Hayes Ability Screening Index

HASI

MANUAL

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About the Author

Susan C Hayes is well known for her work in the area of rights of the person with intellectual disability, particularly people with an intellectual disability in the criminal justice system. She is senior author of significant and groundbreaking books on the legal issues relevant to the person with intellectual disability – *Mental Retardation: Law, Policy and Administration*; and *Simply Criminal, 1st* and *2nd Editions*. She has been a Commissioner for Corrective Services in the New South Wales Corrective Services Commission and Honorary Consultant to the New South Wales Law Reform Commission, during its reference on *The Person with an Intellectual Disability and the Criminal Justice System.* She is author of many articles on intellectual disability. She received the Order of Australia for her work with juvenile offenders with intellectual disabilities.

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I am grateful to many people for their important contributions to the development of the HASI. Development of the Index began in 1995 with the selection of tasks and items for the initial battery, followed by the gathering of pilot data. The test construction phase drew upon previous research, which had utilised some of the items which were later included in the pilot test battery.

The Law Foundation of New South Wales assisted greatly in the initial phase of the project by awarding a grant, which enabled employment of two research assistants to collect field data and assist in the data analyses. **The Western Australian Ministry of Justice** and the **Western Australian Disabilities Services Commission** also assisted in the initial development of the instrument, by allowing the screening battery to be administered in custodial facilities.

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Chapter 1 - Introduction

Purpose and Use of the HASI

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

The Index has been designed for use by professionals working at every stage of the criminal justice system. 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, corrective services staff, drug and alcohol counsellors, and forensic and correctional mental health professionals. The HASI 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 final score on the HASI 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, and respect their rights during interviews.

The Index 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 subjects 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 kit includes the following materials:

- Manual
- Transparent marking sheet for the Puzzle sub-test
- Record Booklet 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 render the person "at risk" in the criminal justice system. The booklet provides a simple method of computing whether or not to refer the person.

Some of the items require the person to join dots in a puzzle, and draw a clock face. These sheets remain attached to the Record Booklet, whilst being written on by the testee. Since the tester must read out some instructions while the person 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 discard it, whilst the pages that the person draws upon remain as part of the Record Booklet. This prevents the important test answers from becoming separated from the rest of the Booklet. A tear-off Instruction Page was 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 could be administered even if the Manual was 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 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 person 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 stopwatch facility must be used. It is vital that during the timed section of the test, the person has only the exact amount of time specified in which to complete the item.

Testing time

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

User qualifications

The HASI is designed to be administered by examiners who may not have psychological or psychometric training. 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. 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 a testing session.

Effective interpretation of the score - that is, the decision to refer or not refer the testee, 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 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 testee, or where the timed sub-test has not been accurately timed, perhaps owing to interruption of the testing session.

Interpretation of HASI Results

Performance on the HASI provides only two descriptive categories - "Refer for further assessment" or "No referral". There are no age-based normative scores, or standard scores. A diagnosis of intellectual disability cannot be made solely on the basis of the HASI. 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 testees into special units within correctional institutions. The results are useful to:

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

Features of the HASI

- **Covers a wide age range**
  The HASI provides a means of assessing people from early adolescence (age 13) through to late adulthood.

- **Can be administered by non-psychologists**
  The HASI was 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, and medical practitioners, including psychiatrists. It is essential that the examiner has received proper training in the use of the Index, understands the scoring procedures and criteria, and has undertaken some practice sessions.

- **Offers validity data**
  This Manual provides details of the validity of the HASI in determining which testees are "at risk" of being intellectually disabled or having another condition which affects their ability to understand and cope with the criminal justice system. The studies which form the background for the selection of items are summarised in Chapter 5 and were conducted by examiners at various sites and in different environments, to show the validity of the HASI in

distinguishing those testees who are vulnerable and may need to be referred for further diagnostic testing. The studies also show the relationship between the HASI and measures of intelligence and other abilities.

- **Statistical procedure have been used in the design**
  Chapter 5 gives details of the analyses, which were performed to determine those items having the strongest ability to predict intellectual disability. Other analyses were conducted to ensure that the items were as culture-fair and gender-fair as possible.

Chapter 2 - Rationale and Content

Rationale for the Development of the Hayes Ability Screening Index

A major difficulty facing professionals working in the criminal justice system is the identification of people with an intellectual disability. The interests of the individual with an intellectual disability (be they victim, witness or perpetrator) and the interests of the system itself cannot be well-served if the presence of intellectual disability is not discerned. When these individuals are not identified as having an intellectual disability, it is unlikely that they will 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 (Hayes and Craddock, 1992).

Intellectual disability is defined as:

> Substantial limitations in present functioning, characterized by significantly sub-average intellectual functioning, existing concurrently with related limitations in two or more adaptive skill areas such as communication, self-care, home living, social skills, community use, self-direction, health and safety, functional literacy, leisure, and work (American Association on Mental Retardation, 1992).

Intelligence quotient (IQ), a concept familiar to most people, was the accepted way of measuring intelligence. The term "standard score" (SS) is now used more frequently, to express the notion 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 "substantial limitations in functioning" as commencing at two standard deviations below the mean of 100, that is, below a standard score of 70. Borderline intellectual functioning occurs in the range of 70-79, whilst low average is 80-89.

The difficulty of identifying the presence of intellectual disability in offenders is implied in numerous studies where over-representation of this group in the criminal justice system has been reported. The incidence of intellectual disability among offenders is greater than is generally estimated by criminal justice personnel. In Australia, attention was initially focussed upon the magnitude of over-representation by research in New South Wales prisons, where the prevalence of intellectual disability was found to be approximately 12% (Hayes and McIlwain, 1988). Subsequent studies of the prevalence of intellectual disability amongst cohorts of people appearing before six New South Wales local courts found further evidence of significant over-representation. Nearly one-quarter of the local court sample had a standard score of less than 70 and a further 14% fell in the borderline range of ability (Hayes, 1993; Hayes, 1996). In the local

court study, even research officers aware that the project was focussing upon intellectual disability were not adept at identifying those testees who had an intellectual disability. Without the aid of the actual test results, the researchers failed to identify the possibility of intellectual disability in over half of the people with standard scores of less than 70 and in more than three-quarters of those in the borderline range. This finding provides graphic illustration of the difficulty of identifying the person with an intellectual disability in the criminal justice environment, even when professionals may be on alert.

In 1991, the New South Wales Law Reform Commission received from the Attorney General a reference on *People with an Intellectual Disability and the Criminal Justice System.* The Commission consulted with many organisations and professions involved in the criminal justice system. A common theme that emerged was the difficulty experienced by non-psychologists in identifying the presence of intellectual disability (New South Wales Law Reform Commission, 1996).

This difficulty is not confined to Australian jurisdictions. A study of the use of the "Appropriate Adult" scheme in Britain (Bean and Nemitz, 1995) examined 20,805 custody records. In 448 instances, the custody records in the police stations indicated that the interviewee was "vulnerable" or "mentally disordered" (these terms are used in the Act). An appropriate adult (AA) should have been present during police interviews of each of these suspects, as required under the provisions of the *Police and Criminal Evidence Act* 1984 (UK) (PACE Act). In fact, however, an AA was present in only 38 cases. Even though these 448 individuals had been classified by police as having some kind of mental disorder and therefore were vulnerable during police interviews and detention, this figure appears to be a gross under-estimate, according to the researchers. Other research in the United Kingdom indicated that in police stations, at least 7% of detained persons appear to be "mentally disordered". Thus, assuming a figure of 7% (which is possibly an under-estimate of the prevalence of intellectual disability and psychiatric disorder amongst police suspects) 1,363 out of the 20,805 custody records examined should probably have classified the suspect as "vulnerable". These findings indicate, first, that the identification of "mental disorder" and vulnerability was very low and, secondly, even when the person was identified as such, compliance with the provisions for a third-party to be present during the police interview was unlikely to occur.

A second British study (Palmer and Hart, 1996) examined how police and defence lawyers attempted to identify the accused person with an intellectual disability. Identification of the presence of some type of "mental disorder" was made on the basis of florid behaviour such as shouting or screaming, tangible clues such as medication or attendance at a special school, and less obvious clues such as demeanour and behaviour. The obstacles to identification were the short amount of time spent by the custody officer with the suspect, the hectic nature of some police stations, and lack of experience and observational skills on the part of some solicitors and police officers. It is immediately apparent that the clues relied upon by many police officers and solicitors would be of little assistance in identifying the presence of intellectual disability. The

person with an intellectual disability may not be on medication, particularly medication relevant to psychiatric symptoms. They may be quiet and withdrawn, rather than noisy and belligerent and they may not have attended, or may not admit to attendance at a special school or class.

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 screening test for intellectual disability has been developed. The Hayes Ability Screening Index (HASI) is designed for use by a wide range of criminal justice personnel, who may have little or no psychological expertise. The HASI 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 indicates that the suspect may be vulnerable during detention and interviewing.

The Index is designed to be over-inclusive and may identify those who have other types of learning difficulty, who are functionally illiterate and innumerate, those who are intoxicated by some substance, mentally ill persons and those who have poor English. Over-inclusion is preferable to under-inclusion, since many of those in the groups mentioned would benefit from a full-scale assessment, for the purposes of:

- providing an interpreter during an interview
- ensuring that they can understand the police caution, and the interview questions
- assessing their ability to participate in their trial
- appropriate mitigation in sentencing
- providing special assistance in the prison system
- providing appropriate supports and resources during a term of probation or parole.

Description and Rationale of Test Items

The HASI consists of four sub-tests –

- Background, consisting of four questions related to disability
- Backwards Spelling
- Puzzle
- Clock Drawing.

Background items

Some previous screening instruments used in criminal justice settings have used self-report items. Murphy et al (1995) screened 157 men admitted to a remand prison over a three-month period, using answers to a self-report questionnaire asking whether the individual had reading problems or learning difficulties, or had been to a special school. Of the 33 who answered in the affirmative to any part of this question, 21 were assessed more thoroughly, yet none of these

subjects was identified as having a learning disability. Nevertheless, this self-identified group had lower than average Verbal IQ, Full Scale IQ, reading age and numeracy age, as well as General Health Questionnaire scores indicative of health problems and a recent history of mental illness or psychiatric hospital admission. Thus, these men were identifying some cognitive or psychological difficulties that could affect their ability to cope with the criminal justice system, despite not being classified as intellectually disabled.

In a study at a Cambridge (UK) police station over 250 people taken into custody were screened by a police officer, using a brief questionnaire about reading and writing difficulties, extra help at school and/or attendance at a special needs school, as well as demographic information (Lyall et al, 1995a). A total of 15.2% of the participants reported one of the following – having attended schools for children with moderate to severe learning difficulties, or schools for children with emotional or behavioural difficulties, or a learning support unit within a mainstream school. Follow up of these cases found that 50% of those who had received special education were later required to attend court (instead of the charges being dropped, or a caution being issued) compared with 37% of the non-disabled group, indicating the possibility of harsher treatment of this group (Lyall et al, 1995b). Whilst validation of the self-reports, using measures of intelligence and adaptive behaviour, was not undertaken, the proportion reporting a history which may render them "vulnerable" during police questioning is similar to prevalence data reported from studies in Australia and North America.

Many people with an intellectual disability are aware that they have limitations, in comparison with the rest of the population. The self-report questions in the original screening battery forming the basis of the HASI consisted of many items, which were then reduced to those items identified as being significantly correlated with measures of cognitive and adaptive behaviour abilities. No single item in Background is strongly related to the "benchmark" measures. The strength of this section lies with the fact that the group of Background items is significantly correlated with psychometric test results of cognitive and adaptive behaviour functioning, and is weighted according to the contribution to the predictive ability of the HASI score.

Backwards Spelling

The Backwards Spelling test requires the testee to spell a five letter word backwards. Versions of the Backwards Spelling test have been used in many screening batteries for neurological and cognitive impairment, including in previous versions of the Mini-Mental State Examination (MMSE) (Folstein, Folstein and McHugh, 1975: Tombaugh and McIntyre, 1992). Research on the MMSE, however, indicates that this sub-test appears not to have been included in the MMSE for some time (Burch and Andrews, 1987; Horton and Alana, 1990). A number of MMSE sub-tests, including the backwards spelling, serial sevens, recall of three items and the folding paper sequence are related to social class and educational levels in aged populations (Brayne and Calloway, 1990). Clearly, some degree of literacy in the English language is essential for this sub-test. Whilst Backwards Spelling may be influenced by social class and educational level, it

was found to be useful in this brief battery as an indicator of attention (Molloy, Alemayehu and Roberts, 1991).

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 according to Lezak (1995), it is in the public domain. Trail Making has been widely used to assess visual-conceptual and visuo-motor tracking and is sensitive to the effects of brain injury (Reitan, 1958). The original test consists of two parts. In Part A, the examinee joins together some sequentially numbered circles, whereas in Part B, the examinee joins a circle with the number "1" in it, to a circle with the letter "A", then a circle "2" and circle "B" and so on. 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 HASI, it was found that some examinees took up to five minutes to complete Part B. The administration was re-designed to eliminate Part A (which was found not to be a useful discriminator) and to incorporate a cut-off score, so that the examinee "fails" the test if they do not complete within a certain time, or they complete but with errors. Some information is lost with this method, as the very severe cases of difficulty with the test are not discriminated from the milder "failures". Nevertheless, the advantages are that the test is completed in a given time, essential for a short screening instrument, and the examinee does not lose motivation, as they tend to do if they sit there for a long time attempting to complete the test. Furthermore, the tester needs only to be concerned with simple, constant, accurate timing of the test and does not have to persevere with accurate timing over a long period of time. This is a vital consideration in a busy and interruption-prone environment such as a prison reception area or a police station.

The cut-off score was determined statistically and varies from the range previously used in the scoring criteria for Trail Making. The original scoring format misclassified a large proportion of older individuals (Berg, Franzen, Wedding, 1994). The development process for the HASI determined that a suitable cut-off score for the Puzzle was accurate completion of the Puzzle within 100 seconds (1 minute 40 seconds), the score then being weighted for inclusion in the final computation.

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. This Clock Drawing sub-test requires the testee to draw on a blank sheet of paper 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 (Huntzinger, Rosse, Schwartz, Ross, Deutsch, 1992; Brodarty and Moore, 1997). A 6-point or 10-point scoring system is used

(Brodarty and Moore, 1997). Using the 10-point scale, scores of 7 to 10 represent normal functioning (Berg et al, 1994) and scores of 5 or less are rare in normally functioning examinees. 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).

More information about the statistical properties of each of the sub-tests, bias analyses and the development of the HASI may be found in Chapter 5.

Chapter 3 - Testing Environment and Practice

The Testing Environment

The HASI is an individually administered test. The examiner needs to be in an environment with the examinee where there are a minimum of distractions and interruptions. The examiner sits at a desk, opposite the examinee. It is inadvisable for the examiner to stand whilst administering the test, as this can intimidate the testee. The examiner should check that s/he has all the equipment needed, including the Record Booklet, pencils or pens, and stopwatch or watch with a second hand. The examiner and examinee should be in a private room where they cannot be overheard by others, if this is possible given security considerations. The test **must** be administered out of the hearing of other examinees who may be awaiting their turn. Similarly, other examinees 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 requirement, for example) that person should also be seated and not in the direct line of sight of, nor directly behind the examinee. The third person must adhere to good testing practice and not give feedback by way of facial expression, body language, grunts, laughter or comments. Whilst it is acknowledged that the HASI may be difficult to administer in a custodial environment, the examiner must attempt to create some degree of rapport with the examinee if the test results are to be valid.

Testing Practice

The HASI 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. Timing must be precise. All sections of the HASI must be administered. Examiners must understand the importance of exact adherence to testing procedure, and realise that deviation from standard procedures means that the HASI results are inexact. Further down the line, the consequences will be serious. "Failing" too many examinees because of poor rapport or inexact timing, for example, may have ripple effects. In a prison, psychological and mental health services will react negatively to their time being devoted to unnecessary assessments. "Passing" an examinee 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 and the entire 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. An examinee may undergo the test on a subsequent occasion and perform better if they know the "right" answers. An examinee may be asked by other suspects or offenders to give them the "right" answers. Alternatively, "faking bad" becomes easier if the examinee receives feedback about their performance. A few examinees may, possibly erroneously, perceive that there is an advantage to "faking bad" - they may think they will be treated better or differently by the system. Examinees are quick to pick up on non-verbal cues such as sighs, frowns, or signs of impatience on the part of the examiner and therefore an examiner 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 examinee asks how they did, a non-committal answer such as "I cannot tell until I score the test" is the best response. It may not be appropriate for the examiner in the screening situation to tell the examinee what the outcome of the 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 examinee 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 results will not harm them in any way.

Observing the Examinee

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

Rapport

The examinees undertaking the HASI 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 fear of what will happen to them, the presence of other people, both officers and inmates, distribution of prison clothing, removal of their own possessions, and separation from family and their normal environmental supports. Under these circumstances, the establishment of rapport 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 examinee is performing.
- Attention - the administrator of the test must pay attention to the examinee and not be distracted by other people or occurrences, especially when timing the Puzzle sub-test.
- Privacy - the examinee must not feel that they are being observed or overheard by others.
- Explanation of the purpose of the test should be non-threatening. The explanation will differ according to the environment and so a standard explanation needs to become part of the protocol followed by test administrators in each testing situation. The focus of the explanation needs to be on assisting the examinee and ensuring fairness, as well as confidentiality of results within clearly specified guidelines which are made apparent to the testee.
- Reassurance – it is important that the examinee be reassured that the results will not threaten them in any way, and will not make their situation worse.
- Sincerity and respect - the examiner needs to see the HASI as an opportunity to benefit both the examinee and that section of the criminal justice system which they represent. Examiners need to practise administration of the HASI until they can undertake it fluidly, without being stilted.

Chapter 4 - Administering and Scoring the HASI

The Test Setting

As mentioned previously, it is important for the test setting to be private so the examinee's responses cannot be overheard or view by others. If a private room is not available, ensure that subsequent examinees are not close enough to see or hear the testing procedure.

The tester should sit across the desk from the testee, or on an adjacent side of the desk. The tester should not stand while administering the test, nor sit on the same side of the desk. A desk is essential – the testee 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 sheet for the Puzzle sub-test
- Two pencils or pens
- A stopwatch, or a watch with a second sweep hand or a stopwatch facility

The desktop should be bare of all other materials which might distract the testee or give clues (for example, a clock should not be visible to the testee).

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 later the professional conducting the full-scale diagnostic assessment can ask questions if necessary, or validate different referral rates emanating from various testers.

Then the tester fills in the section on location, for example, name of police station, name of prison, lawyer's office. Abbreviations which may not be familiar to subsequent assessors should be avoided.

If the testee has an identification number (ID No.) write that in the space provided, again for later reference and to ensure that this testee is not confused with another individual.

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

The tester now fills in the section on gender. In the case of trans-gender testees, 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).

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. This may be useful information, although it is not directly relevant to the results of the HASI (See Chapter 5 for discussion of culture-fairness of the HASI).

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 testee is then asked their date of birth and that section is completed. As a double check on the testee's cognitive abilities, the tester asks the person their date of birth and age at time of testing and enters that in the appropriate spaces. If the testee 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**. Sometimes, people with an intellectual disability will not be able to provide their correct age, and if this occurs it should be noted in the Observation of Behaviour section.

The questions must be asked using the exact words written in the Record Booklet. For the Background sub-test, the tester either records the answer by circling the response given, or by writing the number of the response in the box next to the question. The sub-total can be calculated later. The question of pension refers **only** to a pension related to disability, such as a Disability Support Pension or an Invalid Pension, and not to an unemployment, returned soldier (veteran's), sole parent, or other type of pension or benefit not relevant to disability.

For the Backwards Spelling question, circle each correct letter. If the testee is close enough to read the correct answers upside down, the tester should casually shield the paper with his/her hand. The score is the number of correct letters, in the right order and position. If the person starts off with two correct letters, then gets a letter wrong, then the last two letters are correct, the score is 4, because four of the letters are in the correct order and position. If the person gets the first two letters correct and then omits a letter, then gets two more correct but in the wrong position (that is, they have moved letter number 4 up to the third position and similarly with letter 5), then the score is 2 because the letters are in the wrong position in the word. If it is difficult to score at the time, the tester can write the letters in as the testee recites them, and score this later.

For the Puzzle sub-test, the instructions are on the tear-off sheet in the Record Booklet. The Instruction Page is detached and the tester reads from this while the person completes the Puzzle and Clock Drawing sections in the Record Booklet. The Test Booklet has been designed so that the Instruction Page is torn off, rather than detaching the Puzzle and Clock Drawing sheets, in case the loose sheets become separated from the rest of the test booklet. It would be a serious loss of data if the Puzzle or Clock sheets were mislaid, whereas the Instruction Page can be

simply thrown away. The Instruction Page is included as part of the 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, with all relevant instructions for the administration of the HASI. The tester turns the Record Booklet pages back so that the examinee sees only the **Sample Side** of the Puzzle and puts it on the desk in front of the person.

As noted above, it is vital to follow the instructions in the Record Booklet exactly. It is especially important that the Puzzle is timed at **exactly 100 seconds, or 1 minute 40 seconds**.

The score for the Puzzle is entered later after the tester has checked that there are no errors. This is done by placing the transparent marking sheet over the completed test and making sure the person's test sheet matches the marking sheet exactly. If the transparent marking sheet is unavailable or lost, the marking can still be completed in a few minutes by the tester tracing over the correct answer in a different colour pen. The tester must **under no circumstances** just glance at the Puzzle sheet and assume that "it looks 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, after the testing session is concluded.

HASI Scoring Guidelines

Specific guidelines for scoring the Index appear in the Record Booklet. The tester then fills in the boxes for each item and totals the items for each box in the background section. The RAW scores for each sub-test are transferred to the front page scoring sheet, the tester entering the RAW scores in the RAW score column. Then the SCALED scores coding box is consulted. Each sub-test has a different SCALED score. For example, if the person obtains a RAW score of 4 for Background, the tester runs their finger across to the Background column under Scaled Score and finds out the corresponding SCALED score, which is 14. Then that SCALED score is entered in the SCALED score column of the scoring box for Background on the front page. The tester adds up the total, remembering to add in the "constant" score of 26.

If an adult testee (aged 18 or over) obtains a score of less than 85, s/he needs to be referred for further follow-up assessment, whereas if s/he obtains a score of 85 or more, s/he does not require referral. In the case of a testee aged under 18, the second scoring box is used. If the juvenile obtains a score of less than 90, s/he is referred for further assessment, whereas if a score of 90 or higher is obtained, no referral is necessary. The examiner must tick the appropriate box indicating whether they need further diagnostic assessment.

English language ability and other factors

The test has been designed so that it can be administered to a testee who has minimal English language skills. Nevertheless, clearly a person who speaks little or no English will not be able to understand the instructions and the questions, or answer some of the items.

It is vital that a person with very poor English language skills be tested through an interpreter, if one is available. The rate of intellectual disability amongst non-English speaking testees in the criminal justice system is at least as great as amongst those who speak English. The lack of English language proficiency can easily mask the presence of intellectual disability, and so special efforts must be made to assess non-English speakers.

If an interpreter cannot be obtained for the administration of the HASI, it is advisable for the testee to be referred for further diagnostic assessment automatically. Clinical experience has shown that people with an intellectual disability have great difficulty learning a second language and may have very poor English language skills even after residing in an English-speaking environment for some years. If the person has lived in an English-speaking environment for several years, the lack of proficiency in the English language may in itself be indicative of intellectual disability. Clearly, it is important that the person be able to speak and understand English if they are going to participate in a police interview, or a trial, or comprehend what is said to them in a correctional facility and for this reason they should have a full-scale assessment. If the person is hearing impaired, a deaf interpreter can be used and sign language responses are acceptable.

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

Item Scoring

The guidelines for item scoring are given clearly in the Record Booklet. During the Background sub-test, if a testee gives a response which is not within the possible answers, they should be pushed to give one of the answers. For example, to the question "Do you have a learning disability?" the testee may answer obliquely or in a "joking" manner. The testee may reply by saying, "What do you think?", or "My mates think I do", or some other response which evades the question. This type of response is not acceptable and cannot be scored. If this occurs, repeat the question, emphasising "you" - "Do **you** think you have a learning disability?" If necessary, the examiner indicates to the testee that there can be not progression to the next question until the testee has given a clear "Yes" or "No" response. The examiner can say, "You have to choose Yes or No before we can go on to the next question".

For the question on pension, the item is scored only for a response indicating a Disability Support Pension, or (previously) an Invalid Pension. Unemployment benefits, veterans or returned soldier pension or any other welfare payment not relevant to a disability is scored "2".

The Puzzle sub-test is scored as "1" if the testee did not complete the test in 1 minute 40 seconds, or made a mistake (as shown when the transparent marking sheet is placed over the Puzzle) and "2" if the Puzzle is completed within the time and with no errors.

The Clock Drawing is scored according to the guidelines on the second page of the Record Booklet. The scores are as follows:

1 No attempt, or attempt is not recognisable.
2 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).
3 Numbers and face are no longer connected in the drawing, or hands are not recognisably present.
4 Numbers are absent, written outside the clock, distorted in sequence, or hands are not clearly represented.
5 Inappropriate arrangements which persevere, eg use of dots instead of numbers, or the hands are represented but do not clearly point to a number.
6 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.
7 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).
8 More noticeable errors in placement of hour and minute hand (off by one number), or if number spacing shows a gap.
9 Slight errors in placement of hands (not exactly on the 8 and 4, but not on one of the adjoining numbers), or one missing number from the face of clock.
10 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.

Filling Out the Record Booklet and Answer Sheets

All the information sections on the front sheet, including the tester's name, the location of the testing and the date, must be completed for later reference. The location needs to recorded in a way that someone not familiar with the locality can be clear where testing took place. For example, all the staff at Brewarrina Police Station may understand the abbreviation "BPS", but it may not be clear to the professional undertaking later diagnostic assessment. These test results will be used as a starting point for a professional undertaking a later assessment and any additional information will be useful and may save time or give important insights into the person's behaviour and abilities during later assessments.

Calculating chronological age

Chronological age is important, but even more important in this context is the testee's ability to give their age accurately. The examiner writes down the date of testing and date of birth in the space provided and calculates the testee's date of birth, as mentioned above. The testee is asked how old they are, but the examiner needs to be aware that they may make a mistake, and calculate the date of birth independently.

Chapter 5 - Development and Standardisation

Phase 1 – The Screening Battery

Methodology

A screening battery was devised which attempted to be as culture-fair as possible and which included a wide range of verbal and non-verbal tasks. The aim was to minimise any possible disadvantage to non-English speakers and to those who are illiterate and innumerate. The original screening battery included the following tests and items:

Background items - background information and self-ratings of performance in reading and mathematics; self-report items concerning attendance at a special class or school and self-assessment of having a learning disability, or being a slow learner.

Mini-Mental State Examination - items were included which had been found to correlate highly with tests of cognitive ability (Hayes, 1993, 1996; Folstein, Folstein and McHugh, 1975; Tombaugh and McIntyre, 1992).

Literacy items - including counting, reciting the alphabet, writing their own name and reading.

Gibson Spiral Maze - a psychomotor measure of fine motor performance and hand-eye coordination (Gibson, 1977).

Clock Drawing - a test of organic brain damage (Lezak, 1995).

Trail Making - a widely used test of visual-conceptual and visuo-motor tracking (Army Individual Test, 1944).

Matrix Analogies Test - a measure of non-verbal reasoning ability (Naglieri, 1985).

Draw-A-Person - a non-verbal, non-academic measure of ability (Naglieri, 1988).

Cognitive reasoning test, such as the Kaufman Brief Intelligence Test (K-BIT) (Kaufman and Kaufman, 1990), Wechsler Adult Intelligence Scale – Revised (WAIS-R) (Wechsler, 1981), or the Wechsler Intelligence Scale for Children - III (WISC-III) (Wechsler, 1991).

Vineland Adaptive Behavior Scales (VABS) - an assessment of an individual's ability to function in day-to-day tasks (Sparrow, Balla and Cicchetti, 1984).

The benchmark tests were the cognitive reasoning test, which was the K-BIT for the majority of participants, and the VABS.

The Kaufman Brief Intelligence Test (K-BIT) was chosen because it is easily administered, reliable, and tends to be effective in maintaining the testee's motivation. The K-BIT is a brief, individually administered measure of verbal and non-verbal intelligence, and can be used on age groups between four and 90 years. The test is composed of two sub-tests: Vocabulary (including Part A, expressive vocabulary and Part B, definitions) and Matrices. Vocabulary measures verbal, school-related skills (crystallised thinking) by assessing a person's word knowledge and verbal concept formation. The Matrices sub-test measures non-verbal skills and the ability to solve new problems (fluid thinking) by assessing an individual's ability to perceive relationships and complete analogies. All matrices items involve pictures or abstract designs rather than words. This test correlates highly with the Wechsler Intelligence Scale for Children - Third Edition (WISC-III) (Canivez, 1996; Slate, Graham, and Bower, 1996), with the Wechsler Intelligence Scale for Children - Revised (WISC-R) (Karnes and McGinnis, 1994), and the Wechsler Adult Intelligence Scale - Revised (WAIS-R) (Eisenstein and Engelhart, 1997; Naugle, Chelune and Tucker, 1993). The K-BIT sub-tests do not require motor skills, 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 reception areas. Similarly, the fact that the sub-tests are not strictly timed is also an advantage in difficult testing environments. The verbal components of the WAIS-R and the K-BIT appear to assess different aspects of verbal intelligence, with the K-BIT verbal tasks having a more significant visuo-spatial component (Burton, Naugle and Schuster, 1995). There appears to be general agreement that the Kaufman Brief Intelligence Test is a valuable instrument for use when a more lengthy and involved assessment is not necessary or possible.

The Vineland Adaptive Behavior Scales (VABS) (Interview 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 Scales consist of semi-structured interviews, and direct or indirect observation of behaviour. The items are scored depending on exhibited competencies: 2 (*yes, usually*), 1 (*sometimes or partially*), 0 (*no, never*), N (*no opportunity*), and DK (*don't know*). There is evidence of cross-cultural validity in Western societies (Fombonne and Achard, 1993). Usually the Scales are administered by interviewing, in a conversational data-gathering format, a third party who knows the subject well, such as a caregiver or family member. This option was not available during these research projects, and thus the Vineland was administered directly to the participant. 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, how they maintained their house, managed their finances, and conducted their social life and relationships. The Vineland Adaptive Behavior 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 are available and there is

adequate evidence of the effectiveness of this instrument in differentiating normal and non-normal samples (Kamphaus, 1987). A limitation of this instrument is that it is designed for third-party information, and the results of this research may have been affected by its use in a self-report mode, even though precautions were taken in collecting the data, and observation of actual behaviour was made wherever possible. Research indicates, nevertheless, that 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 testee performs all the tasks and is scored directly (Voelker, Shore, Hakim-Larson, Bruner, 1997). Owing to the scoring method, "no opportunity" and "don't know" effectively have a numerical value of "1", a method which avoids penalising the subject when the behaviour cannot be exhibited, as for example, in a prison. Despite the limitation, the Vineland was used because no well-established, valid and reliable self-administered instrument for adaptive behaviour could be located.

Participants

Participants in the first screening battery evaluation were recruited within gaols or juvenile justice centres in New South Wales and Western Australia. In some instances, the centre's psychologist asked inmates to participate; in other places, inmates were called randomly to the testing location and asked to participate. Others volunteered after seeing posters or talking with inmates who had already participated. The sample, therefore, was self-selected and was a convenience sample rather than being totally random. A small proportion of participants was recruited in special developmental disability units in the New South Wales prison system. Where these targeted participants may affect prevalence data, they have been removed from the data analyses.

Administration of the battery

The screening battery was administered primarily by qualified psychologists, assisted on some occasions in adult gaols in New South Wales by a Disability Coordinator of the Department of Corrective Services, who administered those parts of the battery not requiring psychological expertise and training. The latter also assisted in organising access to testing sites and arranging for inmates to be brought from various parts of the gaol to the testing location. Inmates who had been previously tested by the facility's psychologist were able to give consent for those results to be made available for the research project and in a small number of cases, results of intelligence tests were accessed in this way.

Results

The sample

A total of 339 participants completed all or part of the screening battery, 139 in juvenile justice institutions and 200 in adult gaols.

Table 1 Location of testing

Location	N	%
Adult Institutions		
Long Bay Remand Centre	26	7.7
Long Bay Hospital/Special Unit	9	2.7
Long Bay Reception and Induction Centre	46	13.6
Other Long Bay location	5	1.5
Goulburn Correctional Centre	6	1.8
Mulawa (Women) Correctional Centre	68	20.1
Emu Plains (Women) Correctional Centre	10	2.9
Western Australian Prisons	30	8.8
Juvenile Justice Centres		
Mt Penang	26	7.7
Yasmar	30	8.8
Reiby	53	15.6
Other Juvenile Justice location	30	8.8
Total	**339**	**100.0**

There were 231 males (68.1% of the sample) and 108 females (31.9%) (see Table 2). Fourteen males (4.1% of the sample) were tested in special "developmental disability" units in NSW adult gaols. Ninety-two participants (27.2%) were of Aboriginal or Torres Strait Islander background and 42 (12.4%) were Maori or Pacific Islander.

Table 2 Gender, adult/juvenile inmate status, racial identity and country of birth

Category	Male	Female	Total
Adult prisoner	122 36.0%	78 23.0%	200 59.0%
Juvenile justice centre inmate	109 32.2%	30 21.6%	139 41.0%
Non-indigenous	150 44.2%	67 19.8%	217 64.0%
Aboriginal/Torres Strait Islander	63 18.6%	29 8.6%	92 27.1%
Maori/Pacific Islander	18 5.3%	12 3.5%	30 8.8%
Australian born	187 55.2%	92 27.1%	279 82.3%
Not Australian born	44 13.0%	16 4.7%	60 17.7%
Totals for gender	**231** **68.1%**	**108** **31.9%**	**339** **100.0%**

Some inmates of juvenile justice centres were over the age of 18 at the time of testing. Throughout the Manual, the distinction is made between those who were incarcerated in an adult or juvenile facility, as distinct from those under or over 18 years. Whilst 37.2% (N=126) of

participants were under the age of 18, a further 13 participants aged 18 years or over were nevertheless still detained in juvenile justice centres.

Factor analysis of test results

Factor analysis of the screening tests battery items produced a four-factor solution, as shown in Table 3. The four factors account for 55.1% of the variance. Whilst these factors are consistent with the manner in which the tests were selected, it is relevant that the factors emerge statistically.

Table 3 Varimax factor analysis of screening test battery (N= 269)

Variable	Factor 1 functional literacy	Factor 2 performance skills	Factor 3 problem solving	Factor 4 adaptive behaviour
ABC test	.55			
Backwards Spelling	.68			
Reading List	.72			
Communication Skills SS*	.54			
K-BIT Vocabulary	.60			
Location	.53			
Spiral Maze		.57		
Trail A Score		.77		
Trail B Score		.63		
Trail Total Time**		-.75		
K-BIT Matrices			.72	
Matrix Analogies PR*			.78	
Serial Sevens			.54	
Daily Living Skills SS				.79
Social Skills SS				.76

* SS = Standard Score: PR = Percentile Rank

** Scored in the opposite direction from the other Trail-Making Test results

Prevalence of intellectual disability

Table 4 indicates that 20% of the sample obtained SS of less than 70, being in the range of intellectual disability, whilst a further 17.5% were in the borderline range (SS 70-79).

Table 4 Classification of intellectual ability

Category	K-BIT	WAIS-R	WISC-III	Total N	%
Above average 110+	16			16	4.9
Average 90-109	113	1	1	115	35.3
Low average 80-89	72		1	73	22.4
Borderline 70-79	49	5	3	57	17.5
Mild ID 50-69	45	10	2	57	17.5
Moderate ID 35-49	8			8	2.5
Total	**303**	**16**	**7**	**326**	**100.0**

Table 5 Cross tabulation of K-BIT and Vineland results, for total sample, and for under-18s *(under-18s in italics).*

		Vineland					
K-BIT		***Above average***	***Average***	***Low average***	***Borderline***	***Intellectually disabled***	***N and %***
Above average SS=110+	Total sample	7	7	-	1	1	16 5.4
	<18	*0*	*1*	-	*1*	*1*	*3* *2.7*
Average SS=90-109	Total sample	14	48	20	17	13	112 37.6
	<18	*2*	*11*	*12*	*8*	*8*	*41* *36.3*
Low average SS=80-89	Total sample	2	27	11	20	12	72 24.2
	<18	-	*11*	*4*	*13*	*7*	*35* *30.9*
Borderline SS=70-79	Total sample	-	15	4	15	14	48 16.1
	<18	-	*3*	*2*	*3*	*6*	*14* *12.4*
Intellectually disabled SS<70	Total sample	-	3	4	13	30	50 16.8
	<18	-	*2*	*3*	*4*	*11*	*20* *17.7*
N and %	Total sample	23 7.7	100 33.6	39 13.1	66 22.1	70 23.5	298* 100.1
	<18	*2* *1.8*	*28* *24.8*	*21* *18.6*	*29* *25.7*	*33* *29.2*	*113* *100*

* Some participants had missing data on one or both tests.

Results in Table 5 demonstrate that when cognitive and adaptive skills are compared, 23.5% of the total sample have significant adaptive skills deficits, which would place them in the SS<70

range on the Vineland, but some of these do not have corresponding deficits in cognitive reasoning. On the K-BIT, 16.8% of the total sample and 17.7% of the under-18s have a standard score of less than 70. Of the under-18s, 29.2% have adaptive behaviour deficits. Individuals who have adaptive behaviour deficits, but not cognitive deficits, may have another diagnosis, such as substance abuse disorder, dementia or psychiatric illness. Conversely, some participants with SS<70 on cognitive reasoning tests have low average or better adaptive behaviour, perhaps indicating previous training in skills of daily living.

Those who fall below SS of 70 on **both** tests comprise 30 (10%) of the total sample and 11 (9.7%) of the under-18s. If the criteria are expanded to include those who fall into the category of intellectual disability on one test and borderline on the other, the proportion who may be diagnosed as intellectually disabled is 19% for both the total sample and the under-18s (N=57 and N=21 respectively). Owing to deliberate inclusion of inmates from "developmental disability" units in New South Wales, these data may inflate the prevalence of intellectual disability. If the 14 participants from developmental disability units are removed from the sample, 48 of the remaining sample (16%) would be diagnosed as intellectually disabled on the basis of a SS of less than 70 on at least one test and a score of 70-79 on the other test.

None of those tested in juvenile justice facilities were selected from developmental disability units. Although this is not a random sample, the results nevertheless confirm a significant over-representation of people with intellectual disabilities in custody in New South Wales (Australia).

Accuracy of classification by the screening battery items

The major aim of this phase of the development 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. 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 K-BIT or Wechsler tests, and VABS, 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 scoring of Trail Making Tests A and B. Whilst using the original method, that is, leaving the timing of the test open-ended, was desirable owing to the richness of the data and the possibility of classifying testees into mild, moderate and severe categories of deficit, on the other hand, open-ended timing required very accurate time-keeping by the tester. If, for example, an officer in a prison was interrupted during the course of the test, the accuracy of timing would be lost and the HASI results compromised. The length of time taken by some participants during the test development also militated against an open-ended timing system of scoring. Some participants required five minutes or more to complete the Trail B sub-test, not an optimum time-frame for a quick screening tool, given that other items also have to be completed.

As the instructions and scoring were substantially altered, in order to avoid confusion with the original Trail Making Test, this version was re-named Puzzles A and B. For ease of administration a cut-off time was calculated for Puzzle A (40 seconds) and Puzzle B (97 seconds or 1 minute 37 seconds), timed with a stopwatch. In the next phase of piloting the test, both Puzzles were still incorporated in the pilot version of the HASI. Puzzles instructions and timing were recorded on audiotape as one option for administration, ensuring accurate timing even if the test administrator was distracted or interrupted in any way. The timings determined upon were the optimum for discriminating between the intellectually disabled and non-disabled groups, with a minimum of false positives and false negatives, on the basis of Phase 1 results.

For the next phase, the criteria for referral of a testee, during the pilot testing of the HASI therefore were:

The testee fails one test badly, that is, Present State score of 8 out of 20, or less; or Clock Drawing score of 5 or less.

OR

Four indicator questions ("Do you think you have a learning disability?") were answered in a way consistent with an intellectual disability. The criterion became three indicator questions for juveniles, owing to the small number of juveniles being in receipt of the Disability Support Pension or Invalid Pension.

OR

Falling below criteria on four sub-tests, at the following levels:

Present State = 14 or less
Puzzle A = Fail to complete in 40 seconds
Puzzle B = Fail to complete in 97 seconds
Clock Drawing = 6 or less

Receiver Operating Characteristic (ROC) curve analyses

Receiver Operating Characteristic (ROC) curve analyses were undertaken using MedCalc 5.00.017 (Schoonjans, 1998). 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 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 *Sensitivity* of a test is the probability that a test result will be positive when the disease is present (true positive rate, expressed as a percentage).

The *Specificity* is the probability that a test result will be negative when the disease is not present (true negative rate, expressed as a percentage).

The *Positive likelihood rate* is the ratio between the true positive rate and the false positive rate.

The *Negative likelihood rate* is the ratio between the false negative rate and the true negative rate.

The *Positive predictive value* is the probability that the disease is present when the test is positive (expressed as a percentage) whereas the *Negative predictive* value is the probability that the disease is not present when the test is negative (expressed as a percentage). These two measures are highly dependent on the proportions of subjects who do and do not have the disease, that is, the prior probability of the disease.

The *Area under the ROC curve* 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.

For ease of interpretation of tables, the Positive likelihood rate, Negative likelihood rate, Positive predictive value and Negative predictive value results are not included in data presented below.

Table 6 ROC curve analyses for the screening phase*

Variable	Area under ROC curve	Standard error	Cut-off score	Sensitivity at cut-off	Specificity at cut-off
K-BIT Standard Score (N = 303)					
Background	.74	.04	2	69.8	74.4
Present State total	.83	.03	10	83.0	71.6
Puzzle A	.70	.04	40	64.2	70.4
Puzzle B	.81	.04	99	67.3	79.4
Clock Drawing	.75	.03	8	67.3	71.2
HASI Total**	**.88**	**.03**	**26**	**77.6**	**77.7**
VABS Composite Standard Score (N = 325)					
Background	.70	.03	1	82.3	50.0
Present State total	.73	.03	8	48.4	86.8
Puzzle A	.70	.03	37	70.3	63.7
Puzzle B	.72	.03	99	58.1	77.8
Clock	.70	.03	8	64.0	71.4
HASI Total	**.74**	**.03**	**26**	**64.0**	**76.1**

* The cut-off point for K-BIT and VABS compared participants with an intellectual disability (SS<70) with those in the borderline or above group (SS≥70).

** HASI Total for these analyses was calculated by scoring each "Tick" as 1, and weighting scores according to the then current weighting system.

Phase 2 – Piloting the HASI

The pilot version of the HASI

Following examination of the ROC curve analyses and other data analyses, a pilot version of the HASI was developed which consisted of the following items:

Background

Items asking for the participant's self-report of having a learning disability, being a slow learner, reading ability, maths ability, and receipt of a disability pension were retained. Scoring criteria were altered to be consistent with the direction of scoring on the K-BIT and VABS, that is, a higher score was consistent with being non-disabled.

Present State

The present state items were as follows:

Orientation - year, season, month, date, day
Location - Australian state, city/town, place, street/unit/section of gaol, floor
Serial Sevens - subtracting "7" from "100" sequentially, five subtractions in total
Backwards Spelling - spelling the word "STAMP" backwards

Puzzle A

This required the participants to join circles in a number sequence and complete correctly in 40 seconds.

Puzzle B

This required the participants to join a numbered circle to a circle containing a letter, in alternate sequence and complete correctly in 97 seconds.

Clock Drawing

The participant was required to draw a large clock face, place the numbers on the clock face and position the hands at 20 minutes to 4 o'clock.

Observation of behaviour

A section of the answer sheet allowed the tester to note the testee's English language proficiency and presence of any unusual behaviours.

Scoring of the pilot version was initially in accordance with scoring methods described above. As data analyses proceeded, various other scoring methods were trialled until the optimum scoring was obtained.

Methodology and sample

As a result of the preliminary data analyses, the screening battery was reduced in size to form a pilot version of the HASI, which was administered *in situ*, using a number of groups of participants, as shown in Table 7. These groups were entirely independent of the screening battery participants.

Table 7 Participant groups used for the HASI pilot version

Group	Male		Female		Total	
	N	%	N	%	N	%
Juvenile Justice 1999	45	100			45	100
Legal Aid 1998	21	80.8	5	19.2	26	100
Corrective Services 1999	129	81.1	30	18.9	159	100
Total	**195**	**84.8**	**35**	**15.2**	**230**	**100**

Since all of the original items were available for the screening battery subjects, there were common items for the screening battery and pilot test participants; therefore, wherever possible, the total combined group of participants was used for statistical analyses. Some items from the initial screening battery were re-coded for these common analyses so the scoring was consistent.

A series of regression analyses were conducted, followed by ROC curve analyses utilising different sets of variables, until an optimum formula was devised. First, each item was analysed using Receiver Operating Characteristic (ROC curve) analyses and those items which did not discriminate well between the groups were excluded from regression analyses. The items which proved useful were then combined in various ways in regression analyses. Regression formulae were arrived at and were then applied to all of the participants' scores. ROC curve analyses using the total score were then conducted for various gender, age and ethnic background sub-groups. Both the K-BIT and VABS scores were used as the benchmarks for the ROC curve analyses, with intellectual disability being defined as a standard score (SS) of less than 70, and the population prevalence of the disease being set at 3%. Some items in the pilot version of the HASI were excluded and, in all, more than 14 different formulae were applied, resulting from different regression equations and excluding various test items, before the optimum formula was decided upon.

Scoring criteria and direction of scoring for some items were changed, as noted above. Thus, a high score on the HASI correlated positively with a high standard score on the VABS and the K-BIT and indicated that the person was not intellectually disabled and, on the basis of the HASI score, did not require referral for full-scale assessment. The items or groups of items were then weighted according to the regression equation scores and a constant of 26 was added. ROC curve analyses should ideally be conducted using a sample of 100 or more, with 50 cases being the minimum (Schoonjans, 1998). Therefore, the ROC curve results for samples smaller than that should be regarded with caution and are included only for the sake of completeness, and to indicate trends. Table 8 shows the results of ROC curve analyses for this final formula, incorporating participants from the screening phase and the pilot study phase, for whom common test results were available.

Table 8 ROC curve analyses – HASI score for sub-groups on K-BIT and VABS

Group	N*	Area Under Roc Curve**	Possible Cut-Off Scores	Sensitivity	Specificity
K-BIT Standard Score					
Juvenile Female	28	.754	89.4	100.0	65.2
Juvenile Male	130	.786	76.7 85.2 89.4	57.9 68.4 84.2	94.1 69.3 52.5
All Juveniles	158	.771	76.7 88.4 89.4	50.0 81.8 86.4	94.4 61.3 54.8
Adult Female	98	.934	85.2	100.0	78.2
Adult Male	165	.897	83.4 85.2	91.4 91.4	74.6 67.7
All Adults	263	.916	85.4	95.7	71.0
Indigenous***	108	.826	74.4 85.2	57.1 81.00	95.4 64.4
Non-Indigenous	185	.880	81.9 85.2	75.0 75.0	88.5 78.3
Total Sample	**421**	**.870**	**80.2** **85.2**	**72.1** **82.4**	**85.4** **71.6**
VABS Composite Standard Score					
Juvenile Females	27	.600	85.9 88.9	100.0 100.0	20.0 32.0
Juvenile Males	128	.616	76.9 85.2 89.4	34.1 51.2 61.0	90.8 67.8 48.3
All Juveniles	155	.621	83.2 89.4	44.2 60.5	81.3 50.9
Adult Female	82	.881	80.7 85.2	80.0 90.0	87.5 75.0
Adult Male	138	.816	85.2 87.4	69.4 85.7	64.0 68.5
All Adults	220	.835	81.7 85.2	67.8 72.9	84.5 71.4
Indigenous	114	.681	80.7 85.2	48.8 61.0	82.2 69.9
Non-indigenous	199	.829	87.4 85.2	84.1 68.2	67.7 77.4
Total Sample	**375**	**.745**	**81.7** **85.2**	**55.9** **62.7**	**84.3** **71.2**

* Some missing data in various subgroups

** The area under the ROC curve remains constant irrespective of the cut-off score

*** "Indigenous" refers to participants who stated that they were of Aboriginal, Torres Strait Islander, Maori or Pacific Islander background, whereas "Non-Indigenous" refers to those who did not come from these ethnic groups. Data regarding Indigenous background were not collected for all pilot studies

Table 8 shows that for the total adult sample the most effective cut-off score on the HASI is 85. Adult participants with a score of 84 or less will be referred for full-scale diagnostic assessment, while those scoring 85 or higher will not be referred. In the case of juveniles, the best possible cut-off score is 89 – those with a score of 89 or less will be referred for further assessment, whilst those with a score of 90 or above do not need referral. The cut-off score is designed to be over-inclusive, for the reasons outlined in previous chapters.

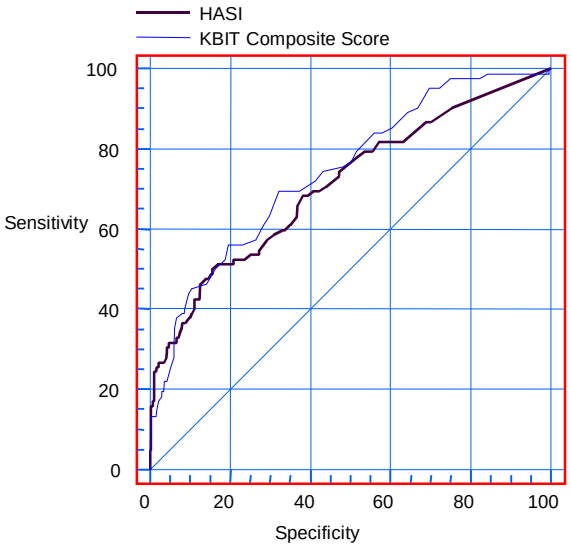
The final version of the HASI consists of:

- Background items
- Backwards Spelling
- Clock Drawing
- Puzzle B with a cut-off time of 100 seconds

An individual's results are calculated according to the formula on the front page of the Record Booklet (see Appendix A, Table A.2). A constant of 26 is incorporated. Background score is weighted by 3.5, Backwards Spelling by 3, Puzzle (formerly Puzzle B) by 3.7 and Clock by 2.

The final version of the HASI was as effective as the K-BIT SS in predicting results on the VABS, as can be seen in Figure 1.

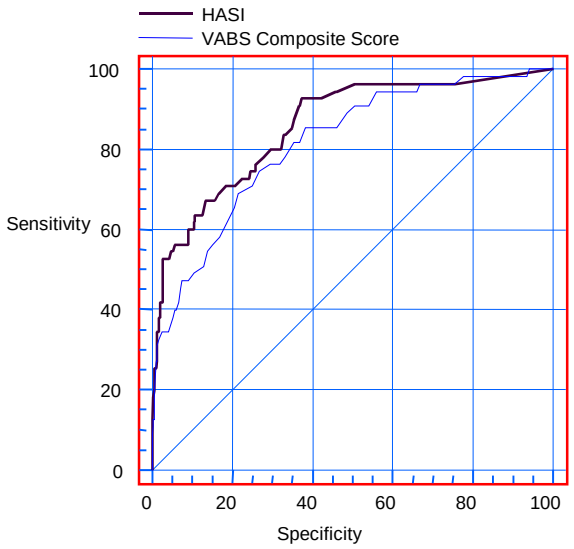
Figure 1 Comparison of ROC curves for K-BIT and HASI, in predicting VABS



The area under the ROC curve for HASI was 0.710 and for the K-BIT SS was 0.743, the difference being non-significant (p = 0.267).

Figure 2 shows the comparison of the ROC curves, when the HASI and VABS are used to predict K-BIT SS. The area under the ROC curve for HASI is 0.858, compared with the VABS which has an area of 0.814. The difference is non-significant (p = 0.137). Hence the final version of the HASI is as effective as the K-BIT or the VABS in predicting the other test.

Figure 2 Comparison of ROC curves for VABS and HASI, in predicting K-BIT



Figures 3 and 4 show the relationship between HASI results and K-BIT and VABS results, for the total adult sample.

Figure 3 HASI predicting K-BIT for total adult sample

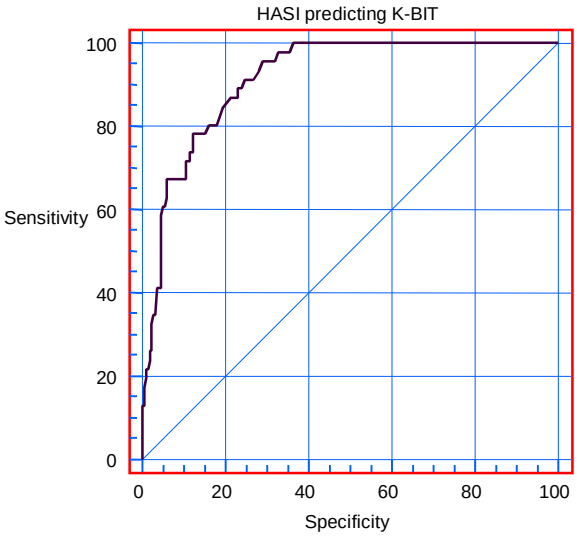
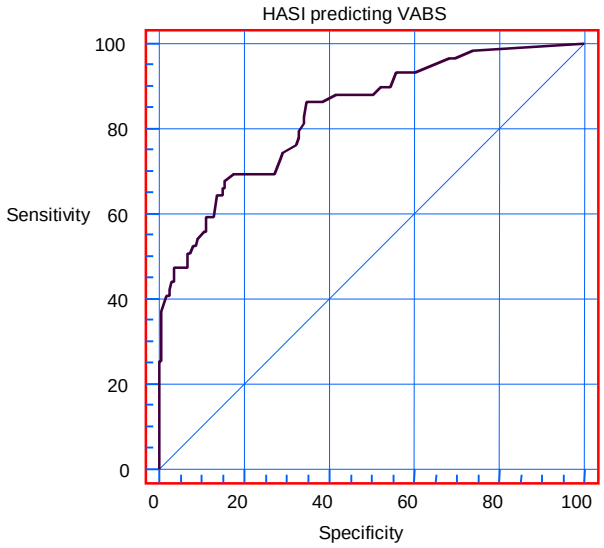


Figure 4 HASI predicting VABS for total adult sample



Correlation with other psychometric tests

Table 9 shows the correlation coefficients between the HASI and other psychometric tests. Some sub-group analyses for female/male or juvenile/adult result could not be calculated owing to small sub-group numbers. The correlation matrix indicates that in relation to the VABS, the HASI scores correlate more strongly for adult groups, compared with juveniles. This may be owing to the fact that adaptive behaviour is more variable for juveniles than for adults. Young people have a wider variation in their levels of maturity and acceptable behaviour than adults. Another explanation may be that juveniles mis-reported their adaptive skills, compared with adults. Nevertheless, all correlations between the HASI and other tests are significant, with the exception of the correlation between HASI and VABS for Aboriginal and Torres Strait Islanders who were under 18 years.

Table 9 Correlation (Pearson R 2-tailed) of HASI score with other psychometric tests

Criterion Measure and Groups	N	Correlation with HASI Score
Total Sample		
K-BIT Vocabulary score	410	.575**
K-BIT Matrices score	412	.517**
K-BIT Composite score	410	.627*
VABS Composite score	376	.497**
Adult Females		
K-BIT Vocabulary score	98	.634**
K-BIT Matrices score	98	.566**
K-BIT Composite score	98	.638**
VABS Composite score	82	.606**
Adult Males		
K-BIT Vocabulary score	166	.687**
K-BIT Matrices score	166	.614**
K-BIT Composite score	165	.701**
VABS Composite score	138	.651**
Under 18s		
K-BIT Vocabulary score	145	.392**
K-BIT Matrices score	147	.350**
K-BIT Composite score	146	.500**
VABS Composite score	152	.203*
Indigenous* **		
K-BIT Vocabulary score	110	.667**
K-BIT Matrices score	110	.499**
K-BIT Composite score	110	.631**
VABS Composite score	116	.504**
ATSI* **		
K-BIT Vocabulary score	81	.691**
K-BIT Matrices score	81	.491**
K-BIT Composite score	81	.631**
VABS Composite score	86	.480**
Adult ATSI* **		
K-BIT Vocabulary score	33	.787**
K-BIT Matrices score	33	.567**
K-BIT Composite score	33	.712**
VABS Composite score	35	.705**
Juvenile ATSI		
K-BIT Vocabulary score	48	.558**
K-BIT Matrices score	48	.368**
K-BIT Composite score	48	.506**
VABS Composite score	51	.174
Juvenile Sample 1999		
WISC-III full-scale IQ score	45	.404**

* Correlation is significant at the 0.05 level (2-tailed)

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

*** "Indigenous" refers to participants who stated that they were of Aboriginal, Torres Strait Islander, Maori or Pacific Islander background, whereas "Non-Indigenous" refers to those who did not come from these ethnic groups. "ATSI" refers only to Aboriginal and Torres Strait Islander participants, and does not include Maori or Pacific Islander. Data regarding indigenous background were not collected for all pilot studies

Phase 3 – Piloting the HASI in Corrective Services

Although the results of the pilot study in 1999 in New South Wales Department of Corrective Services prisons have been incorporated into the merged results above, these results are also reported separately here because of their significance for prison systems which may be considering the use of the HASI to screen all inmates upon reception to prison.

In this pilot study of the efficacy of the HASI in custodial environments, the HASI was administered shortly after the participant entered either Silverwater (a men's prison) or Mulawa (a women's prison) Correctional Centres in the suburbs of Sydney, Australia. The tester was either a member of the alcohol and other drugs staff of the prison, or a Corrective Services psychologist who was seconded to the study. On the basis of the HASI results, a decision was made as to whether or not a participant would be referred for full-scale diagnostic assessment, and these participants were assessed by the psychologist. A sample of those who would not have been referred on the basis of HASI results was also assessed using psychometric tests, in order to allow calculation of the false positive and false negative rates. The K-BIT and the VABS were used as the benchmark criteria, consistent with other pilot studies for the HASI.

The sample

A total of 159 prisoners in NSW gaols participated in the HASI, and a sub-sample of 57 completed a full-scale diagnostic assessment. Of these 57, 22 obtained a score on the HASI (using the scoring method used for the pilot phase) which would have indicated that they should be referred for assessment. Therefore, 35 participants who would not have been referred normally, were nevertheless included for full-scale assessment for validation purposes. These participants were selected on the basis of no specific criteria, and therefore can be regarded as a "random" sample.

Under the final HASI scoring system, 37 participants would have been referred for full-scale diagnostic assessment, including all of those who were referred under the pilot phase scoring procedure.

Most of the sample were male prisoners (81%, N=129), women forming a minority (18.9%, N=30). The average age was 28 years, the range being 18-62 years.

Of the sub-sample who participated in the full-scale diagnostic assessment (N=57), 19.3% fell below a standard score of 70 on the K-BIT, and 20% fell below SS of 70 on the VABS. For males (N=40), 22.5% were below 70 on the K-BIT, and 20.5% on the VABS. For females (N=17), 11.8% were below 70 on the K-BIT and 18.8% on the VABS. Of the total sample, 27.8% were below SS of 70 on either or both of the K-BIT and VABS. There were no significant differences (using T-test, $p<.05$) between males' and females' scores on K-BIT, VABS or HASI. This result indicates the gender-fairness of the HASI.

Receiver Operating Characteristics (ROC) curve analysis of the HASI

Table 10 Corrective Services 1999 sample ROC curve analyses for HASI scores and criterion measures

Criterion measure*	N	Area under ROC curve	Standard error	Cut-off score	Sensitivity at cut-off	Specificity at cut-off
K-BIT SS	55	.91	.04	79.4	100.0	82.2
VABS SS	54	.80	.07	83.9	81.8	69.8

*Cut-off score for intellectual disability was SS<70.

The ROC curve analyses indicate that within this 1999 Corrective Services sample, the HASI is a good discriminating tool, and predicts both K-BIT and VABS scores well. Consistent with other results, however, the HASI is somewhat better at predicting K-BIT outcome. According to the final method of scoring the HASI, the cut-off score for adults for referral for full-scale diagnostic assessment is 84 or less. At this score, all participants with SS on the K-BIT of less than 70 would be referred for diagnostic assessment, and 82% of those with similar results on the VABS. "False positives" at this score are low, as Table 10 indicates. The true negative rate (specificity) would exclude 82% of participants who did not have an intellectual disability according to K-BIT results, and 70% of those who were non-disabled according to the VABS.

Figure 5 ROC curve for K-BIT and HASI for 1999 Corrective Services sample

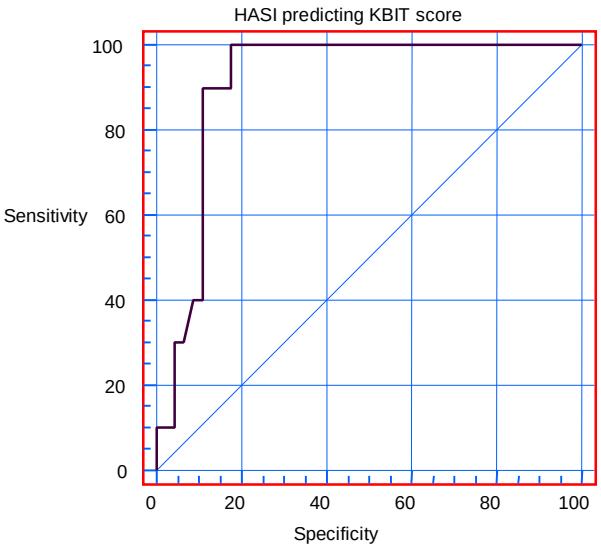
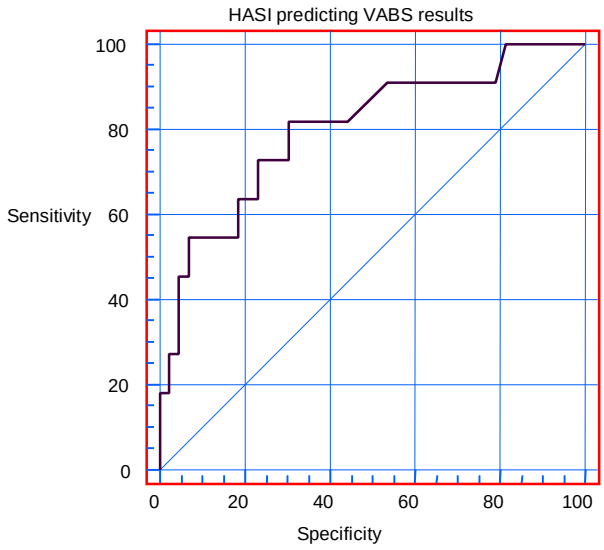


Figure 6 ROC curve for VABS and HASI for 1999 Corrective Services sample



When the HASI and VABS are compared, in terms of their effectiveness in predicting K-BIT SS, the area under the ROC curve for the HASI is .907, whereas it is .744 using the VABS. The difference is significant, at the .01 level of significance, indicating that the HASI is significantly better than VABS in predicting K-BIT results.

When the alternate comparison is made, comparing the efficacy of the HASI and K-BIT in predicting VABS scores, the area under the ROC curve for the HASI is .806, and for the K-BIT, it is .861. The difference is not significant, which indicates that the HASI is comparable to the K-BIT in predicting VABS scores.

Using the final HASI scoring system, all those participants who were NOT referred for diagnostic assessment obtained a SS of 70 or above on the K-BIT. On the VABS, of those who would not have been referred, 7% were below SS of 70. Sixty-two per cent of those who were referred on the basis of their HASI score fell below SS of 70 on either or both of the criterion measures. These findings are in accordance with the aim of the HASI, which is to minimise the referral of those who do not have a disability, and to over-include within the disability category, to incorporate those who may have other difficulties apart from intellectual disability.

Correlation between HASI and criterion measures

Within this Corrective Services sample, the HASI correlated significantly with the K-BIT sub-test and composite scores, and with the VABS composite score, all correlations being significant at the .01 level, as Table 11 shows.

Table 11 Correlation between HASI and criterion measures

Criterion measure	N	Pearson 2-tailed correlation
K-BIT Vocabulary SS	55	.75**
K-BIT Matrices SS	55	.59**
K-BIT Composite SS	55	.73**
VABS Communication SS	55	.518**
VABS Daily Living SS	55	.29*
VABS Socialization SS	54	.38**
VABS Composite SS	54	.44**

* Correlation is significant at the .05 Level (2-tailed)
** Correlation is significant at the .01 Level (2-tailed)

Summary

The results of the many research studies undertaken during the development of this instrument indicate that the HASI is a valid tool for screening the population of persons within the criminal justice system, and discriminates well between the intellectually disabled and non-disabled groups. The usefulness of the HASI 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 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 results correlate significantly with the two tests, the K-BIT and VABS, which were used as the benchmarks in this study. ROC curve analyses and correlation coefficients indicate that the HASI is effective for males and females, adults and juveniles, indigenous and non-indigenous, accused persons and sentenced offenders.

Appendix A Conversion to Standard Scores and Scoring

Table A.1 Raw Scores and Standard Score Equivalents for Sub-tests

Raw Score	Scaled Score				Raw Score
	Background	Backwards Spelling	Puzzle	Clock Drawing	
1	3.5	3	3.7	2	1
2	7	6	7.4	4	2
3	10.5	9		6	3
4	14	12		8	4
5	17.5	15		10	5
6	21			12	6
7	24.5			14	7
8	28			16	8
9				18	9
10				20	10

Table A.2 Scoring calculations

Sub-Test	Raw Score	Scaled Score
Background		
Backwards Spelling		
Puzzle		
Clock Drawing		
Add		26.0
Total Score		

ENTER THE SCORE IN THE APPROPRIATE BOX –

IF AGED 18 YEARS OR OVER:

Score is <85		Refer for further assessment
Score is 85+		No referral

IF AGED <u>UNDER</u> 18 YEARS:

Score is <90		Refer for further assessment
Score is 90+		No referral

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