB&lt;75</b>	<b>AB 75+</b>	<b>Total</b>
<90	56	7	63
Percent of row	88.9%	11.1%	100.0%
Percent of total	52.3%	6.5%	58.9%
90+	9	35	44
Percent of row	20.5%	79.5%	100.0%
Percent of total	8.4%	32.7%	41.1%
Total	65	42	107
Percent of row	20.5%	39.3%	100.0%
Percent of total	60.7%	39.3%	100.0%
<b>Cut-off Score</b>	<b>AB&lt;80</b>	<b>AB 80+</b>	<b>Total</b>
<90	59	4	63
Percent of row	93.7%	6.3%	100.0%
Percent of total	55.1%	3.7%	58.9%
90+	9	35	44
Percent of row	20.5%	79.5%	100.0%
Percent of total	8.4%	32.7%	41.1%
Total	68	39	107
Percent of row	63.6%	36.4%	100.0%
Percent of total	63.6%	36.4%	100.0%

As a further example of the co-morbid difficulties which may be experienced by those referred for further assessment although their AB score is 70+, of those 16 participants, two had a concurrent mental health condition, three admitted to taking illicit substances currently, and 12 were in the borderline range of AB standard score. Therefore, whilst the AB cut-off score of 70+ may seem to refer many false positives for further assessment, in fact the HASI-NV cut-off of 90 is also including individuals with other problems warranting assessment.

The false positives, that is, individuals who fall below the cut-off score of 90 on the HASI-NV (i.e. hypothetically diagnosable with ID), but who in fact have an IQ score of 80+ is low, at only 6.3%. However, the disadvantage is that the number of participants who potentially have ID, but were missed by the screening procedure, rises to 8.4%.

**Correlation with other psychometric tests**

Table 7 shows a correlation matrix for the HASI-NV with the sub-test and composite scores for both the KBIT-2 and VABS-II. The HASI-NV correlates significantly at the 0.01 level, with each of the sub-test or subdomain scores and the composite scores on both tests.

*Table 7 – Correlation of HASI-NV with KBIT-2 and VABS-II*

Measure	Correlation Coefficient
KBIT-2 Verbal Score	0.75**
KBIT-2 Nonverbal Score	0.73**
KBIT-2 Composite Score	0.76**
VABS-II Communication Score	0.69**
VABS-II Daily Living Score	0.73**
VABS-II Socialization Score	0.72**
VABS-II Composite Score	0.74**

\*\*Correlation is significant at the 0.01 level (2-tailed)

**Receiver Operating Characteristic (ROC) curve analyses**

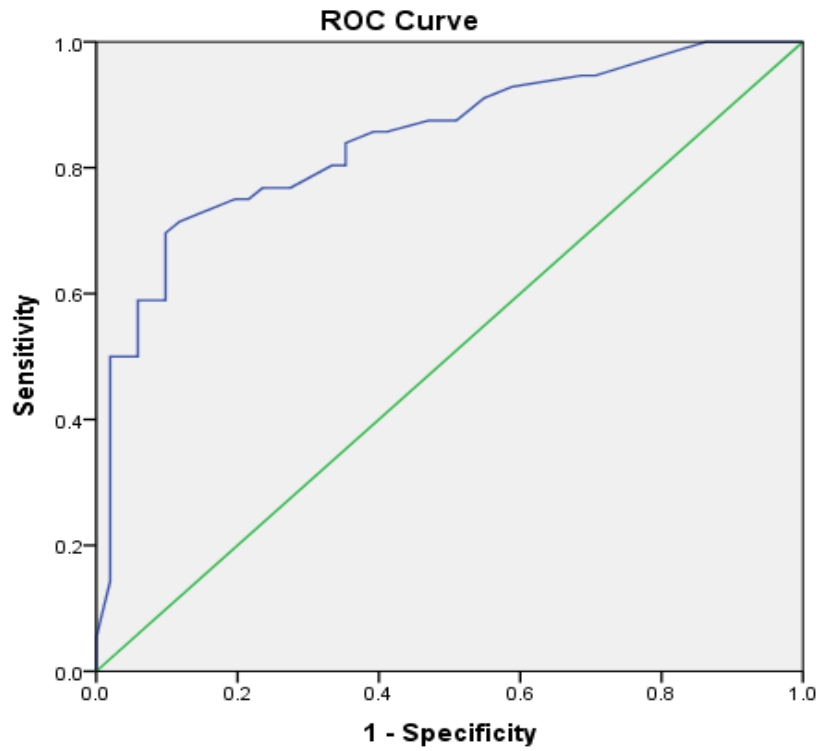
Receiver Operating Characteristic (ROC) curve analyses were undertaken using IBM SPSS Statistics Version 22. ROC curves can be used to determine the ability of a test to discriminate "cases" from "non-cases".

When a condition (such as intellectual disability) is present and is correctly diagnosed by a test, a True Positive fraction is obtained, whereas when the condition is absent, but the individual is diagnosed as having the condition, a False Positive fraction results. Conversely, when the condition is not present and the test correctly identifies this, a True Negative fraction is obtained (that is, the individual truly does not have the condition), whereas where the individual is incorrectly diagnosed as not having the condition when in fact the condition is present, this is described as a False Negative. Disease prevalence was assumed to be 3%, in accordance with population studies of intellectual disability.

The *Area under the ROC curve* (AUC) is interpreted as follows. When a variable cannot distinguish between the cases and non-cases, the area will be 0.5 and the ROC curve is diagonal. The closer the value is to 1, the less overlap between the two distributions and the greater the differentiation between the groups.

When both IQ and AB scores were less than 70, 56 participants fell above a combined cut-off score of 70 whereas 51 were <70 on both tests. Figure 1 shows the ROC curve analysis results.

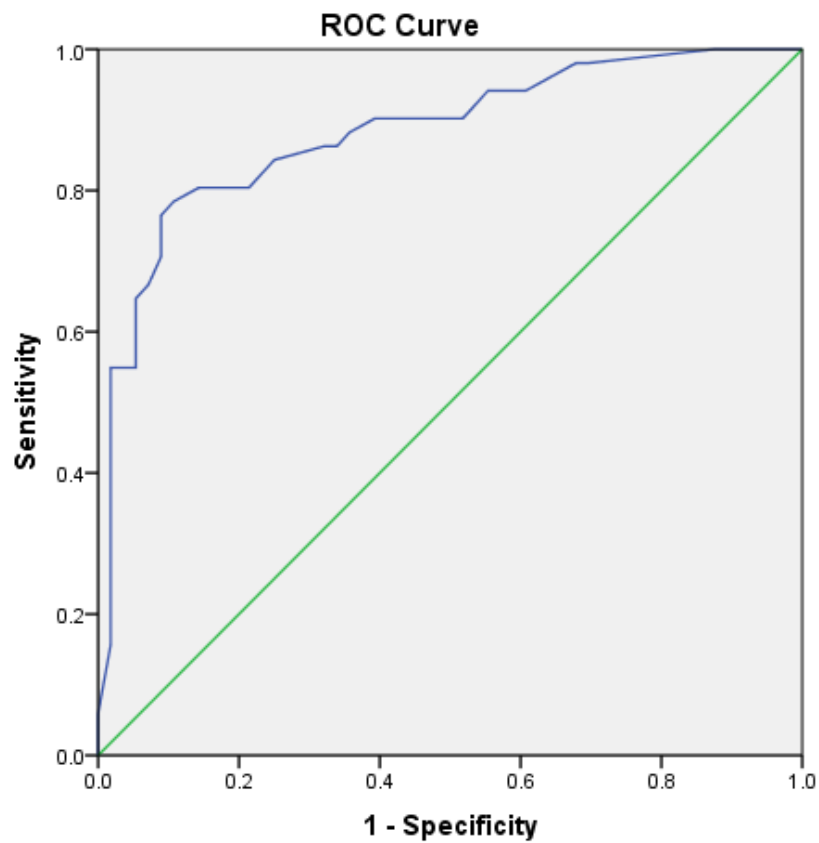
**Figure 1** – ROC curve analysis for HASI-NV and IQ and AB <70



The AUC is 0.844; the Standard Error under nonparametric assumption is 0.038.

The analysis was repeated for a cut-off score of 75 on both IQ and AB tests, with 51 participants scoring 75+ and 56 scoring <75 on both instruments. The results are shown in Figure 2.

*Figure 2 – ROC curve analysis for HASI-NV and IQ and AB <75*

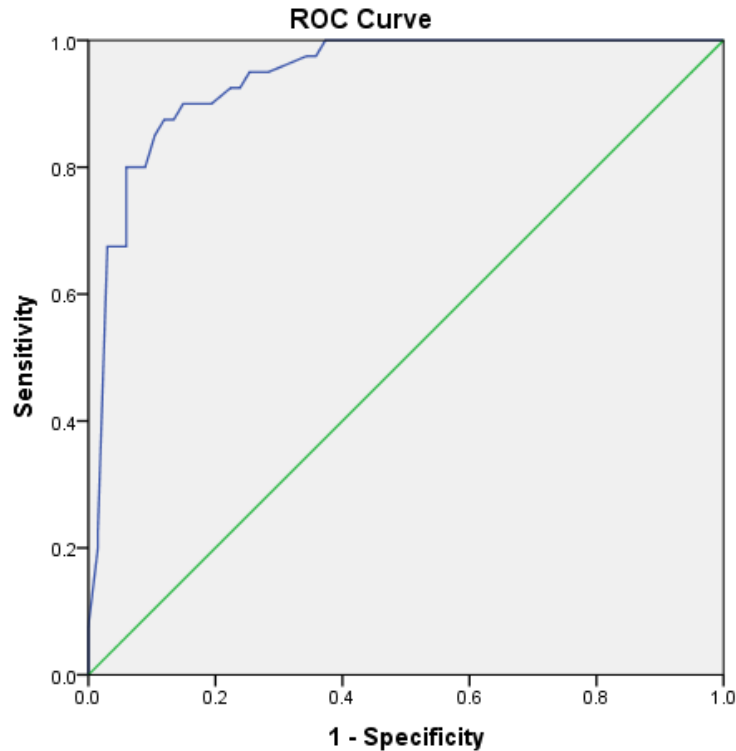


The AUC is 0.882; the Standard Error under nonparametric assumption is 0.034.



When a cut-off score of 80 was used on both the IQ and AB instruments, 40 participants score 80+ whilst 67 scored <80 on both tests. The results are shown in Figure 3.

**Figure 3** – ROC curve analysis for HASI-NV and IQ and AB <80



The AUC is 0.942; the Standard Error under nonparametric assumption is 0.022. Therefore, whilst the AUC for a cut-off of IQ/AB of <80 is increased, when the results of the cross-tabulations in Table 4 are taken into account, the goal of being over-inclusive is compromised.

## Summary

The results of the research undertaken during the development of this instrument indicate that the HASI-NV is a valid tool for screening the population of persons within the justice system, and discriminates well between the intellectually disabled and non-disabled groups. The usefulness of the HASI-NV lies in identifying those accused persons and offenders who require full-scale diagnostic assessment for intellectual disability, and vulnerable persons who require special assistance whilst in police custody or during police interviews. The HASI-NV may also be useful in identifying people with intellectual disability who are entering other services, such as health or mental health services, immigration centres, or probation and parole, to name a few.

The HASI-NV excludes from referral for full-scale assessment the majority of the non-disabled population, which makes it cost-effective in terms of utilising psychological services

to best advantage. The HASI-NV works well with cut-off scores on both tests of 70 and 75 (the latter being a score which some agencies use to determine those individuals who will be admitted to their service). The HASI-NV results correlate significantly with the two tests, the KBIT-2 and VABS-II, which were used as the benchmarks in this study.

Further research into the HASI-NV is ongoing with larger samples, in order to monitor its effectiveness in various service settings. A large scale cross-validation study is proposed, to determine how the results to date would generalise to an independent data set. Larger sample sizes will enable the use of more sophisticated statistical analyses, including discriminant analysis. As the HASI-NV enters into use with non-English speaking populations, ongoing research and monitoring will be undertaken to ensure that the aim of culture-fairness is being met. Lastly, translation of the HASI-NV into non-English languages will be undertaken in a rolling fashion, to make the test available as widely as possible.

# Appendix A – Conversion to Standard Scores

The conversion of the raw scores and times to standard scores is accomplished using the table below, which is included in the test booklet on page 2.

<b>PUZZLE: RECORD TIME IN SECONDS →</b>		
	<b>Circle one score below</b>	
Incorrect	1	
Correct, 90 + seconds	10	
70–89 seconds	20	Transfer Puzzle score to box below
55–69 seconds	30	
Correct, under 55 seconds	40	
<b>CLOCK</b>	<b>Circle one score below</b>	
No attempt, or attempt is not recognisable.	5	
Clock drawing shows some evidence that instructions were understood but is only a vague representation; inappropriate arrangement of numbers (in lines, or random on page).	10	
Numbers and face are no longer connected in the drawing, or hands are not recognisably present	15	
Some numbers are absent, written outside clock, distorted in sequence, or hands are not clearly represented.	20	
Inappropriate arrangements which persevere, eg. use of dots instead of numbers, or hands are represented but do not clearly point to a number.	25	
Inappropriate use of clock hands (digital display, or circling of numbers) or the crowding of numbers at one end of the clock, or reversal of numbers.	30	
Hands are placed significantly off the mark by more than one number, or inappropriate spacing of the numbers (all numbers on one side of clock).	35	
More noticeable errors in placement of hour and minute hand (off by one number), or if number spacing shows a gap.	40	
Slight errors in placement of hands (not exactly on the 8, or just before the 4, but not on one of the adjoining numbers) OR one missing number from face of clock.	45	Transfer Clock score to box below
Normal drawing with the numbers and the hands in roughly the correct positions; hour hand should be distinctly different from the minute hand and approaching 4 o'clock.	50	
<b>MATCH THE PICTURES: RECORD TIME IN SECONDS →</b>		
	<b>Circle one score below</b>	
At least one error	1	
All correct, 70 + seconds	10	
All correct, 50–65 seconds	20	Transfer Match Pictures score to box below
All correct, 40–49 seconds	30	
All correct, under 40 seconds	40	
<b>ODD ONE OUT: RECORD TIME IN SECONDS →</b>		
	<b>Circle one score below</b>	
At least one error	1	
All correct, 50 + seconds	10	
All correct, 40–49 seconds	20	Transfer Odd One Out score to box below
All correct, 25–39 seconds	30	
All correct, under 25 seconds	40	
	<b>TOTAL OF GREEN BOXES</b>	
	→	
	<b>TICK ONE BOX BELOW</b>	
Score is less than 90		Refer for further assessment
Score is 90 or above		No referral

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