



Burdett Trust for Nursing

Final Report

“What Matters to Patients”: Identifying Applicants to Nursing who have the Personal Values required to build a Skilled and Competent Workforce and Lead the Nursing Profession in Northern Ireland.

A Project by Queen’s University Belfast and Ulster University in collaboration with Identity Exploration Limited, Belfast.

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EXECUTIVE SUMMARY

Introduction

This is a report to the Burdett Trust on an evaluation of the effectiveness of a values-based screening tool (Nurse Match, NM) in the identification of suitable candidates for interview as part of the application process for nursing and midwifery programmes in Northern Ireland. The tool is also assessed as a potential replacement for the present screening test, a Personal Statement. It is compared with the present screening test with a focus on psychometric probity and a modified version is used to assess leadership potential in applicants. The report is funded by the Trust.

The evaluation was carried out by a team consisting of
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Professor Owen Barr Ulster University
Professor Roger Ellis Ulster University and Chester University
Mr Colin McNeill Identity Exploration Ltd.
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The NM instrument is a specially constructed test based on the well-established Identity Structure Analysis theory and its associated Ipseus software for test construction and scoring. Ipseus instruments measure aspects of identity including the values that make up identity. The values measured by the assessment tool are based on the five attributes proposed in 2013 by Gateway in Northern Ireland. The test yields a score on individual values and an overall score on the set of values. This score can then be used to select applicants to proceed to the next stage of selection.

The Personal Statement is submitted by applicants as part of their UCAS application. Applicants for Nursing are encouraged to focus their statement on this profession. The statements are then marked by Nursing faculty using a scoring grid related to four attributes: personal desire for a career in nursing; motivation for nursing; expectations of the course and nursing as a profession; decision making affecting self and others

The marked Personal Statement yields a score which can be used to screen applicants. The Personal Statement has been used as a basis for initial screening at Queens University Belfast (QUB) and Ulster University (UU) since 2012.

The evaluation is structured using the well-established Trident Method which focusses evaluation questions on Outcomes; Process and Stakeholder Perspectives. The major outcome evaluated is the fitness for purpose of the test for initial applicant screening. The test is also evaluated with regard to its compliance with psychometric standards and hence its psychological probity and defensibility as a basis for decisions. The processes required for the tests are evaluated with regard to feasibility and cost effectiveness. With regard to stakeholder perspectives the acceptability of Nurse Match to applicants is evaluated. Additionally, the data are analysed using a Leadership version of NM to explore the provisional identification of leadership potential.

The Report to Burdett comprises the following elements

1. An Executive Summary including Conclusion and Recommendations
2. A research report on the effectiveness of the screening tool
3. A comparative evaluation of psychometric standards and defensibility of the screening tool and the Personal Statement
4. A report on the use of screening tool data to seek a better measure of leadership potential.

The evidence for the evaluation comes from two pilot uses of Nurse Match first in 2015 with a group of first year students at Queen's University Belfast (QUB) and second in 2018 with applicants to nursing programmes at QUB and Ulster University (UU); from an analysis of NM and PS against APA psychometric standards and from surveys of the views of those who completed the instrument in the two pilots.

Outcomes

The primary evaluation question regarding outcomes was the extent to which the instrument was fit for the purpose of ranking a set of applicants using valid and reliable criteria including the values they held relevant to Nursing. On the basis of this ranking applicants could be selected to proceed to the next stage of selection.

The selection instrument should be fair, transparent and defensible through meeting internationally recognised standards for a psychometric instrument. That is the instrument should have psychometric probity.

In the 2015 study (McNeill et al 2018) the NM instrument was found to have:

- discriminated effectively and efficiently between year one nurses in terms of the professional quality of their inherent nursing values and attributes;
- created suitability scores (S^{TOT} scores) for candidate screening purposes;
- produced suitability scores that closely approximated normal distributions;
- proved valid and reliable: robust in quantitative and qualitative terms;
- been administered, scored and interpreted in a standard manner;
- been easy to understand and complete and well received by participants.

In the 2018 study, funded by the Burdett Trust, the NM psychometric test

- screened applicants effectively and efficiently in terms of the professional quality of their inherent nursing values and attributes;
- measured the overall professional quality of applicant's values in terms of a single suitability score (S^{TOT});
- the S^{TOT} score for overall suitability had a normal distribution: symmetry and shape were within limits for skewness and kurtosis;
- was shown to be robust in quantitative and qualitative terms; valid and reliable (internally consistent):
- was administered, scored and interpreted in a standard manner;
- was easy to understand and complete and well received by most applicants;
- was a more effective, robust and valid screening tool than the personal statement;
- provided data that on analysis can inform staff appraisal and the management process

On the basis of these two studies it was established that the psychometric (NM) offered a standardized, effective, user friendly, screening test for values and attributes.

We were told that in 2014 an evaluation was undertaken of two year's use of the Personal Statement and the conclusion was that the data suggested this was an effective approach to streamline the number of individuals offered an interview.

It is clear that both Nurse Match and the Personal Statement are fit for purpose in the sense that they provide a score which can be used in the initial screening of applicants to Nursing programmes. However, the measures are quite different in the extent to which they meet psychometric standards of validity and reliability and hence are fair, transparent and defensible in use. The NM screening test demonstrates psychometric probity whereas PS does not.

There is no requirement to use a Value Recruitment instrument at this stage of selection. However, it is an advantage that NM has been specially devised to be such an instrument and is based on the Gateway attributes. PS is not a value-based recruitment instrument but rather an assessment of knowledge and commitment to Nursing in a personal statement. included in the UCAS application.

The comparative evaluation considers the two measures, PS and NM, in detail with regard to the extent they meet APA standards for psychometric tests. While NM has been designed as a test following well established principles and practices PS is more an opportunistic use of a statement required as part of a UCAS application for a university place and the marking of that statement while functional was not designed as a psychometric measure. Nevertheless, the fairness and defensibility of the PS should require it to meet psychometric standards.

The following comparative study shows in evidenced detail that while NM measures up well to APA standards of validity and reliability, there are serious weaknesses in PS with regard to both validity and reliability. Practically this means that it would be difficult to justify PS as a measure used to exclude applicants whereas the use of NM would be justified by its psychometric probity.

Process

This is a brief description of the process involved in using PS or NM as part of the selection procedure for entry to undergraduate Nursing programmes. Along with the

descriptions some comparisons are made of the resource implications of the two approaches.

PS has been used as part of the selection procedures of QUB and UU since 2012. Applicants for undergraduate programmes through the Universities and Colleges Admission System (UCAS) are required to complete a personal statement to support their application. This is described by UCAS as 'a chance for you to articulate why you'd like to study a particular course or subject, and what skills and experience you possess that show your passion for your chosen field'.

Support for the production of the PS is provided by UCAS and often by the careers teachers of secondary schools and colleges. The production of the PS is cost neutral for universities. There is no guarantee that a statement was actually produced by the applicant.

Following a decision by Gateway in 2012 personal statements of applicants to UU and QUB are marked and used for the initial screening. Marking is undertaken by faculty in Nursing and is on a four-point scale against each of four criteria. These are: personal desire for a career in nursing; motivation for nursing expectations of the course and nursing as a profession; decision making affecting self and others. These criteria, whilst relevant in themselves, are not conceived as Value Based Recruitment (VBR) and do not relate to the five attributes proposed by Gateway in 2014. There is clearly a cost involved in this marking in terms of the time of nursing faculty. This has not been quantified at this point but clearly it could be in terms of number of PSs marked; average time per marking; and cost of the total time as a proportion of lecturer cost. For faculty who have to meet the demands of teaching, research, and professional updating, this marking probably has an opportunity cost.

The NM test requires applicants to complete an instrument online. This takes about forty minutes in a computer equipped class room. In principle the instrument could be completed on any device with internet access and in whatever supervised circumstances suited the applicant. The instrument has been completed by 291 respondents in two pilots described in a published article on the first pilot (McNeill et

al 2018) and in a paper on the second pilot intended for publication; see the contents list.

The responses of each applicant are stored on a server and initial scoring and reporting is carried out through the Ipsos software which produces an overall score and scores for six values. The cost of this for each candidate will be between £30 and £50 depending on the depth of reporting required. This cost could be met by the receiving university or by each applicant and compared with the cost of marking PS.

Stakeholder Perspectives

A formal survey was undertaken of those who completed the instrument in the two pilots. Details are given in the following reports but in summary participants reported the instrument as being

1. easy to understand (97%) and could be responded to intuitively (93%)
2. quite easy to complete (94%); quite difficult to complete (19%)
3. identified most important nursing values (83%) and contain no irrelevant issues (88%)
4. was interesting, to complete (65%)
5. required extra time to complete (6%)

Further analyses

Additionally, the data from the second pilot were further analysed to explore an approach to identifying leadership potential. The outcome was suggestive of further studies which might be undertaken to provide indicative results.

Leadership Qualities

The study involved the design and testing of an instrument aimed at measuring leadership qualities associate with personal values. Such an instrument would enhance research capabilities and support staff appraisal and development in the manner indicated below.

The new instrument worked well, profiling and rank ordering the applicant sample by way of their leadership qualities. Psychometric test standards were met. Two

successful applicants were described (anonymously) in terms of their leadership qualities, highlighting their strengths and limitations. NM analytics, inherent software functionality so far unused in the context of nursing, identified key factors enhancing and adversely affecting personal performance and indicated how development of leadership skills in these students might be encouraged.

This work demonstrated how this assessment tool and software can provide better quantitative and qualitative research data on leadership in nursing than is currently available.

Conclusions and Recommendations

The NM psychometric instrument measures the value orientation of respondents. It has been devised to measure orientation towards the five Gateway attributes plus an additional attribute - Teamwork. It has proved valid, reliable and practical. Scores from the instrument can be used for an initial screening of applicants which is value based. Its use is defensible since it has demonstrated psychological probity.

The Personal Statement has been used for six years to screen applicants and the scores from its marking allow this. It is not a measure of values but rather of knowledge of and motivation towards Nursing and the training programme. Against psychometric standards the personal statement has problems of validity and reliability. The poor inter-marker reliability found is a particular cause for concern. Its defence would pose problems.

Marking the Personal Statement places considerable demands on faculty staff time. While this has not been costed for the evaluation it is likely to be significantly more expensive than Nurse Match the costs of which could be met by applicants.

On this basis of this assessment it is recommended that a psychometric test such as Nurse Match is used for the initial screening of applicants for initial training in Nursing at QUB and UU.

While this assessment tool has been evaluated in this study for use in screening for interview it has great potential for use in initial education and staff development to

describe the value profiles of students and qualified nurses. A project to investigate these curriculum applications is strongly recommended.

An initial study suggests that a leadership version of NM could support the appraisal and development of leadership potential both pre-graduation and post registration and it is recommended that this instrument should be further developed and evaluated to that end.

References

Colin McNeill, Allen Erskine, Roger Ellis, and Marian Traynor, 2018. Developing nurse match: A selection tool for evoking and scoring an applicant's nursing values and attributes. *Nursing Open*, 00, pp.1–13. Available at: <https://www.growkudos.com/publications/10.1002%25252Fnop2.183/reader>.

A REPLICATION STUDY: THE EFFECTIVENESS OF THE SCREENING TOOL

Abstract

Aim: The aim is to evaluate Nurse Match (NM) as a tool for assessing the private meaning, relative importance and emotional significance of nursing values. Nurse Match will score personal nursing values against preferred nursing values for screening and or staff developmental purposes. The task will be completed effectively and efficiently.

Design: Repetition of a pilot with student nurses (McNeill et al, 2018) this time using applicants to nursing. The process is case-study based and qualitative with quantified output. The instrument allows an applicant to appraise self and others from relevant contexts by way of the same bipolar values used in the pilot measure, small adjustments having been made to wording to take account of the absence of nursing experience in the applicants.

Methods: A convenience sample of applicants to a School of Nursing and Midwifery (N = 228) completed the instrument and a feedback questionnaire. Data were analysed and scored using algorithm defined parameters. Minitab 17 was used for statistical analysis.

Results: The key findings of the pilot study with student nurses were repeated with naive applicants save for reduction in the overall level of scoring. Feedback was positive as before but there were differences the most noteworthy being that applicants found the test less interesting to complete. The findings were that the NM psychometric test:

- screened applicants effectively and efficiently in terms of the professional quality of their inherent nursing values and attributes;
- measured the overall professional quality of applicants' values in terms of a single suitability score (mean S^{TOT});
- the mean S^{TOT} score for overall suitability had a normal distribution: symmetry and shape were within limits for skewness and kurtosis;
- was shown to be robust in quantitative and qualitative terms; valid and reliable (internally consistent):
- was administered, scored and interpreted in a standard manner;
- was easy to understand and complete and well received by most applicants;
- was a more effective, robust and valid screening tool than the personal statement;
- provided data that, on analysis, can inform staff appraisal and the management process

Conclusion: The Nurse Match measure offers a standardized, valid, reliable, user-friendly, screening test for values and attributes. NM is complementary to other modes of assessment. It can have a role to play in developing and assessing professional identity.

1 INTRODUCTION

The purpose of this research is to evaluate the use of Nurse Match (NM), in values-based recruitment. NM is a psychological test for assessment of nursing identity, specifically, for screening a candidate's nursing values against professional nursing values; their personal meaning, relative importance and emotional significance.

A pilot study with student nurses was conducted in 2015. The current study is intended to replicate that research but with applicants undergoing selection - to consider the results and the extent to which they reaffirm the results of the pilot.

The development of NM is in the context of concern that standards in nursing may be falling and a need to identify candidates with attributes suggesting suitability for the work and a cultural fit.

The long-term goal is an appraisal process with global relevance for nursing; assessing fit of the personal values of a candidate from any background with localised culturally and socially appropriate nursing values.

1.1 Background

The background is set out in detail in the original study (McNeill et al 2018) and is not repeated here. The findings of the original study and expectations for the current study are summarised here.

The NM psychometric test is a suitable test for assessing the personal values of student nurses; it

- assesses student nurses effectively and efficiently distinguishing between them in terms of the professional quality of their inherent nursing values and attributes;
- measures the overall professional quality of student nurse's values in terms of a single suitability score (S^{TOT});
- produces suitability scores for the sample approximated a normal distribution; skewness and kurtosis being within limits
- was shown to be valid and reliable: robust in quantitative and qualitative terms;
- was administered, scored and interpreted in a standard manner;
- was easy to understand and complete and well received by most applicants

The research had established that the NM instrument is a standardized, effective, user friendly, psychometric test for assessing nursing values and attributes – in student nurses. NM should be complementary to other modes of assessment.

The numbers of student nurse participants had been relatively small (N=63) so it was thought necessary to reaffirm these findings with a larger group of actual applicants. A replication study was planned and a research proposal was submitted to the Burdett Trust for Nursing which agreed to fund a research proposal with extended aims.

2. THE STUDY

2.1 Burdett Research

The research is to replicate so far as possible the procedure and test used in the pilot study, this time with a sample of applicants; and explore the extent to which the results were reaffirmed.

In addition, it would evaluate and explore the potential of the NM test as a replacement for the Personal Statement and as research tool in the realm of nursing - as agreed with Burdett.

2.1.1 Basic Aim

A major objective of this work was therefore replication of the design and procedure of the pilot study and comparative evaluation of the results of the two studies. The outcome was to be data on the overall (mean) S^{TOT} scores used to grade applicants and scores (S^{TOT}) on the six themed attributes or values which contributed to the overall scores i.e. "Person centredness" (PC), "Accountability" (ACC), "Trust" (T), "Integrity" (I), "Commitment to Personal Development" (CPD) and "Teamwork" (TW).

2.1.2 Additional Aims: to evaluate the effectiveness of the values-based screening tool known as Nurse Match (NM) as a potential replacement for the Personal Statement which is currently used to screen suitable candidates for interview as part of the application process for nursing and midwifery programmes in Northern Ireland: and also, it's potential for other applications in nursing including research.

These Aims and the basic Aim will be achieved through the following agreed Objectives each of which is reported on below in a separate section (except the fourth Aim which is reported on with the first Aim in this section).

1. To provide applicants to nursing from secondary schools and FE Colleges in Northern Ireland with the opportunity to use Nurse Match to profile their suitability for nursing and midwifery in terms of their nursing values
2. To evaluate the relationship between candidate scores on the Nurse Match screening tool and on the Personal Statement.
3. To evaluate the use of the NM screening tool as an indicator of leadership potential and tool for assessing related professional matters (*gender in nursing was chosen as an example*)
4. To obtain feedback from applicants on the user experience.

2.1.3 Long term aim: Identity instruments such as NM can be custom build for particular needs offering a tool for assessing applicants to nursing from a variety of social and cultural backgrounds on their personal nursing values and appraise those against a school's professional standards. It is believed that this approach has the flexibility necessary to operate effectively in the context of population movements and an international dynamic that tend to modulate extant localised value systems.

2.2 Design

A case-study approach to screening for nursing values that required respondents to appraise themselves and relevant others using an instrument, Nurse Match, designed to assess everyday use of nursing values and attributes in the appraisal of self and others (see example in Figure 1). Ipeus software in which NM resides was used to record responses and score the outcome on three theoretical concepts from ISA. These were used to calculate a score (S) on each value theme: see *para 2.7.2 on Methodology*.

2.2.1 Measures

The two measures used in the 2015 pilot study were used again in this replication study:

- a. The Nurse Match (NM) instrument is custom designed and built on the Ipeus software framework to enable a respondent to describe thirteen people (entities) from personal, home and work domains (such as 'self-at-work' and 'model nurse') using twenty carefully selected bi-polar constructs (dimensions) representing valid nursing attributes and values such as 'Truthfulness' and 'Teamwork') (see Appendix B: Tables B1 and B2) and
- b. a Feedback Questionnaire (Appendix A: Figure A9).

2.2.2 The Nurse Match measure

Nurse Match uses identity analysis in an idiographic approach in which the applicant's personal responses to a set of significant value dimensions are evoked and used in a scoring process. The scoring process uses parameters from the theory of ISA in a measure estimating the quality of these real personal values. It assesses their professional probity, stability and emotional significance against an idealised set of professional values as an indication of suitability for nursing.

The value constructs used in the NM instrument were derived from a literature search, trials with experienced and well-respected nurses and life experience, see section 2.7 below for a more detailed description of the process and see Figure 1 for an example. They were aligned with NIPEC¹ attributes and values.

Scores on two selected ISA parameters (stability of a value construct — sp.; and emotional significance of a value construct — es.) together with ideal self's choice of pole were used to calculate a score (S) for each of the twenty NM nursing values.

There are six value themes ('Person Centredness' (PC), 'Accountability' (ACC), 'Trustworthiness' (T), 'Integrity' (I), 'Commitment to Personal Development' (CPD), 'Teamwork' (TW)) each composed of a set of such nursing attributes and values (see Table B4: Appendix B). Scores (S scores) on each constituent value are summed for a theme score (S^{TOT}). An overall score (mean S^{TOT}) is calculated from the theme scores.

Note: A full exposition of the Nurse Match measure including the scoring process is available from the principal author on request.

2.2.3 Comparison with NM pilot instrument

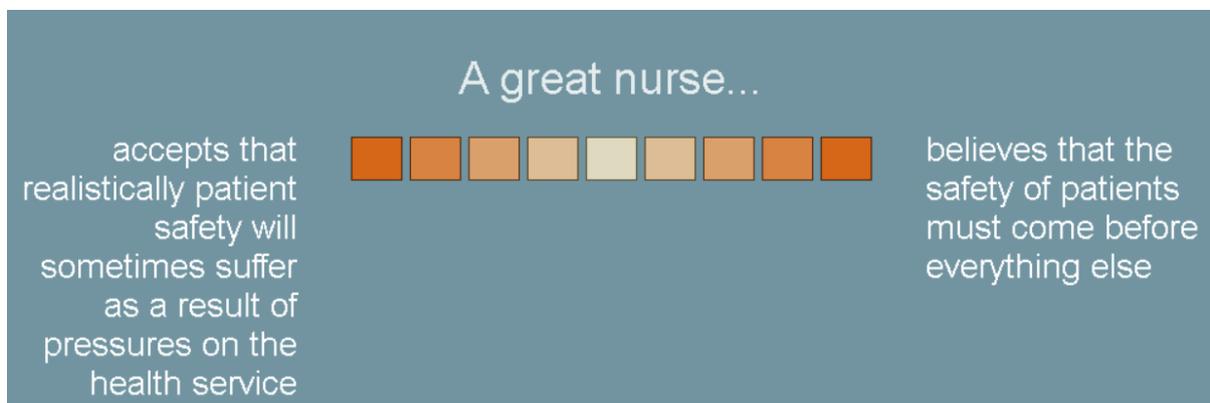
The instrument used here was almost identical to the instrument used in the pilot study. In the present instrument some minor changes were made in the discourses used to express the value constructs and in the way the entities were described. [Tables B1 and B2 provide the comparison: see Appendix B].

This was to get at personal identity at school or work and related values (respondents included secondary school pupils and college students some of whom had work experience). That is personal values before they were affected by nurse training as they had been with student nurses in the 2015 pilot. Essentially to address respondents with no nursing experience rather than some nursing experience.

2.2.4 The Feedback Questionnaire:

The design of the feedback questionnaire was improved by making the available response options more balanced while retaining most of the original questions. [see Figure A9: Appendix A for the questionnaire]

Figure 1. An example of a value construct as presented to applicants



¹ Northern Ireland Practice and Education Council for Nursing and Midwifery (NIPEC).

2.3 Sample

Volunteers were sought from Secondary Schools and Further Education Colleges that were listed by UCAS as putting forward applicants each year for selection. Contact was made by email with careers teachers and college careers advisers across Northern Ireland, describing the project in outline and asking for volunteers.

Those schools and colleges which consistently put forward larger numbers annually were circulated first followed by the smaller producers of applicants. The process ended on May 31st. Eighteen Secondary Schools and five Colleges participated.

Those who did so were briefed on the research process and aims and asked to seek volunteers from pupils or students who had applied through UCAS for the September 2018 intake to Schools of Nursing. Where volunteers came forward, arrangements were made for supervised data collection.

The outcome was a self-selected, convenience, purposive sample (N = 228) drawn from the 2018 cohort of applicants from Northern Ireland who used the UCAS process to apply to Schools of Nursing in the United Kingdom (N = 2380). They came from a wide geographical spread of participating schools and colleges, although participation rates varied widely.

2.3.1 Respondents

The volunteers who responded were aged 18-19 (180); 20-24 (26); 25-30 (8); 30+ (10); no return (4): 163 were secondary school pupils and 65 from Belfast and Regional Colleges. Ten were male.

As an inducement to participate, schools were informed that volunteers would be entered in a draw for one voucher of £200 and one of £100 to be spent at a Belfast shopping centre. Approval had been granted by the School of Nursing and Midwifery Ethics Committee at Queens University.

Applications were being considered for selection as data collection proceeded so that some volunteers knew whether they had been selected for interview before they sat the test. Those selected for interview had not yet been told if they were to be made an offer of a place.

2.4 Data collection

Data collection was done online at www.professionmatch.com in a classroom or computer laboratory supervised by at least one a research worker or a fully briefed teacher or tutor. UCAS applicants are given a personal UCAS number during the application process and this was used to identify volunteers during data collection and subsequent data analysis. This identifier was anonymous in that the research workers did not have access to the UCAS records.

UCAS numbers were also used to identify personal statement scores and record progress through the selection process.

The process of data collection was as follows:

- a. Before logging on: the supervisor used a briefing sheet to verbally brief participants about the test and help with management of the session. It dealt with the process, logging on, guidance on use of the software and completion of feedback. (see Appendix A, Figure A1)
- b. Participants then log on and are taken through the following seven stage process online clicking 'proceed' to move from page to page as completed (see Appendix A, Figures A2 to A7)
 - a. Introduction to the research, reassurance about use of data and 'thank you' draw

- b. Participant Information Statement (PIS)
- c. Completion of Consent Form for participation
- d. Collection of demographic information
- e. Read instructions and guidance for completion of Nurse Match
- f. Complete the Nurse Match psychological assessment
- g. Complete feedback questionnaire

Note: This differed from the 2015 pilot procedure only in that consent was obtained online as opposed to in writing and the briefing was given via the online process to each group of volunteers whereas in the pilot the entire group of 63 volunteers was briefed verbally at the same time.

- c. Participant's responses were recorded in the software database.

2.5 Ethical considerations

Ethics committee approval was obtained from Queen's University Belfast.

2.6 Data analysis

Initial data analysis was carried out automatically by Ipeus software using algorithms defining two ISA concepts ("structural pressure" on a construct and "emotional significance" of a construct) to calculate a score on each concept for each value construct. Those scores, downloaded to Excel software, were used with the chosen pole of each construct to calculate a score for each respondent on each of the six value themes and an overall score. Note, the personally preferred pole may or may not have been the professionally preferred pole. Subsequent statistical analysis used Minitab 17.

The output for each respondent is an S^{TOT} score for each of the six nursing value themes and an overall (mean) S^{TOT} score on which applicants are rank ordered, see example of output in Findings Table B5 Appendix B. The full set of results for the sample are to be found at Appendix A, Table A1.

2.7 Validity and reliability of the Nurse Match Instrument

2.7.1 Theoretical basis

The epistemological position we adopt is essentially constructionist. That is a person develops a unique sense of self and perspective by way of personal experience of self-in-the-world (see ISA meta-theory: Weinreich & Saunderson, 2003). Sense of identity and construal of the world emerges from the activity of real world somatic and neuropsychological processes that develop and modulate self's values and beliefs in response to life experience.

2.7.2 Methodology

We use ISA in an idiographic case-study approach to each applicant. Data are gathered using a structured self-report instrument. This approach offers a holistic description of self-identity in a constrained context that is then open to interpretation and analysis. The complexity of outcome and subjective judgement involved in interpretation of interrelated data mean that, practically, findings are often focussed on and limited to narrower aspects of self-identity.

In this research, for practical reasons related to aim, the report is limited to appraisal of the applicant's value and belief system with outcome limited to a graphic illustrating scores on nursing themes and an overall score estimating the match or fit of self's values and beliefs with those required of a nurse. The result is in fact a snapshot in time of an aspect of a personal value and belief system that is relevant to nursing. If you like, we are exploring self-identity but for now only looking at self's construal of self and life in the context of nursing.

2.7.3 Qualitative rigour

The criteria we adopted to address validity and reliability, provide qualitative rigour, are based accordingly on this philosophical position and methodology and expressed here in terms of the literature (Anney, 2014; Huntley et al., 2017; Madill, Jordan, & Shirley, 2000; O'Brien, Harris, Beckman, Reed, & Cook, 2014; Pidgeon & Henwood, 1995; Tai & Ajjawi, 2016; Tobin & Begley, 2004). We used a selection of Standards for Supporting Qualitative Research (SRQR) criteria:

1. Credibility: the credibility of our chosen values was established by way of an extended process of exploration and selection (see below under robustness). The score on a value construct is an estimate of its meaning to the respondent and its emotional significance for them and is “true” to the extent that the respondent’s response is natural.

2. Fitness: the designed, quantitative, in face, content and construct validity of the instrument has been re-affirmed by feedback on its use (immediately post hoc instrument completion) and this is closely bound up with the fitness for purpose of the qualitative elements. The degree of “stability” of each qualitative element (value construct) is estimated using a clearly defined scoring process, so that value construct and personal score on it combine to create valid meaning couched in ISA terms.

3. Robustness: the ISA systematic procedure is inherently robust, but a great deal of time and effort was expended to ensure that the values used in the study were credible, dependable, confirmable and transferable (Anney, 2014; Houghton, Casey, Shaw, & Murphy, 2013). This was done during an extended developmental period; exploring the literature on values, consulting with experienced nurses and with several leaders in the profession, using personal experience of the NHS, creating a list of 102 value constructs, reducing that to twenty by a process of content analysis, reducing those twenty to six themes related to attribute themes being used in the NHS, having the professionals complete pilot instruments and provide feedback and seeking confirmation through feedback from the group who sat this pilot instrument — which generally confirmed that the values used in the study had face and content validity and were indeed “credible, dependable, confirmable and transferable”.

4. Reliability: The instrument provides a reliable “snapshot” of values at time of response; internal consistency (item or scale reliability) of the instrument has been reaffirmed in this research by the Cronbach’s alpha statistic (2015 pilot, 0.9437: 2018, 0.9499).

Reliability of the “snapshot” over time remains to be fully appraised (test-retest reliability). While experience with the instrument leads us to expect the same approximate results when utilised repeatedly under similar conditions, we are realistic about the stability of results using an idiographic measure such as this considering all the personal and social factors in play over time. Identity analysis theory assumes that some ideas and values are more stable than others (reliable in terms of use to make sense of the personal world) and that affect (‘mood in the moment’) and affect-in-context will affect significance and meaning.

We are conscious of research in social psychology and neuroscience on the role of values and evaluation in thinking and decision-making, (House, 2016; Kahneman & Egan, 2011). Values are typically processed in two different ways. There is evidence for an intuitive process that operates automatically with little apparent effort, can detect simple relationships and responds quickly and a more considered process that can follow rules, compare objects on several attributes and make deliberate choices. We expect from ISA theory that the more stable (core and everyday) values will have continuity over time particularly in the more established identity while the less stable values (conflicted to some degree) will be relatively easily changed or adjusted by mood and circumstance.

5. Integrity: genuineness of approach to completion of the instrument is the key factor in integrity. We advise respondents to respond promptly and intuitively which helps to avoid “over- thinking”. Lack of integrity of response is detectable by way of the software report and is usually due to lack of willingness to engage with the process. Feedback indicated that the instrument was easy to complete and understand (98% (2015) and 95% (2018) of respondents).

6. Representativeness: this is an idiographic measure so, despite being arguably more valid as a reflection of reality, it is not normally generalisable in quantitative terms. However, scoring in ISA is standardised to make individual’s scores comparable with others using the same process; see Weinreich (Weinreich & Saunderson, 2003) at pp. 78–9, 104–5 and 110 on “standardisation” and “internal standardization”. The collective of such scores by individuals does, therefore, enable inferences to be made about the values and beliefs of the sample of volunteers as a group and, ipso facto, of any population to the extent that it is representative of the group in a statistical sense.

7. Coherence: the findings on significance of value constructs are the consequence of a “synthesis” by algorithm assessing (a) the importance and (b) the emotional significance of each value in the appraised of self and others across several contexts: work-place, home, social life, past-self, future-self, self-under-pressure. Thus ISA offers a coherent and holistic analysis while retaining idiosyncrasies in the data.

8. Transparency: it is clear where the data came from (immediately from each respondent) and how results are reported (the software interface) and the data analysed (automatically by the software and then by the researcher working with the automatically analysed data).

3 THE FINDINGS

3.1 Values-based appraisal: data output: basic analysis: utility of output

The full set of sample scores prepared as if for screening process is set out, rank ordered by overall score in Appendix A: Figures A12 (1-4). The data set is quite large so Tables 1 - 3 are provided by way of illustration. Comment and analysis like that below may be added as required for screening purposes.

Comment: Table 1 shows a set of the data before rank ordering. We don’t know how the candidates rank overall but one can immediately see the low scores and the reason why scores were low. Take SUI004 the lowest scorer for example. The impression given is of someone who is person-centred and quite convinced about the importance of teamwork but whose conviction about the value of personal development looks weak, and a question arises about belief in accountability, trustworthiness and, particularly, integrity.

Table 1: Sub-set of results before rank ordering

Student Unique Identity	Person Centredness	Account ability	Trust worthiness	Integrity	Commitment to Personal Development	Team work	Suitability Score S^{TOT}
SUI001	56.92	50.62	47.47	53.04	47.87	42.96	49.81
SUI002	58.46	55.39	53.66	43.86	73.69	55.11	56.70
SUI003	62.90	52.39	40.77	43.29	62.25	48.68	51.71
SUI004	53.37	20.77	17.79	-1.20	16.93	36.94	24.10
SUI005	52.19	42.22	34.57	23.23	51.92	46.36	41.75
SUI006	76.04	63.69	61.29	69.30	36.96	67.78	62.51
SUI007	75.11	58.41	65.72	61.26	47.33	55.47	60.55
SUI008	79.70	70.97	75.70	73.91	64.64	81.12	74.34
SUI009	47.04	39.79	32.15	38.98	40.09	47.63	40.95
SUI010	40.02	35.85	50.50	23.93	41.14	10.52	33.66

Table 2 sets out the top ten scores where scores on all the value themes look consistently quite good even if quality of values does vary somewhat.

Table 2: Top ten scores rank ordered by overall suitability

Student Unique Identity	Person Centredness	Account ability	Trust worthiness	Integrity	Commitment to Personal Development	Team work	Suitability Score STOT
SUI065	94.80	89.34	88.93	82.26	94.33	78.98	88.11
SUI188	97.32	84.95	83.21	82.74	72.48	91.62	85.39
SUI030	86.38	81.03	77.50	76.89	82.67	81.23	80.95
SUI206	87.30	76.37	76.59	56.46	89.52	79.95	77.70
SUI100	90.54	75.70	83.78	68.90	66.17	75.33	76.73
SUI125	90.28	74.40	78.02	68.44	58.57	80.97	75.11
SUI226	94.19	69.68	81.48	60.18	52.90	90.80	74.87
SUI185	85.09	72.19	81.17	63.33	66.60	79.18	74.59
SUI008	79.70	70.97	75.70	73.91	64.64	81.12	74.34
SUI148	86.74	73.08	72.44	68.19	61.72	82.18	74.06

Table 3 consists of data on the bottom ten suitability scores illustrating the lower scores on value themes and their increased variability.

Table 3: Bottom ten scores rank ordered by overall suitability

Student Unique Identity	Person Centredness	Account ability	Trust worthiness	Integrity	Commitment to Personal Development	Team work	Suitability Score STOT
SUI074	53.13	20.99	22.11	12.19	4.92	33.15	24.42
SUI004	53.37	20.77	17.79	-1.20	16.93	36.94	24.10
SUI149	32.44	19.19	12.24	13.15	30.02	36.96	24.00
SUI057	41.03	22.21	19.09	12.57	25.00	23.76	23.94
SUI017	41.04	7.57	31.48	9.93	8.86	28.55	21.24
SUI216	38.97	16.72	16.71	8.33	13.01	31.63	20.89
SUI176	27.99	13.72	11.67	5.69	27.75	26.79	18.93
SUI060	33.26	18.63	11.89	11.95	5.76	21.63	17.19
SUI091	38.90	18.11	15.34	-2.56	17.51	14.85	17.02
SUI193	15.58	12.87	7.76	13.25	24.25	9.84	13.93

After rank ordering, one can compare the individual applicant's performance to the cohorts' performance by way of the cohort mean scores - see Figure 2

Value profile	Sample mean score	SUI065 top scorer	SUI225 mid scorer	SUI193 low scorer
Person Centredness	65.08	94.80	71.82	15.58
Accountability	46.03	89.34	45.34	12.87
Trustworthiness	45.73	88.93	38.17	7.76
Integrity	39.23	82.26	32.49	13.25
Commitment to Development	36.45	94.33	34.22	24.25
Teamwork	54.39	78.98	65.09	9.84
Overall Suitability	47.82	88.11	47.85	13.93

Figure 2: Examples: top, middle and low scorers with group test norms.

And, again see Figure 2, one can get a sense of the defining characteristics of the cohort from individual scores and the profile of mean scores on value themes as well as the descriptive statistics on distribution of scores: for the descriptive statistics see para. 3.1.2.

The defining shared characteristic of the 2018 cohort can be described from the sample mean score as 'person centredness'. That is this sample of applicants can be characterised (see Table 4) as generally giving considerable importance to peoples' dignity, human rights and safety, the ability to influence peoples' behaviour, listening carefully to people, kindness, compassion and sympathy, relating well to others, good communication and thinking about the other person.

Briefly stated, the other values tend to be given normal, acceptable, everyday importance with teamwork the strongest and commitment to personal development the weakest. Commitment to personal development as a value seems, in the round, a little conflicted so reducing conviction. The mean score tells of somewhat limited confidence in this group of young people about the value of personal development, the enjoyment of decision making, the taking of personal responsibility for action and the value of reflecting on experience.

Of course, the profile of personal characteristics varies with rank order in the cohort and between individuals. The top scorer for example, SUI065, is highly person centred and committed to personal development and generally scores high on nursing values although noticeably less high on teamwork. The lowest scorer, SUI193, seems very conflicted and unsure about all these values, less so about commitment to personal development. It is at this level that most of the excluding criterion scores occur i.e. exclusion if a score is greater than two standard deviations below the mean score on any value theme. The example of a mid-range scorer, SUI225, shows more variance between scores on values, being above the cohort average on person centredness and teamwork but noticeably below average on integrity and trustworthiness.

3.1.1 Deeper understanding of scores on values: challenges and education

The profile of scores on value themes facilitates HEI staff in understanding and explaining to an applicant why they got the score they did, should the overall score determining the outcome be challenged. They can suggest where work might be done to improve prospect of future success. The component elements in the value theme can be accessed if a deeper analysis is required: Table 4.

Table 4: Scoring matrix showing contribution of bi-polar constructs to value themes

Value theme/ Construct	Person Centred	Accountable	Trust	Integrity	Commitment to personal development	Team Work	Professional nursing value or attribute used as one pole of Construct
C1	X	X	X				People's dignity and human rights first
C2	X	X	X				People's safety comes before anything else
C3		X				X	Unpleasant tasks part of role of all nurses
C4						X	People work best with others in a team
C5	X	X					Can influence people and get them to follow instructions
C6					X		Learning and developing competence is a lifelong process
C7	X						Can listen carefully and can tune in to what people mean
C8		X		X			Its better to be open and honest
C9	X	X					Are kind compassionate sympathetic; resources no excuse
C10		X		X			Are prepared to challenge someone senior in interest of patient
C11		X			X		Prefer making decisions within area of competence
C12		X	X		X		Take personal responsibility for judgement and action
C13		X	X	X			Take time necessary to do a job properly
C14	X					X	Am good communicator, easily understood
C15	X					X	Usually relate well to others
C16		X	X	X		X	Can be relied upon
C17		X	X	X		X	Work best with minimum supervision
C18		X				X	Generally understand situations
C19		X			X	X	Often pause and reflect on how things have gone
C20	X					X	Am always thinking about the other person
C in theme	8	14	6	5	4	9	

3.1.2 Statistical properties of score data

Basic statistics and test norms: pilot and replication study

See **Table 5** for basic statistics describing and comparing the NM Suitability scores (S^{TOT}) in the 2015 pilot and the 2018 replication study. The spread was similar (15-94/14-88) and the standard deviation quite similar (17/14). The sample of 2018 applicants did not score as well on average on Suitability in terms of nursing values as the 2015, Year 1, sample of student nurses. This was to be anticipated given the contrast in experience of nursing.

Table 5: Basic statistics for Suitability (mean S^{TOT}) scores): pilot v repeat study

Themed Nursing Value	Min	Max	Mean**	SD**
PERSON CENTREDNESS	32/16*	98/97	73/65	14/16
ACCOUNTABILITY	14/8	91/89	60/46	15/15
TRUST	7/1	98/89	58/46	19/17
INTEGRITY	-13/-3	93/83	54/39	19/17
COMMITMENT TO DEVELOPMENT	9/-2	94/94	58/36	19/17
TEAMWORK	18/10	90/93	60/54	14/15
OVERALL SUITABILITY	15/14	94/88	61/48	17/14

* Pilot sample 2015 (N=63) /Repeat sample 2018 (N=228)

**Sample Statistics

Normal Distribution of Suitability Scores for this and the pilot study

The Suitability scores for the Applicants sample (N=228) have a normal distribution – see **Figure 3 and Table 11**. This is important since the rank ordering of respondents is determined by this overall ‘Suitability’ score. This provides evidence reaffirming the evidence of normal distribution provided by the pilot study.

The Anderson Darling (AD) test statistic was quite low at 0.55 with non-significant p-value of 0.159 (alpha = 0.05) suggesting that the population from which the sample data was drawn has a normal distribution or strictly speaking that there is no evidence to suggest the distribution is not normal. Skewness and ‘excess’ kurtosis are within two standard errors (SE) of their means so that the extent of asymmetry and ‘flatness’ of the distribution can be considered not to detract from normality of the distribution.

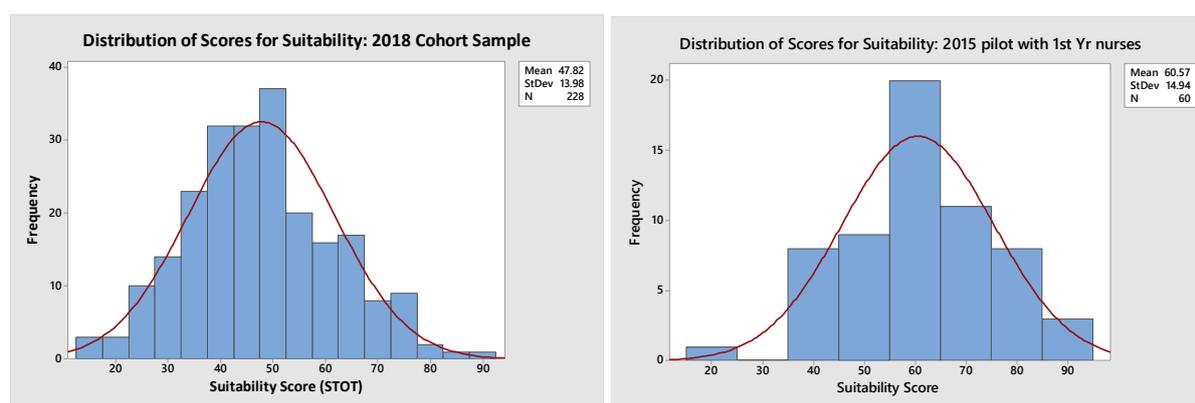


Figure 3: Histogram of ‘Suitability’ scores: applicants (N=228) 2018: student nurses (N=62) 2015

The distribution of Suitability scores for the pilot Student nurse sample (N=60) had also been within the normal range in terms of distribution, symmetry and flatness. The mean and median scores were notably lower than with the Applicant sample (47.82 /60.57 and 46.86/60.81 respectively). The student nurse sample distribution had a small negative skew as against a small positive skew for the Applicant sample (-0.28/+0.24) indicating that the student nurses found the test a little easier to score on than the applicants did.

Table 11: Pilot Study and Repeat Study: Descriptive Statistics for Overall Suitability Scores

Measure	Applicant Statistic N=228	1 st Year Nurse Statistic N=60
AD test	0.55	0.39
P-value* (α is 0.05)	0.159	0.38
Mean	47.82	60.57
Median	46.86	60.81
Skewness (centredness)	0.24	-0.28
Skew SE	0.16	0.32
Kurtosis (peakiness)	-0.16	0.47
Kurt SE	0.32	0.63

**The null hypothesis (H₀) for the Anderson Darling (AD) test is that the distribution is normal. Here there is no reason to reject the null hypothesis p-value >0.05.*

Correlation: value theme scores and Suitability Scores

There are moderate to strong positive and statistically significant linear relationships (correlations) between applicants S^{TOT} scores on the value themes i.e., their score on one theme variable tends to increase as the other increases. This replicates quite closely the findings in the pilot study, see Table 10 and is evidence of the reliability and robustness of the Nurse Match test item scales.

Statistical significance of all correlations is: 2015, p-value = 0.000 (alpha = 0.05): 2018, p-values < 0.01 (alpha = 0.05) indicating a very low probability that they happened by chance.

For both study samples, see Table 9, the value themes that correlate most strongly with the suitability score (OS), are Accountability (0.98/0.98), Trust (0.93/0.92) and Teamwork (0.89/0.85). These are followed by Integrity (0.87/0.85), Person Centredness (0.85/0.85) and Commitment to Personal Development (0.78/0.73). These may be considered as the component factors in the NM measure of Suitability

There are some notable differences in correlations, Table 10 again, e.g. integrity and teamwork correlate much more closely for student nurses than for applicants (r = 0.84/0.65). Nevertheless, the rank ordering of the correlations between values and suitability is much the same for both samples, student nurses (2015) and applicants to nursing (2018), despite the presumed greater exposure of the student nurses to professional nursing values.

In fact, the correlation statistics for values theme scores with suitability score correlate extremely well for applicants and for pilot study student nurses, see Table 9.

Table 9: Pilot and repeat study: Pearson correlation between value themes and suitability scores

VALUE THEME	ACC	TRUST	TEAMWORK	INTEGRITY	PC	CPD
Pilot Study	98	93	89	87	85	78
Repeat	98	92	85	85	85	73

Table 10: Correlation matrices: 2015/18*: scores on value themes and suitability**

	PERSON CENTREDNESS	ACC	T	I	CPD	TW
ACCOUNTABILITY ACC	0.85/0.82					
TRUST T	0.70/0.79	0.89/0.90				
INTEGRITY I	0.72/0.59	0.89/0.87	0.76/0.78			
COMMITMENT CPD	0.52/0.42	0.76/0.70	0.79/0.60	0.46/0.51		
TEAMWORK T	0.85/0.80	0.87/0.78	0.72/0.67	0.84/0.65	0.51/0.55	
SUITABILITY (OS) #	0.85/0.85	0.98/0.98	0.93/0.92	0.87/0.85	0.78/0.73	0.89/0.85

* First the 2015 (N=63) pilot study statistic then the 2018 (N=228) statistic

**correlations moderate to strong: 2015; all, p-value = 0.000: 2018; all, p-value < 0.01 (alpha = 0.05 for both)

overall suitability score OS is the mean of the scores on the six value themes

Reliability of the Nurse Match psychometric: pilot and repeat studies

The NM test used six scales to measure six component nursing themes and the mean of the scores on those themes was construed as a measure of the construct 'suitability for a nursing career'. These test item scales have a high level of internal consistency (item or scale or internal reliability) as determined by the Cronbach's alpha coefficient of reliability (alpha = 0.9449) reaffirming the findings in the pilot study (alpha = 0.9437). (see Table 11). Alpha > 0.9 is generally regarded as excellent.

Table 11: Nurse Match test: Item analysis: coefficient of reliability (Cronbach's alpha) 2015/2018

Test items*	Pilot study (2015) Cronbach's alpha statistic	Repeat study (2018) Cronbach's alpha statistic
Six (6) value themes	0.9437	0.9449

* Test Items: Data on six (6) value themes viz:

Test Items	N= 2015/2018	Mean 2015/2018	St Dev 2015/2018
PC	63/228	71.00/65.08	20.16/15.71
ACC	63/228	59.6/46.03	15.1/14.86
T	63/228	58.07/45.73	19.28/17.22
I	63/228	54.03/39.23	17.92/17.38
CPD	63/228	57.7/36.45	19.15/16.96
TW	63/228	59.59/54.39	14.01/15.15
Overall Score	63/228	60.17/47.82	14.81/13.98

One can say because of this analysis that the test items that are designed to measure aspects of the construct i.e. 'suitability for a career in nursing based on attitudes and values' do measure 'Suitability', and the six factors of which it is composed, with a high degree of reliability.

3.2 Nurse Match, APA, Test Standards and the Personal Statement

The Nurse Match psychometric test is concerned with objective and standardised measurement of attitudes and values and suitability for nursing. It is designed to be a screening tool used in selection for a career in nursing. The research team is concerned with the construction and validation of this assessment instrument according to the APA's Standards for Psychological and Educational Testing: American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999).

The UCAS personal statement is commonly used for screening purpose to assess suitability for a career in nursing. For a more comprehensive comparative appraisal of utility value and test standards of the two 'tests' see the report 'A comparative psychometric analysis of test characteristics: Nurse Match and the Personal Statement' which follows as a subsequent section.

INTRODUCTION

The *Standards* cover essential topics in testing including validity, reliability/errors of measurement, and fairness in testing. They also establish standards related to testing operations including test design and development, scales and norms, test administration and documentation including score interpretation. A thorough assessment of the test in these terms is a considerable undertaking and is an ongoing project: for a more complete evaluative comparison of NM and the Personal Statement see the report on Objective Two below. There is only space here to consider the key topics of validity, reliability and fairness.

The research work undertaken so far goes quite a long way to establishing compliance of the psychometric characteristics of the Nurse Match test with APA Standards.

3.2.1 Basic Topics in APA standards for Psychological Testing: Nurse Match

The psychometric foundations of the test regarded as essential to compliance are as follows. Note that 'validity and reliability' are present and are linked concepts in the sense that both must be present if the test is to meet acceptable standards. Validity without reliability or reliability without validity is of little use.

1. Validity

This refers to the degree to which evidence and theory support the interpretations of test scores in context. Test validity is the extent to which a test accurately measures what it is supposed to measure.

Since Samuel Messick's work, following discontent with the classic multiple concept of validity, inferences made from test scores may require different types of evidence, but not different validities (Messick 1995). Validity is now generally regarded as a *unitary concept* although the classic 'three-in-one' concepts remain in use: see the 1999 *Standards for Educational and Psychological Testing* that largely codified Messick's model: American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999). According to Messick, validation is the process of gathering evidence to provide "a sound scientific basis" for interpreting the scores as proposed by the test developer and/or the test user. Each piece of

evidence is finally integrated into a validity argument. Emphasis is placed on quality, rather than quantity, of the evidence.

This rationale is followed here using Standards for Supporting Qualitative Research (SRQR) criteria. The theory from which validation emerges is described and evidence provided for the validity (incl. reliability) of Nurse Match. This is set out in some detail at paragraphs 2.7.2 and 2.7.3 along with some classic concepts of validity. This evidence is summarised in Table 12.

Table 12: evidence for validity of scores on the NM psychological test

Test scores have	Why test scores have validity
<i>Classic Concepts</i>	
Face validity	Values characterising 'Suitability' became test content: literature, personal experience, content analysis was used: confirmed by expert and experienced nurses via process of trial and error: re-affirmed by feedback on its use from student nurses and applicants to nursing and statistically via correlation and factor analysis ('Suitability' unidimensional)
Content validity	
Construct validity	
<i>Unitary Concept (SRQR)</i>	
Credibility	Direct measure of importance and emotional significance
Fitness	Values and entities are fit for purpose by design (<i>Classic Concepts</i>)
Robustness	Procedure and calculations are systematic and inherently robust
Reliability	Provide reliable "snapshot" of values at time of response
Integrity	Easy to complete and understand: genuine response = integrity
Representativeness	Standardised to make individual's scores comparable with others
Coherence	Concepts defined by algorithms: coherent and holistic analysis
Transparency	Data direct from respondent via interface: automatic analysis

2. Reliability and Errors of Measurement

Reliability in psychometrics is the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions.

However, the complete concept is 'reliability with validity'. Scores that are highly reliable are accurate, reproducible, and consistent from one testing occasion to another, so long as nothing significant has changed in experience, mood or mindset of the test respondent. If a change has occurred over time or a response is affected by mood or circumstance at the time of responding, and perceived importance or emotional significance of a value is affected, as it may with individuals, a reliable test will detect it, much as a reliable speedometer will accurately measure change in speed of a vehicle. However, if the testing process is repeated with a group of test takers, individual variations should cancel out: essentially the same results should be obtained from group to similar group unless the later group has been affected by some change.

Cronbach's alpha coefficient of reliability was used to indicate the amount of error in the theme scores for the pilot group and the repeat study group. Cronbach's alpha is calculated from the pairwise correlations between scale items in this case the six value theme scores making up the 'Suitability' measure. For the group (N=63) of 1st Year student nurses in the pilot the alpha statistic

was 0.9437 and for the group of nursing applicants (N=223) it was 0.9449. The conventional rule of thumb classifies this statistic as 'Excellent'.

3. Fairness

The testing or assessment process was carried out so that test takers received comparable and equitable treatment during all phases of the testing or assessment process. Everyone received standardised instructions on the tests and has the same user interface.

Given that the Nurse Match test is a screening test in a selection process, the test developers will fully and accurately inform policymakers of the characteristics of the tests as well as any relevant and credible information that may be available concerning the likely consequences of test use.

IEL strives to identify and eliminate language, symbols, words, phrases, and content that are generally regarded as offensive by members of racial, ethnic, gender, or other groups.

3.3 Feedback from participants

3.3.1 Tick Box Comment The responses to the Survey Monkey hosted feedback questionnaire on the experience of completing the NM instrument were collated and analysed (see questionnaire design at **Appendix A: Figure A9**. See **Appendix B: B3** was seen by most respondents to:

1. be easy to understand (97%) and respond intuitively (93%)
2. be quite easy to complete (94%); be quite difficult to complete (19%)
3. identify most important nursing values (83%) and contain no irrelevant issues (88%)
4. be interesting, to complete (65%)
5. require extra time to complete (6%)

3.3.2 Free text comment increased in volume and content was notably different from that in the pilot study. In a way this was to be expected given that a substantial proportion of volunteers, circa 16% scored greater than one SD below the mean on overall suitability. This sub-group often misunderstood or were not sure about what attributes were required of a nurse.

This factor could help explain the overall reduction in level of interest in the test content ('interesting to complete' 90% > 65%) underlined by several free text comments about a lengthy boring process causing loss of attention.

In the pilot all respondents were student nurses and it is reasonable to assume that the issues posed were more 'live' for them. The volume of free text comment was also much greater due to the increased opportunity to provide it. Details of this medley of commentary are available from the author if required.

4 DISCUSSION

4.1 General Terms The primary aim of this research was to continue development of the Nurse Match psychological test by replicating the successful pilot study results using the same instrument. This time using applicants to nursing rather than student nurses and doing so while they were participating in the selection process. The sample size was increased four-fold and some small adjustments made to test content to take account of the change of respondent type. The resulting value profiles were scored as in the pilot, applicants rank ordered by suitability score and feedback obtained on user experience.

The results closely replicated and reaffirmed the original findings including the validity and reliability of Nurse Match as a standardised psychometric test assessing professional nursing values. Feedback was similar but with notable differences – see ‘Feedback’ above.

Typically, Schools of Nursing combine several different tests and modes of assessment. Each has been of some practical use in recruitment and selection, but each says something different about the characteristics of the candidate and their potential for a career in nursing.

NM is designed and been custom built to measure personal nursing values, their importance in a personal hierarchy of values and their emotional significance to the individual and compare those personal values with ideal professional standards. The question arises as to how this functionality fits with the selection needs of a given school of nursing. The quest being to find the best and most suitable cluster of qualifications and tests.

Best use will be made of the test given some knowledge of its strengths and limitations.

4.2 Strengths of the Nurse Match (NM) psychological test

The instrument is designed to conform to psychometric test standards as set out in Standards for Educational and Psychological Testing (2014) and research to date has established close conformity with those standards. Work continues to improve conformity.

NM assessment scores typically present as a normal distribution with appropriate ranges, means, variances and symmetry (skewness). The instrument has, and is seen by respondents to have, face and content validity, has a very high coefficient of internal reliability, identifies important nursing values, is interesting to complete, easy to understand and complete and is a ‘different experience’.

Nurse Match is a standardised, online or on screen, self-report measure requiring a prompt response. It uses a case study design to evoke personal attitudes and values to nursing, including their importance and emotional significance to the person as values, and assesses them against ideal professional nursing values.

The scoring process for comparing respondent profiles on nursing values discriminates effectively between nursing students, provides a ‘value profile’ of each applicant, and the analogue scoring system effectively avoids tied scores.

The test design, the need for a quick response and the number of responses required in the time available mitigate against social desirability bias or systematic manipulation of responses to appear to be better than they are and achieve a higher score. In fact, where the respondent is aware of the standards they should be achieving and presents as such a value and belief system this can be regarded as a positive characteristic.

A NM assessment process can stand alone as an assessment of personal values and may also be used as part of a suite of qualifications and tests for screening purposes in selection. Evidence presented here and evaluated more carefully in a supplementary report indicates that it is more valid and reliable than the UCAS personal statement as a screening test for nursing values and attributes.

Values assessed can be adjusted, following consultation and research, to conform with professional context: specialist and otherwise socially or culturally distinct professional values.

The choice of nursing values and value themes in the NM instrument used in this research is well aligned with recently researched attributes and value themes in the United Kingdom.

Presentation and use of the instrument generally works well, most respondent's being fully engaged and responding appropriately.

4.2 Limitations of the Nurse Match psychological test

Just asking people directly about themselves and what they think of others can offer revealing, fascinating and rich data. Particularly so, if a quick response is sought. However, by their very nature, internal identity states including values cannot be observed directly. Consequently, valid and reliable self-reports rely on sound motivation, openness, honesty and astute self-awareness which is difficult to ensure. Every effort is made as part of data collection to encourage quick, intuitive and frank responses.

Self-report knowledge of a person's mind set, world view and perception is always valuable information. However, 'social desirability' bias - an attempt to manage responses to be viewed more favourably – a well-recognised problem with self-reports, particularly questionnaires – must be kept in mind. However, the NM test anticipates that respondents may know what the professionally preferred value option is. And that they may attempt to show themselves in a better light given what they think it being tested for. What is assessed by NM is the relative 'weight' and emotional significance given to each value in a respondent's mind. The calculation of these parameters is not straightforward so that the outcome as a score is difficult to deliberately 'manage'. This helps guard against this form of bias. And, in fact, if the respondent is aware of what is a better response this can be regarded as favourable to them. The possible bias is something to be aware of at the interview stage.

NM test provides a snapshot of values held at one moment in time. It is therefore subject, as all psychological tests tend to be, to inherent or randomly occurring factors that influence responses to questions (mood of the moment, recent traumatic experience, loss of confidence, trying to be clever and so on). Particularly in respect of teenage applicants, those whose identity development has yet to mature and stabilize, the validity of self-report scores on Suitability that go to interview may in the end be a judgement best made by others exploring values at interview or observing behaviour in MMI interview, school or workplace. Maturity of character is of course one aspect of assessment during the chosen interview process.

Some respondents may have very high self-regard and be totally committed to some of their values and beliefs, give the meaning behind some (or all) values great weight and emotional significance. They may score very highly on this test and be accepted for interview. While having strongly held core values can be an admirable characteristic, in a role model for example, a less rigid, more balanced and equitable approach might be preferable in the average career nurse. So, it might be considered sensible to explore this characteristic of the highest scorers at the interview stage.

Suitability in terms of nursing values and attributes can only be part of the process of assessment. There is clearly a need for complementarity in appraisal of nurses and candidates for both developmental and recruitment purposes. For example, the Nurse Match test result provides an insightful 'snapshot' of values at a moment in time. Insight can be improved if the content of the report is explored during interview.

The UCAS personal statement (PS) is used as a screening tool by Schools of Nursing in the United Kingdom. The pilot study produced some evidence to suggest that there is little or no correlation between scores on NM and the PS. Evidence in this repeat study with a much larger sample confirms a very low correlation. This can be explained by the fact that NM measures suitability in

terms of six defined nursing values while PS measures suitability in terms of four broader and looser described concepts such as 'realistic expectations' and 'motivation'.

5. CONCLUSIONS

The aim of this research was to use and evaluate a psychological instrument Nurse Match (NM) designed to assess personal values against professional nursing values. The measure may be used in screening applicants to a career in nursing. The relative importance and emotional significance of nursing values to the applicant was to be assessed and it was to be done effectively and efficiently.

The pilot study, and this larger replication study with applicants, provides clear evidence that the NM instrument offers a standardized, valid and reliable, fair, effective and user friendly, screening test for measuring and scoring nursing values and attributes. NM is complementary to other modes of assessment, particularly interview and can have a role to play in staff developing and assessing professional identity.

That is the NM psychometric test

- screened applicants effectively and efficiently in terms of the professional quality of their inherent nursing values and attributes
- measured the overall professional quality of applicant's values in terms of a single suitability score (S^{TOT})
- S^{TOT} score outcomes for overall suitability had a normal distribution with symmetry and shape that were within limits for normality
- was shown to be robust in quantitative and qualitative terms; valid and reliable (internally consistent)
- was a standardised test: administered, scored and interpreted in a fair and consistent manner
- was easy to understand and complete and well received by most applicants
- provided data that on analysis can inform the staff appraisal and development process

While the research has these strengths, it is necessary to point out some limitations to its effectiveness. It has the limitations common with self-report and case study methodology. It is difficult to ensure sound motivation, openness and frankness. Manipulation of the test for self-interest is possible as it is with many psychological tests (even if difficult here) and must be guarded against and inferences about suitability, however good the score on personal values, are better confirmed by interview or observation.

The next stage in development of the instrument will be to use the NM test process to screen full cohorts of new applicants to schools of nursing and continue the research and development process to broaden the reach of the instrument into other professions and enhance the online delivery process.

The longer-term aim is to promote the Health Service credentials of the Nurse Match process universally and make it available globally to schools of nursing as a standardised, online, low resource, value-based screening process for use in candidate selection.

Despite the general difficulties with showing scientifically the value of particular selection measures for predicting performance as a nurse, there can be little doubt that someone with a fine set of nursing values today will probably perform more effectively today, and later in life, than someone with a poor set of nursing values today or that, on the evidence of this piece of work, Nurse Match can be a fair, effective, efficient and systematic way to get at and assess those values.

PSYCHOMETRIC TEST STANDARDS AND DEFENSIBILITY: NURSE MATCH (NM) AND THE PERSONAL STATEMENT (PS)

Section Summary

A comparative evaluation makes it clear that these tests assess suitability for nursing using different concepts. NM is values based. It assesses personal nursing values against professional nursing values. The PS assesses attitude to the course (motivation), professional expectations, desire for nursing as a career and decision making.

There was no correlation between scores by the same individuals on NM and PS.

The PS has been a useful means of assessment, but some concerns have arisen particularly about validity and poor inter-marker reliability. When both tests were assessed against APA standards for psychometric tests it became evident that NM is the more acceptable test. It has superior validity, reliability and test norms, an automated objective scoring process and consistency in test administration. Decisions using NM are therefore defensible. The demand on staff resources is very much reduced.

1. INTRODUCTION:

The second Burdett Objective was "To evaluate the relationship between candidates scores on the NM screening and on the PS". The following analysis is based on the American Psychological Association's test standards (Standards for Psychological and Educational Testing: American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999) but is limited to a set of key APA standards.

The PS (UCAS personal statement) is commonly used for screening and interview purposes to assess suitability for a career in nursing but some concerns have been expressed about its validity. The NM psychometric test is concerned with objective and standardised measurement of attitudes and values in the determination of suitability for nursing initially for screening purposes.

The *Standards* cover essential topics in testing including validity, reliability, errors of measurement, and fairness in testing. They also establish standards related to testing operations including test design and development, scales and norms, test administration and documentation including score interpretation.

The research work undertaken so far goes a long way towards establishing compliance of the psychometric characteristics of the NM test with APA Standards. This section takes a closer look at the qualities of both tests as psychometric assessments.

2. NM: PSYCHOMETRIC FOUNDATIONS AND APA STANDARDS

The psychometric foundations of the NM test are as described below. They are essential to compliance with APA Standards. The test is both valid and reliable. These are linked concepts, and both must be present if the test is to meet standards. Validity without reliability or reliability without validity is of little use.

2.1 Validity

Basic concepts: Test validity is the extent to which a test accurately measures what it is supposed to measure. Evidence and theory should support the interpretations of test scores in context.

Validity depends on both the inherent characteristics of the test itself and the extent to which the results of the test correlate with other relevant measures or predicted events. Classically, test characteristics include face validity, whether the test appears to contain relevant items and construct validity, whether the test overall appears to measure the underlying construct.

Table 1: evidence for validity of scores on the NM psychological test

Test scores have	Why test scores have validity
<i>Classic Concepts</i>	
Content validity	Values characterising ‘Suitability’ became test content: literature, personal experience, content analysis used: confirmed by expert and experienced nurses via process of trial and error: re-affirmed by feedback on its use from student nurses and applicants to nursing and statistically via correlation and factor analysis (‘Suitability’ unidimensional)
Construct validity	
Face validity	
<i>Unitary Concept (SRQR)</i>	
Credibility	Direct measure of importance and emotional significance: values
Fitness	Values and entities are fit for purpose by design (Classic Concepts)
Robustness	Procedure and calculations are systematic and inherently robust
Reliability	Provide reliable “snapshot” of values at time of response
Integrity	Easy to complete and understand: genuine response = integrity
Representativeness	Standardised to make individual’s scores comparable with others
Coherence	Concepts defined by algorithms: coherent and holistic analysis
Transparency	Data direct from respondent via interface: automatic analysis

Since Samuel Messick’s work, following discontent with the classic multiple concept of validity, inferences made from test scores may require different types of evidence, but not different validities (Messick 1995). Validity is now generally regarded as a *unitary concept* although the classic ‘three-in-one’ concept remains in use: see the 1999 *Standards for Educational and Psychological Testing* that largely codified Messick’s model: American Educational Research Association, American Psychological Association, & National Council on Measurement in Education (1999). According to Messick, validation is the process of gathering evidence to provide “a sound scientific basis” for interpreting the scores as proposed by the test developer and/or the test user. Each piece of evidence is finally integrated into a validity argument.

According to the 1999 standards, evidence to support (or question) the validity of an interpretation can be categorized into one of five categories: test content, response processes, internal structure, relations to other variables and consequences of testing. Emphasis is placed on quality, rather than quantity, of the evidence.

This rationale is followed here, these evidential categories are covered, but by using Standards for Supporting Qualitative Research and (SRQR) criteria. The theory from which validation emerges is described and evidence is provided for the validity (incl. reliability) of Nurse Match. This is set out in some detail at sections 2.7.2 and 2.7.3 of the Replication Study along with some classic concepts of validity. This evidence for validity expressed there is summarised in Table 1.

2.2 Reliability and Errors of Measurement in Nurse Match

Basic concepts: Reliability in psychometrics is the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions. Nurse Match is seen to meet the standards.

However, the complete concept is ‘reliability with validity’. Scores that are highly reliable are accurate, reproducible, and consistent from one testing occasion to another, so long as nothing

significant has changed in experience, mood or mindset of the test respondent. If a small change has occurred over time in perceived importance or emotional significance of a value, as it may with individuals, a reliable test will detect it, much as a reliable speedometer will accurately measure change in speed of a vehicle. However, if the testing process is repeated with a group of test takers, individual variations should cancel out essentially the same results should be obtained unless the whole group has been affected by some change.

Errors of measurement: Cronbach's alpha coefficient of reliability was used to indicate the amount of error in the scores for the pilot group and the repeat study group. Cronbach's alpha is calculated from the pairwise correlations between scale items in this case the six value theme scores making up the 'Suitability' measure. For the group (N=63) of 1st Year student nurses in the pilot the alpha statistic was 0.9437 and for the group of nursing applicants (N=223) it was 0.9449. The conventional rule of thumb classifies this statistic as 'Excellent'.

2.3 Fairness

Basic concepts: The testing or assessment process is carried out in such a way that test takers receive comparable and equitable treatment during all phases of the testing or assessment process. Everyone receives standardized instructions on the tests and has the same user interface.

Given that the Nurse Match test is a screening test in a selection process, policymakers are fully and accurately informed of the characteristics of the tests as well as any relevant and credible information that may be available concerning the likely consequences of test use.

The test developers strive to identify and eliminate language, symbols, words, phrases, and content that are generally regarded as offensive by members of racial, ethnic, gender, or other groups.

3. UCAS PERSONAL STATEMENT: PSYCHOMETRIC FOUNDATIONS AND APA STANDARDS

A request by UCAS for a Personal Statement (PS) is an integral part of application for entry to UK Universities. The Personal Statement is entirely open and unstructured but is line of text limited to 47 lines. It gives candidates a chance to write about their achievements, their interest in the subject they are applying for, as well as their suitability for, interest in, and commitment to higher education. It is not presented as a test or questionnaire but as simply an opportunity to promote self as an applicant in competition with others.

The UCAS request for a personal statement to accompany an application to an HEI can be regarded as a psychometric personality 'test'. It is customary to speak of psychological measurement as a test when it is used primarily to assess some characteristic of an individual. It should therefore conform to the APA Standards spoken of earlier and some key psychometric features are considered here.

3.1 Validity

A close examination of the content of the test criteria (outlined in Section 3.2) reveals serious concern about evidence for validity in terms of two classic concepts, content and construct validity and as we shall see similar concerns arise if considering validity as a unitary concept.

Are the four criteria appropriate and are they cohesive taken together? On the face of it they seem appropriate and there is statistical evidence to suggest, via correlation and factor analysis, that the overall concept, whatever it consists of, is coherent (unidimensional).

However, in considering validity one must ask if an overall concept is being assessed and if so "What construct is being assessed?". Is it the capacity to write a decent essay in praise of self? The construct has no name, so we assume it is 'Suitability for a career in nursing' in order to take a perspective on it. What traits or qualities

would characterise 'Suitability' and do the four test criteria tap such constructs? The issue is summarised in Table 2 and considered further below.

Table 2: Summary of evidence about Validity of the Personal Statement as a test

Do test scores have: -	What evidence is there for validity in test scores?
<i>Classic Concepts</i>	
Content validity	A close examination of the content of the test criteria reveals serious concern about evidence for validity in terms of these three classic concepts of validity.
Construct validity	Are the four criteria appropriate and are they cohesive taken together? On the face of it they seem appropriate and there is statistical evidence to suggest, via correlation and factor analysis, that the overall concept* is coherent (unidimensional).
Face validity	However, one must ask if an overall concept is being assessed and if so "What construct is being assessed.?" Is it the capacity to write a decent essay in praise of self? The construct has no name, so we assume it is 'Suitability for a career in nursing' in order to evaluate it. What traits or qualities characterise 'Suitability' and do the four test criteria tap such constructs? See the comment below Table 2.
<i>Unitary Concept (SRQR)</i>	
Credibility	Scoring is indirect difficult and subjective: importance and emotional significance must be inferred from text and rank ordered
Fitness	Criteria appear relevant intuitively but are broad and complex without developmental history and justification
Robustness	Procedure and calculations are systematic but error prone and lack consistency due to subjectivity of interpretation:
Reliability	Coefficient of Reliability is acceptable if close to the margin $\alpha = 0.78$ (UU) 0.75 (QUB) (<i>alpha values around 0.75 to 1 represent acceptable reliability.</i>) Many confounding variables: written for several Providers, multiple sources of advice and guidance, broad complex concepts, subjective interpretation and ranking of script. Where is the applicants voice here?
Integrity	Free text open response so potentially genuinely honest and moral: but this is confounded by a plethora of advice, encouragement to seek assistance from others with expertise so uncertainty exists about the true voice of the applicant, yet script is marked as if the applicant is the sole author (so score is possibly higher than true score without assistance).
Representativeness	Standardisation of process is undermined by the weaknesses expressed above such as modest reliability; non-normal distributions of ordinal data make individual's scores less comparable with others
Coherence	Criteria interpreted and marked by tutors: coherence determined subjectively by markers
Transparency	Data comes indirectly from respondent; to an unknown degree via online guides, co-authors and markers

There are several reasons for doubt about validity. Do the four test criteria capture the personal qualities they were designed to measure? There is no research literature, technical manual or other evidence to show the existence of a scientifically based developmental process that would answer this question.

The constructs are broad statements about generally suitable characteristics and lack definition, giving markers greater freedom to use their own perception of and attitude to, for example, a 'Demonstration of personal desire for a career in nursing' in the Personal Statement script. Interpretation and scoring are prone to subjective bias.

The concerns are much the same if validity is assumed to be a unitary concept – see Appendix B, Table Z. The classic concerns emerge as concerns about *fitness* for purpose of the criteria, *credibility* of the scoring process and *robustness* of an error prone procedure. Also, *representativeness* (comparability with others given ordinal data with non-normal distribution), *coherence* dependent on subjectivity and questionable *transparency* due to confounding variables such as multiple authorship.

Summary on Validity: On this analysis there are serious questions to answer about validity of the Personal Statement as a screening process for interview. There is however evidence to suggest that the Personal Statement may be regarded as internally reliable (marginally: Cronbach's $\alpha = 0.77/0.78$, 0.75 being the threshold to acceptability) and assessing a unidimensional concept.

The evidence is of acceptable reliability but evidence for validity of the Personal Statement as measuring what it is intended to measure is, at best, not convincing.

3.2 Reliability and Errors of Measurement on the Personal Statement

Reliability in psychometrics is the overall consistency of a measure. A measure is said to have a high reliability if it produces similar results under consistent conditions. However, the complete concept is 'reliability with validity'. Standardised presentation and consistency in scoring underpin reliability (and validity).

The Personal Statement script is scored by the course tutors at the UCAS participant university or universities to which an application is made. The Personal Statement Scoring Form for BSc. (Hons) Nursing in Northern Ireland (see Appendix X) cites four criteria

1. Personal desire for a career in nursing
1. Motivation for nursing
2. Expectations of the course and nursing as a profession
3. Decision making affecting self and others

The tutor marker responds on a five-point scale from 0 to 4 as they assess the applicant's script in respect of each criteria. Each scale point indicates that the marker agrees with a description of an impression gained from the text.

So, with criteria 1 the marker will score the script with a zero (0) if "The candidate demonstrates ... No reasons given for choosing nursing", a 1 if "Reasons for choosing nursing lack clarity", a two (2) if there is "A clear reason for choosing nursing", a three (3) if there is "Development of the reasons for choosing nursing" and a four (4) if "A clearly articulated desire to commence a career in nursing based on clear goals, experience and knowledge of the role of the nurse".

From a psychometric point of view these numbers are ordinal since each represents a category the applicants script falls into in respect of each criterion. The overall score on the PS is the sum of the numbers on the four criteria. Ordinal numbers do not represent quantities or counts they represent rank positions in a group. They tell us nothing about distances between ranking positions. But they can be and are used to rank order applicants in a cohort.

We were able to estimate *reliability* of the Personal Statement using a well-regarded coefficient of reliability Cronbach's Alpha and found reliability acceptable. A coefficient statistic of $> \text{ or } = 0.7 < 0.8$ is commonly regarded as acceptable, $> \text{ or } = 0.8 < 0.9$ is good and $> \text{ or } = 0.9$ is excellent. See Table 3.

Table 3: Coefficient of reliability calculated using PS test items: PS marked independently at QUB and UU

	NM (N=203)	NM (N=60)	QUB PS (N=196)	UU PS (N=137)
Cronbach's alpha*	0.9322	0.9437	0.7769	0.7655

However, despite the internal reliability of the test, there are concerns about consistency of marking between the two sets of markers. A sub-group of applicants (N=132) were 'double marked' by school tutors at QUB and UU since an application had been made to both HEI's.

PS scores showed notable differences in marking between tutors: see Table 4 below. There was a low correlation coefficient ($r = 0.27$) statistically significant $p=0.002$ ($\alpha = 0.05$). Differences that were unsatisfactory (in social science terms) were for example

- 'agreement' is low (5 <10% variance explained)
- greater negative skew in QUB scoring suggesting easier marking
- higher mean and median, of QUB data also indicating easier marking

- this is evident by inspection when viewing histograms and individual value plots: see Figures 1 and 2 below.

Table 4: Descriptive Statistics: PSQ (QUB PS scores) and PSUU (UU PS scores)

	PSQ	PSUU	Comment
N	132	132	
Mean	76.09	68.99	PSQ higher mean: substantial difference [Cohen's d = 0.44 - substantial effect size (small d = 0.20: medium d = 0.50)]
SD	14.38	17.4	PSQ Tighter spread
Median	75.00	68.75	PSQ Higher mid score
Mode (no for mode)	75.00 (30)	75.00 (18)	PSQ Flatter mode (most scores)
Minimum	18.75	25.00	
Maximum	100	100	
Skewness	-0.76	-0.44	PSQ easier to score on (> -ve. skew)
Kurtosis	1.45	-0.35	PSQ peaked: UU flatter (see graph)

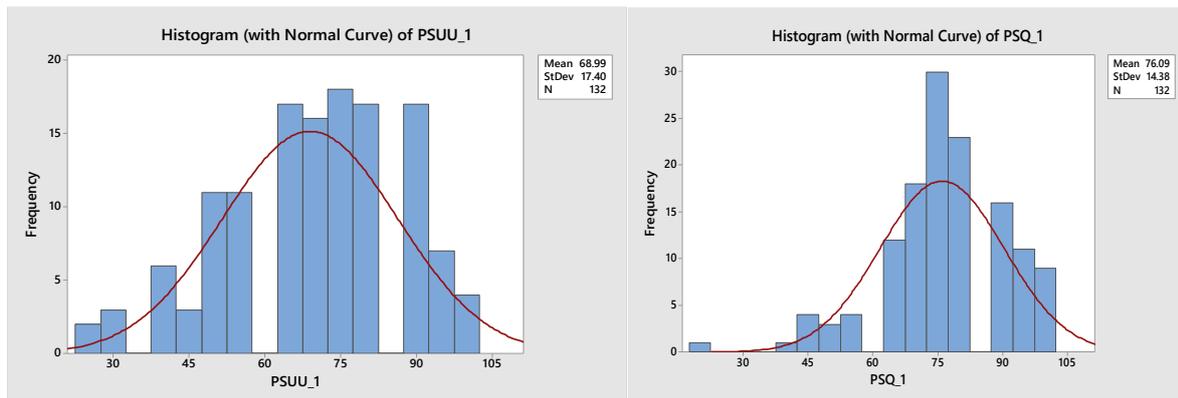


Figure 1: Histograms of the scores on the same PS scripts as marked by UU and QUB nursing tutors

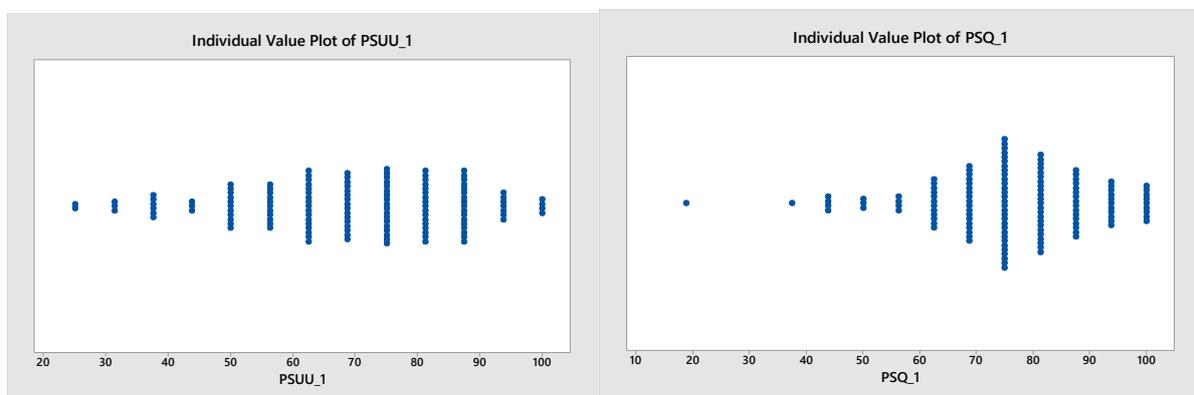


Figure 2: Individual value plot of scores on the same PS script as marked by UU and QUB tutors

The implication of these findings seems to be that while the internal reliability of Personal Statement and its criteria (item) scores is acceptable considerable 'error' in the sense of bias or inconsistency can arise in the

scoring of the scripts between tutor markers and sets of tutor markers. Here, perhaps, QUB markers were more ready to award a higher rating than the ‘true’ rating or maybe UU markers were less likely to do so. The origin of ‘bias’ is open to debate, but it may well be in the unconscious subjectivity of markers and or be systemic and conscious, inherent in school guidelines to markers or due to cultural differences in the schools. Further scientific enquiry would be necessary to try to understand what is going on.

3.3 Fairness of the Personal Statement

The testing or assessment process should be carried out so that test takers receive comparable and equitable treatment during all phases of the testing or assessment process. Broadly speaking this seems true of the personal statement. Closer examination of individual circumstances and experience during the current research project have uncovered levels and standards of advice and assistance in writing up the Personal Statement that vary greatly between pupils and schools of origin. Where this is excessive it becomes unfair.

Everyone should receive standardised instructions on the tests and have the same user interface. Applicants for a place at university are required by the UCAS service to complete a Personal Statement and given a line limit so everyone does start from the same blank sheet and ipso facto it is a ‘standardised’ test and user interface. However, the ‘instructions’ on completion of the PS that appear on the UCAS website and the links that radiate out from it offer a plethora of guidance on and exemplars of what is required that has sound guidance and common themes but is by no means standardised. The upshot is that it is very difficult to know what the applicant’s true input was and what their ‘true’ score on criteria should be. This loosely knit procedure does not comply with the fairness, and validity and reliability, aims of the APA test standards in seeking to ensure standardisation.

Given that the Personal Statement is a screening test in a selection process, test users should fully and accurately inform policymakers of the characteristics of the tests as well as any relevant and credible information that may be available concerning the likely consequences of test use. It is hoped that policy makers will be more aware of the limitations of the PS as a result of our findings.

Fairness implies that test creators and users should identify and eliminate language, symbols, words, phrases, and content that are generally regarded as offensive by members of racial, ethnic, gender, or other groups. The research has not uncovered any hint of unfairness in this context.

4. EVALUATION AND COMPARISON OF NM AND PS AS PSYCHOLOGICAL TESTS

4.1 Test Standards: psychometric properties

Table 5: NM and PS compared against key criteria for good quality psychological scales

Criteria	Nurse Match	Personal Statement
Discriminatory power	Continuous measure	Ordinal ranking
Reliability (consistency)	High	Acceptable
Validity (measure intended construct)	Good evidence	Questionable
Standardised (on a population: consistent administration of test)	Yes: Yes	Yes: in doubt

On the evidence in sections A and B above, summarised in Table 5, one can conclude that NM is a better-quality psychological scale than PS. It is a valid measure with high reliability and excellent discriminatory power that will be standardised on the population of annual applicants and has standardised administration.

Table 6: Nurse Match, Personal Statement and APA Test Standards: Psychometrics Compared

	Personal Statement	Nurse Match Screening Test
Validity	Validity questionable: face value yes but concerns about developmental origins of what is being assessed and how ... see Section B above.	Evidence supports: classical content and construct validity; and modern single variable validity ... see Section A above.
Reliability	Moderate internal reliability (alpha: 0.75 QUB 0.78 UU):	Excellent internal reliability: (Cronbach's' alpha 0.94):
Consistency	Evidence suggests issues with Consistency of scoring	Evidence that Consistency in scoring is excellent
Standardisation	Some concern about fine comparisons: score distribution not normal; ordinal scores. Administration not fully standardised.	No concerns about comparisons with other applicants; score distribution normal, interval scoring. Admin is to APA standards
Scaling, norming and scoring	Not a robust psychological 'scale': it is quite reliable and rank ordering is acceptable but on ordinal scores with a score distribution that is not normal: validity is questionable as is power to discriminate completely fairly.	A quality psychological scale: valid, highly reliable, and standardised, normal population and administratively, with good power to discriminate between candidates

Comparing NM and PS as tests using comments based on the APA Standards (Table 6) one can conclude that Nurse Match clearly meets those standards while the Personal Statement does not.

4.2. Descriptive Statistics and test norms

The main points to take from the evidence in Table 7 is that applicants generally found the PS easier to score on than NM (noticeable negative skew), the spread on NM was tighter (SD 14.03), the distribution more central (mean 48.17) symmetrical (skew 0.30) and significantly normal where PS was not. These cannot yet be regarded as test norms, but the 2015 pilot results were closely similar.

Table 7: Comparative descriptive statistics: NM S score and PS scores (QUB and UU)

	QUB PS (N=196)	UU PS (N=137)	NM (N=203)	NM (N=60)
Mean	74.62	68.8	48.17	60.57
SD	16.22	17.56	14.03	14.94
Median	75.00	68.75	46.90	60.81
SE Mean	1.16	1.50	0.99	-
Mode	75 (38)	75 (19)	*	*
Skewness	-0.77	-0.43	0.30	-0.28
Kurtosis	1.42	-0.42	-0.17	0.47
AD statistic	3.650	1.45	0.738	0.39
P value	<0.005	<0.005	0.054	0.38
Normal Distribution	No	No	Yes	Yes
Cronbach's alpha*	0.7769	0.7655	0.9322	0.9437

4.3 Validity

Section A describes and Table 6 above summarises the evidence for validity of Nurse Match. NM can present substantial good evidence about the care taken during the developmental process to select values that are valid to ensure that the test measures what it is meant to measure – suitability for a career in nursing.

The Personal Statement, unlike NM, does not name a personal characteristic it is intended to measure but it is assumed from its role in the selection process to be ‘suitability for a career in nursing’. The four criteria do have face value, but we have found no description of them or a developmental process that explains and justifies their use. Their broad and general nature makes them prone to alternative interpretations. Marking of PS scripts requires subjective judgement about the extent to which the criteria are met.

In short, the NM psychometric test can provide evidence that it measures what it claims to measure while the Personal Statement cannot.

4.4 Reliability

Both NM and the PS can be said to be reliable measures producing similar results under consistent conditions. Reliability in psychometrics is the overall consistency of a measure. The internal reliability of both tests was calculated using scoring data on the test items; see Table 2 above. NM was shown to have a higher coefficient of reliability (Cronbach’s alpha = 0.93) than either of the PS measures (UU alpha = 0.77: QUB alpha = 0.78). *[A reliability coefficient of 0.75 or higher is considered ‘acceptable’ in most social science research situations: >0.90 considered excellent].*

NM is measurably more effective at producing similar results under consistent conditions.

4.5 Linear relationship

There is little or no correlation between scores on the PS and scores on NM. This result for the strength of the relationship is based on the group who completed the NM test and were ‘double marked’ on the PS by QUB and UU (N=132).

A positive correlation close to no relationship (weak: $r > 0.2$) emerged using a Pearson’s product-moment correlation coefficient but the result was not significant. The implication is that any correlation that exists is by chance. NM compared with PS QUB ($r = 0.095$: $p = 0.279$: $\alpha = 0.05$): compared with PS UU ($r = 0.104$: $p = 0.235$: $\alpha = 0.05$).

(NM scoring is a continuous analog variable while PS is ordinal and digital which works against correlation – digital being a ‘less sensitive’ measure.)

4.6 Scoring Process

This was discussed in some detail in Section B where the outcome of the PS scoring process at QUB and UU was compared. PS scores showed notable differences in marking between tutors: see Table 1. The strength of the relationship was assessed. There was a weak correlation between scores: a Pearson correlation coefficient ($r = 0.27$: weak $>0.2 < 0.4$) that was statistically significant $p=0.002$ ($\alpha = 0.05$).

The implication of these findings seems to be that while the internal reliability of Personal Statement and its criteria (item) scores is acceptable, considerable ‘error’ in the sense of bias or inconsistency or other difference can arise in the scoring of the scripts between tutor markers and sets of tutor markers.

This potential source of error is not present in the NM scoring process.

4.7 Suitability for Nursing: Meaning of the Concept

Table 8: Unidimensional tests: Factor Loadings on Item Variables (eigenvalues)

Data Items NM	NM Factor 1	Data items PS QUB/UU	PS QUB Factor 1	PS UU Factor 1
Person Centredness PC	0.844	Desire for career A	0.82	0.81
Accountability ACC	0.984	Motivation B	0.823	0.853
Trustworthiness T	0.924	Professional Expectations C	0.667	0.742
Integrity I	0.860	Decision making D	0.726	0.708
Commitment to personal Development CPD	0.749			
Teamworking TW	0.865			
VARIANCE	4.5833		2.32	2.43
% common variance	0.764		0.58	0.61

Factor analysis was used to help explicate how NM and PS assess ‘suitability for a career in nursing’ as a concept. Both NM and PS appear to be unidimensional tests – one ‘hidden’ factor creates most affect and it makes sense to call it ‘suitability for nursing’ – but the natures of the ‘hidden’ unidimensional factors are distinctly different in terms of the items of which they are composed. The weighting given to each data item (in NM and PS ‘sets’) taken together give a real sense of the differences in meaning inherent in the two different constructs representing suitability for a career in nursing. (Factor 1 columns in Table 8).

In short it can be said that NM measures a candidates personal nursing values and attributes while PS assesses their attitude to nursing as a career.

4.8 Administration

The evidence is that the NM psychometric complies very well with APA guidelines on test administration. PS, which is not in the mainstream of psychological tests, being like a tutor marked essay on self as a nurse, fares less well in a comparison. It has limitations in terms of administration, scoring and reporting, test development, fairness and bias. See Table 9.

Table 9: Nurse Match, Personal Statement and APA Test Standards: Administration

	Personal Statement	Nurse Match Screening Test
Administration scoring and reporting	Not fully compliant with APA Standards: Applicant response is a variable subject to outside influence, time to manage it not accounted for: scoring requires marker interpretation and judgement, so reporting is marker subjective and possibly biased.	Fully compliant with APA Standards for Administration. Scoring and reporting systematic and automated using algorithms for coherence. Response is immediate, recorded online secure and safe from influence.
Test development	No record exists describing the process of test development. The attributes tested have face value. But are broad and general. The scoring system requires a tutor to mark the UCAS PS script by rank ordering attributes demonstrated in the Personal Statement. The basis for this approach is not known.	Test values developed on a sound scientific basis over several years. Designed to measure suitability for a career in nursing with the assistance of experts and experienced nurses. Response format, scoring and test administration to APA Standards Psychometric properties carefully monitored and adjusted.
Fairness and bias	Broadly speaking test takers receive comparable and equitable treatment. However, there appears to be a source of bias and unfairness in the allocation of support resources to write up. Admin procedures at the outset are somewhat loosely knit and do not comply fully with the fairness, validity and reliability, aims of the APA test standards in seeking to ensure standardisation. Scoring by markers is subjective and open to conscious or unconscious bias.	The test is carried out so that test takers receive comparable and equitable treatment during all phases of the testing or assessment process. Everyone receives standardized instructions on the tests and has the same user interface. The scoring is automated so there is no bias.

4.9 Demand on resources.

NM makes fewer demands on staff resources than the marking of the PS. And it is more cost effective. See Table 10.

Table 10: Nurse Match, Personal Statement and Demand on School of Nursing Resources

	Personal Statement	Nurse Match Screening Test
Demand on staff resources	Having tutors mark many scrips that require thoughtful consideration and analysis is resource intensive.	Very low tutor time. Tests administered by external staff. Results straight to administration people. An option is for applicants to pay and defer costs.

5 SUMMARY AND CONCLUSIONS

The tests assess suitability using different concepts. NM assesses personal nursing values against professional nursing values. PS assesses mindset in more general terms - attitude to the course, professional expectations, desire for nursing as a career and decision making. There is no correlation between scores by the same individuals on NM and PS

The PS, scored as a test, has been a useful tool for generic assessment of mindset, but use has raised some concerns, particularly about validity and poor inter-marker reliability.

When both tests were assessed against APA standards for psychometric tests it became evident that NM is the more acceptable test. It has superior validity, reliability and test norms, an automated objective scoring process and consistency in test administration. Decisions using NM are therefore defensible. The demand on staff resources is very much reduced.

Towards a Better Measure of Leadership Qualities in Nursing Identity

Section Summary

This section describes how the NM psychometric instrument was upgraded to be a test of leadership qualities in order to demonstrate how such an instrument might enhance staff assessment and staff development processes. NM scores on nursing values were factored into leadership qualities and summed as scores on leadership qualities.

The instrument worked well, profiling and rank ordering the leadership qualities of the sample. Psychometric test standards were met. Two successful applicants were described in terms of their leadership qualities, highlighting their strengths and limitations.

NM identity analytics, inherent functionality not previously used in the context of nursing, facilitated identification of nursing characteristics that enhanced or adversely affected leadership performance demonstrating how leadership skills might be appraised and development encouraged.

The outcome demonstrated how a well-designed NM style Leadership instrument could provide quantitative and qualitative research data on leadership in nursing that is not currently available.

1. INTRODUCTION

Our first research objective concerned using Nurse Match as a measure of personal values in nursing. The second objective concerned a psychometric assessment of Nurse Match and the Personal Statement. Objective three was to demonstrate how an applicant's leadership qualities might be better understood

What might we learn about the existence of leadership potential in applicants to schools of nursing from data on personal nursing values acquired for selection screening purposes? To what extent can the data outcome be augmented by currently 'hidden' identity analysis performed automatically by the Nurse Match software? To what uses might this information be put?

The question of leadership in the profession can be a vexing one. In order to better understand the question and inform the use of Nurse Match in its assessment, we conducted a desk top search of the literature on leadership in nursing and generally.

We acknowledge from the literature that leadership is not a unitary concept but exists to various degrees and in various kinds in different individuals, in different workplaces and in different situations. Also, as a broad generalisation, that the 'great leaders' are 'born not made'.

The focus fell on one aspect of leadership in nursing practice (caring for people, not resource or financial management). We decided to use the concept of 'authentic leadership', familiar to leadership theorists, as the concept around which to design a measure (Avolio et al 2008: Waite et al 2014).

The developmental processes behind Nurse Match test design can be applied to other types of leadership in nursing, such as is required in the management of capital, cash and resources.

1.1 Background

A systematic review of policy and research reports (Cummings et al, 2010) stated that "Numerous policy and research reports call for leadership to build quality work environments, implement new models of care, and bring health and wellbeing to an exhausted and stretched nursing workforce ... Our results document evidence of various forms of leadership and their differential effects on the nursing workforce and work environments. Efforts by organizations and individuals to encourage

and develop transformational and relational leadership are needed to enhance nurse satisfaction, recruitment, retention, and healthy work environments, particularly in this current and worsening nursing shortage.”

“Recent theoretical and empirical developments in the leadership literature, are currently receiving attention in terms of research, theory, and practice. We begin by examining authentic leadership ...” (Avolio et al, 2008). “There are many identified styles of nursing leadership ... Servant ... Transformational ... Democratic ... Authoritarian ... Laissez-faire ...” (Fransden,2014). Development of student leadership capacity and efficacy is critical to the nursing profession (Waite et al, 2014) who also made the point that authentic leadership is a popular leadership theory and that an authentic leadership course has been very well received by Fellowship students.

Authentic leadership is an approach to leadership that emphasizes building the leader’s legitimacy through honest relationships with followers who value their input and are built on an ethical foundation. Generally, authentic leaders are positive people with truthful self-concepts who promote openness. By building trust and generating enthusiastic support from their subordinates, authentic leaders can improve individual and team performance. (Gardner et al, 2011: Waite et al 2014). Authentic leaders are genuine with people and have a real interest in their health and welfare.

Since the twenty nursing values we have been using with Nurse Match mapped well to nine ‘authentic leadership’ attributes we were able to design an instrument to assess and score our sample of applicants on qualities associated with authentic leadership: to ask the question “To what extent does this applicant embody authentic leadership qualities?”

2. THE STUDY

2.1 Aim

To assess and describe the ‘authentic leadership’ qualities of applicants to schools of nursing from the importance and emotional significance they give to twenty nursing values as assessed by the Nurse Match psychometric.

2.1.1 Objectives

- (a) Devise a measure of nine qualities of the ‘authentic leader’ based on an applicant’s nursing values as assessed by Nurse Match and use it to rank order applicants on leadership qualities.
- (b) Answer the question “What might the personal nursing values of applicants, their item scores and overall score on the new leadership measure and other available Nurse Match identity analytics, tell us about their attributes as an ‘authentic leader’?”

2.2 Design

A case-study approach to screening for nursing values that required respondents to appraise themselves and relevant others using an instrument Nurse Match (NM) designed to assess everyday use of nursing values and attributes. Ipsus software was used to record responses and report the outcome. Three theoretical concepts (ISA) were used to score the data. Authentic leadership qualities were defined as sets of nursing values: see Table 2. Scores on nursing values were the units of measurement used to score respondents on leadership qualities. See Table 3 and Section 2.7.2 on methodology.

2.2.1 Measures

An enhanced version of Nurse Match (NM) psychometric test used in the main body of research was used: also, some additional analytical features of NM.

The existing measure: It was custom designed and built on the Ipseus software framework to enable a respondent to describe thirteen (13) people (entities) from personal, home and work domains using twenty (20) carefully selected bi-polar constructs representing nursing attributes and values. The output was used to create a score (S_score) for the professional suitability, importance and emotional significance of each of twenty nursing values. Six themed nursing value item scores were derived from the twenty value results (STOT scores i.e. the sum of the constituent S-scores). An Overall Score for nursing values was calculated (the mean of the six STOT scores). See the main report at 2.2.1 for more complete information on the existing measure.

The enhanced version: Nine leadership quality items were composed using different sets of our twenty nursing values. A score was calculated for each item by summing the constituent S_scores on values (LTOT scores). An Overall Leadership Score was calculated: the mean of the nine LTOT scores. See Table 2 for the matrix of nursing values and leadership scores.

Additional analytics: two aspects of the NM identity analysis functionality enhanced the interpretation of personal leadership profiles: the identity variant and the scatterplot on values.

The identity variant offers a global overview of identity type based on self-esteem and coherence of identity (measured as extent of identity diffusion) and can offer rapid overviews of certain major propensities. A functionally healthy variant ('Balance') brings together a coherent sense of working identity with moderate and positive self-evaluation and accepts differences of attitudes and values in others as normal. Very high self-esteem and very low levels of diffusion (variant - Defensive High Self-Regard) indicates an inflexible sense of who one is and what one stands for, a defensive state of mind which tends not to accept difference as normal and sees things in black and white terms.

The scatterplot on values compares importance of meaning with emotional significance and helps to identify core values and outriders.

2.2.2 The Nurse Match Leadership Instrument

The assumption which could be made here is that to become a great authentic leader you should have all the qualities set out in Table 1. And if you lack any one of them then you might struggle to make a mark as a leader. The reality of course is somewhat different being more a matter of strong features and limitations, degree and kind, time and place. To the extent to which you show commitment, empathy, honesty and integrity and accountability you will set a good example which others will follow. The quality of your communication skills and decision-making capabilities will also play a vital role in effective leadership. Lastly, innovation and creative thinking and the capacity to deal effectively and well with discomfiting and difficult decisions will help you stand out as an authentic leader.

We will consider our findings using Nurse Match shortly and, in these terms, but first let us say something about the leadership measure we devised. This is not a fully developed instrument. It has been designed to demonstrate how better quantitative data on leadership might be acquired, beginning with the applicant to nursing and following through longitudinally. We have used qualities associated with one form of leadership, but the instrument might have addressed any other form of leadership by simply changing the values to match the form of leadership being studied.

Table 1: Qualities of the Authentic Leader

Qualities of an Authentic Leader	
CONF	Confidence
COMM	Commitment
DMC	Decision making capability
CIO	Capacity to inspire others
H&I	Honesty and integrity
GCS	Good communication skills
EMP	Empathy
ICT	Innovation and creative thinking
ACC	Accountability

A backdrop to our consideration of leadership qualities is that we have a measure of personal nursing values against which to compare our measure of leadership values. In doing so it seems reasonable to suppose that successful nurses, those that have the required nursing values to the required standard, will have authentic leadership qualities to a greater or lesser extent. The reality of nursing is taking control in a caring way.

Nursing values tell you quite a lot about leadership qualities, but not everything, since personality, character, personal identity, personal circumstances and skills are among other factors affecting performance. Our task here is to focus on nursing values and leadership.

Table 2: Leadership Qualities and Nursing Values

Leadership Qualities										
NURSING VALUES*	C No.	CONF	COMM	DMC	CIO	H&I	GCS	EMP	ICT	ACC
Rights	1			1		1				1
Safety	2			2		2				2
Discomfort	3									
Teamwork	4			4				4		4
Influence	5	5		5	5		5	5		5
Learning	6	6	6	6	6				6	6
Listening	7	7		7			7	7		
Honesty	8	8			8	8	8			8
Coping	9	9	9	9	9				9	9
Challenging	10	10	10	10	10	10				10
Deciding	11	11	11	11	11				11	11
Responsibility	12	12		12					12	12
Carefulness	13		13			13				13
Communication	14	14			14		14	14		
Getting on	15	15			15		15	15		
Reliability	16		16	16		16	16			16
Independence	17	17		17		17			17	
Awareness	18			18	18		18	18	18	18
Reflectivity	19			19				19	19	19
Selflessness	20	20	20		20	20		20		

* A full description of the value choices made can be found via paragraph 2.2.1 of the main report

Rank ordering applicants using NM Leadership psychometric is one way of distinguishing those better endowed with the qualities of authentic leadership from the less well endowed, but each applicant has different strengths and limitations in their leadership profile and is a unique leadership asset. Any process of professional development should carefully weight each talent and consider what might be done to nurture it. This uniqueness reflects the real world of leadership and identity instruments like Nurse Match Leadership can be of great assistance with staff development.

NB: The leadership measure we use here is for demonstration purposes. Life experience and everyday knowledge was used to populate the leadership items with relevant nursing value constructs. See Table 2 for the outcome.

2.3 Data Analysis

Initial data analysis was carried out automatically by Ipeus software using algorithms defining two ISA concepts (“structural pressure” on a construct and “emotional significance” of a construct) to calculate a score on each concept for each value construct. Those scores, downloaded to Excel software, were used with the chosen pole of each construct to calculate (a) a score (S-score) for each respondent on each of the twenty (20) nursing values, (b) a score (L^{TOT}) for each respondent on each of nine leadership quality items and (c) an overall leadership score (mean L^{TOT}). Note, the personally preferred pole on each of the twenty constructs may or may not have been the professionally preferred pole. Subsequent statistical analysis used Minitab 17.

The output for each respondent is an overall (mean) L^{TOT} score and an L^{TOT} score for each of the nine leadership values: see example of data output in Table 5 below and of data analysis at Findings, paragraph 3. The full set of rank ordered scores for the sample are to be found at Appendix A, Table A1.

2.4 Validity and Reliability

2.4.1 Theoretical Basis

The epistemological position we adopt is essentially constructionist. That is a person develops a unique sense of self and perspective by way of personal experience of self-in-the-world (see ISA meta- theory: Weinreich & Saunderson, 2003). Sense of identity and construal of the world emerges from the activity of real world somatic and neuropsychological processes that develop and modulate self’s values and beliefs in response to life experience.

2.4.2 Methodology

To address Burdett objective three on Leadership in Nursing our standard scoring procedure has been adapted by using the S_score measure of the quality of twenty personal values and beliefs underpinning the nursing themes to create a nine item measure of ‘authentic leadership’ qualities. See the matrix of nursing values contributing to leadership values set out in Table 2.

2.4.3 Qualitative and Quantitative Rigour

The criteria we adopted to address validity and reliability, provide the test with qualitative and quantitative rigour, are based accordingly on this philosophical position and methodology (see paragraph 2.7.1) and described in considerable detail at paragraph 2.7.3 of the main report.

The units of measurement remain the reliable and valid S-scores on nursing values. The validity of deriving the L-scores from these valid and reliable S-scores is based on life experience and common

sense and requires further developmental work. This is acceptable here since our aim is to demonstrate the viability of the process as a test of leadership qualities.

3. THE FINDINGS

3.1 Nurse Match as a measure of the qualities of an ‘authentic leader’ (Objective 1)

The nature of the scoring process devised to assess applicants on ‘Authentic Leadership’ is described under ‘Measures’ at 2.2.1 above and an example of output data with comment and analysis can be found at Section 3.2, Table 5. The complete set of output data can be found in Appendix C: Table C 1.

Nurse Match Leadership (NML) proved to be effective as a tool for rank ordering applicants on yes leadership qualities during a selection process, as a practical tool for the more detailed appraisal of individuals who score well on it and to meet test standards for psychometrics, see paragraph 3.1.1 below.

A full description of the development of the Nurse Match instrument on which this Leadership instrument is founded is provided earlier in this report. It is complemented in respect of the development of the Leadership Qualities by a description at Section 2.2, Design.

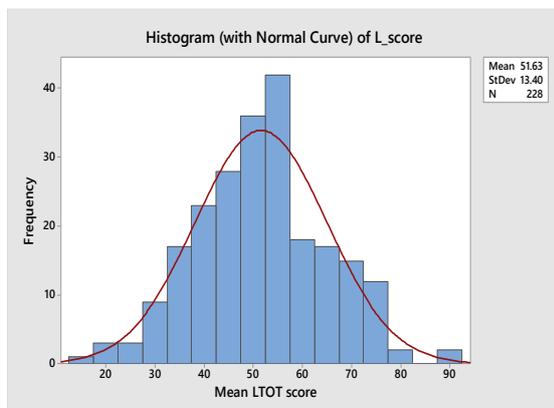
3.1.1 Statistical Properties

The scoring process conforms with internationally accepted standards for a psychometric test including internal reliability (Cronbach’s alpha 0.9753): see Table 3.

The distribution of the overall scores (mean L^{TOT} scores) is normal. Anderson Darling statistic was used to appraise normality (AD = 0.386: p-value = 0.388 with alpha = 0.05). All nine item scores are normally distributed (*AD statistic and p-values are reported in Appendix B at Table BA*).

Table 4 illustrates the substantive difference between the measure of values and the measure of leadership – each participant was scored on both measures. The substantive difference is reflected in the mean scores i.e. 47.82 for values and 51.46 for authentic leadership. The ‘unit of measurement’ is the same in both cases. It is the S_score on each of the twenty values. A t-test indicated a real difference between the measures, and this was significant, p-value 0.003 (alpha = 0.05). The effect size was small (Cohen’s d = 0.28) and correlation was high (r = 0.998).

Table 3: Descriptive Statistics for mean ‘Authentic Leadership’ (L^{TOT}) score



Statistic (N=228)		Comment
AD test	0.386	Normal Dist.
P-value*	0.388	Alpha = 0.05
St Dev	13.40	
Mean	51.63	Close to median
Median	51.35	Close to mean
Skewness	0.09	Symmetrical
Skew SE	0.16	
Kurtosis	-0.10	Low ‘tailiness’
Kurt SE	0.32	
Cronbach’s alpha	0.9753	VG reliability

Table 4: Suitability S^{TOT} and Leadership L^{TOT} test scores: high correlation but real difference

Mean S ^{TOT}	Mean L ^{TOT}	Comment
47.82	51.46	Substantive difference
Statistic: L score cf. S score		
t-test (crit. t = 1.96)	-2.97	Real difference
p-value	0.003	(alpha = 0.05) significant difference
Cohens d =	0.28	Small effect size
Correlation (r)	0.998	Very high

3.2 What does the data tell us about the leadership potential of applicants

The instrument assesses the authentic leadership qualities of an applicant (Table 1 below) by making certain assumptions about what attributes are required. For example, the leadership quality of Confidence will be demonstrated by a willingness to take on unpleasant tasks, being able to influence others, to learn, listen, be honest, cope with resource limitations, take responsibility, make decisions and still get on with others and remain self-less: see Table 2 for the list of attributes and values concerned for each leadership quality. All these qualities exist in a good leader, to a greater or lesser extent, and interact to emerge as 'leadership'. If one is absent or poorly represented, a reputation as a leader can difficult to establish or maintain.

Table 5 sets out (a) the profiles of some of the top individual performers on overall leadership qualities, (b) the performance of the whole sample as mean scores on leadership qualities and (c) in contrast, some of the lowest ranked scorers. The top performers can be seen to score well on most items but look closely and the variability between these scores is plain to see.

As a group (N=228), the volunteers also demonstrated variability on item scores, strongest on good communication skills (GCS) and empathy (EMP) and noticeably weaker on innovation and creative thinking (ICT). The lowest ranking applicants did not score well on items but individual variability between item scores is again readily apparent. It was also apparent that individuals of similar rank would often differ considerably in their strength on a leadership quality.

Table 1: Qualities of the Authentic Leader

Qualities of an Authentic Leader	
CONF	Confidence
COMM	Commitment
DMC	Decision making capability
CIO	Capacity to inspire others
H&I	Honesty and integrity
GCS	Good communication skills
EMP	Empathy
ICT	Innovation and creative thinking
ACC	Accountability

Table 5: high and low and mean output scores on nine elements of leadership

SUI	CONF	COMM	DMC	CIO	H&I	GCS	EMP	ICT	ACC	L_score	R/O
169	69.09	84.76	83.78	74.29	84.63	70.27	88.32	71.31	68.32	77.20	5
148	72.87	75.95	75.37	77.62	75.06	85.30	84.09	66.48	73.13	76.21	6
226	68.07	79.56	81.83	70.00	76.59	77.79	92.31	65.30	72.51	75.99	7
125	71.52	72.07	75.45	75.17	71.42	86.02	86.72	66.49	75.05	75.54	8
8	73.47	81.59	75.73	72.75	72.06	75.88	81.86	72.22	71.85	75.27	9
MEAN	49.57	54.47	50.58	53.70	49.47	58.30	58.36	43.21	47.03	51.63	Mean
4	32.34	20.05	32.85	33.44	13.74	36.09	52.21	28.44	25.09	30.47	217
184	30.76	25.51	31.86	26.79	38.29	24.65	36.11	29.12	28.67	30.19	218
98	35.10	23.71	25.24	31.13	26.31	44.55	44.80	19.35	13.58	29.31	219
74	24.87	30.95	23.50	35.02	22.73	38.60	40.36	13.79	29.85	28.85	220
10	31.13	18.40	32.53	23.97	32.86	31.29	20.60	28.19	31.98	27.88	221

The high level of correlation between nursing values and leadership qualities (see paragraph 3.1.1) makes sense since our nine leadership values are those of the ‘authentic leader’ whose sense of identity is grounded in having the right professional values and ethical thinking and applying them to colleagues as well as patients.

The mean score on the leadership items is used to rank order applicants but, since a leader is unlikely to show the same strength across all qualities, even high-ranking profiles should be examined for limitations in one or more elements. Any limitations or suspected limitations can be examined more closely and an explanation sought using the additional analytics provided by the NM software as shown below.

The applicants we are most interested in here are those who have scored well on nursing values using NM and have been offered a place on a course. It would be helpful to have an assessment of the potential of these students as leaders.

Selection involves a broader assessment than is provided here by a psychometric test and not all the applicants who scored well on nursing values were offered a nursing course. In fact, only two of those listed above in Table 5 were offered a course, SUI 148 and SUI 226. We will use these two examples to demonstrate the potential of NM in the assessment of leadership potential.

3.2.1 Applicant SUI 148

The defining leadership qualities of this applicant are empathy and good communication: see Figure 1. That is, the student can be characterised as giving considerable importance and emotional significance to influencing people’s behaviour, doing unpleasant tasks, listening, communicating effectively, being reliable, honest and unselfish, being aware of what is going on, being reflective rather than responsive and just plain getting on with people. See Table 2 for the values underpinning these qualities. Figure 1 and Figure 2 for the scores on and clustering of her core nursing values.

The main drivers of respect for a leader are present as good scores on Accountability, Empathy, Honesty and Integrity. They underpin her authentic leadership credentials. Confidence is an essential quality and is present. The Capacity to Inspire Others features strongly, emerging just short of Empathy and good Communication. Strong scores on Decision Making and Commitment complete

a strong hand of leadership qualities, except perhaps for Innovative and Creative Thinking, one quality that is a little less impressive.

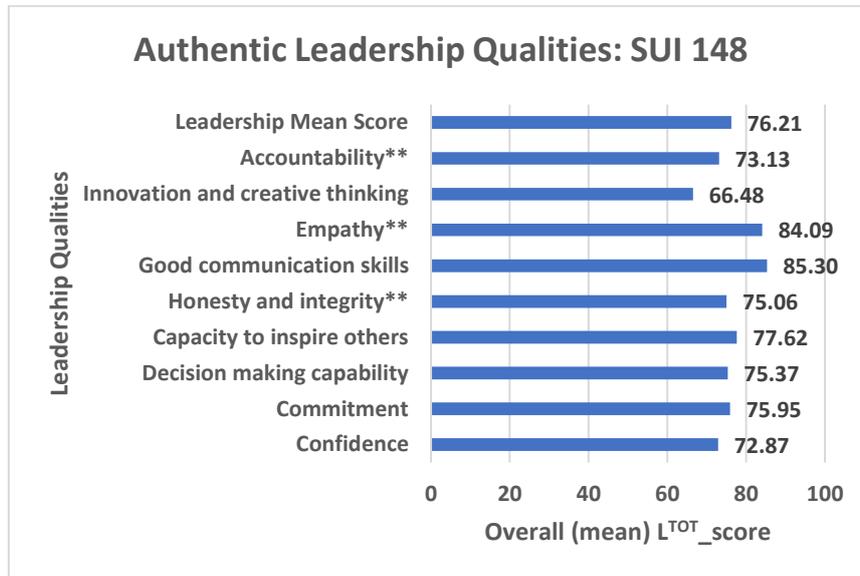


Figure 1: Leadership qualities of SUI 148, a successful applicant

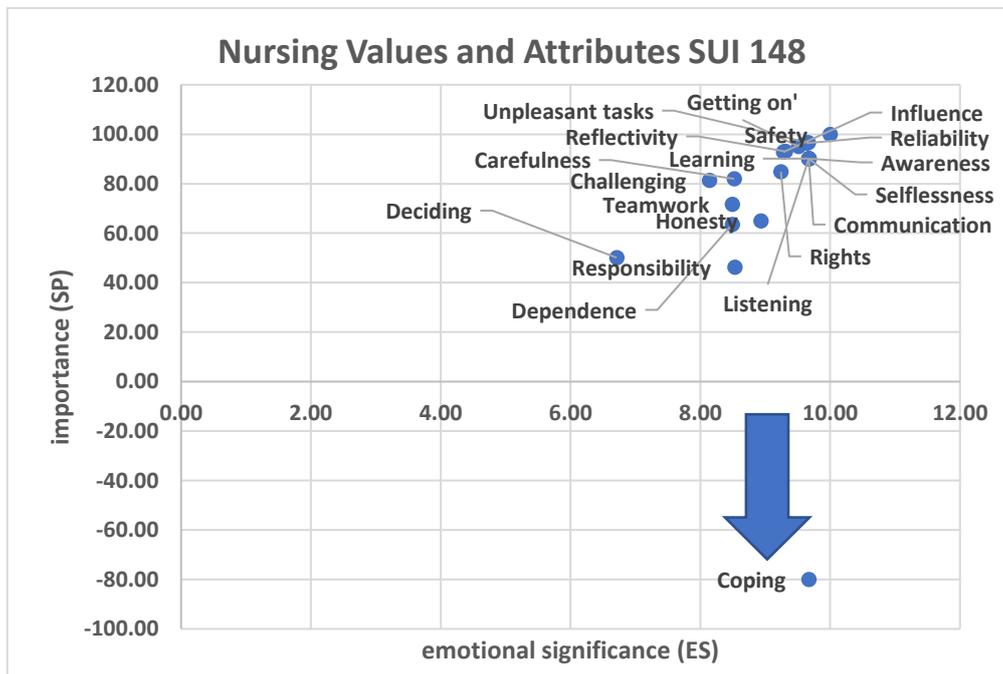


Figure 2: Core Nursing Values showing concern about coping with pressure on resources

In order to pin down the reason for the constraint on Innovative and Creative Thinking (ICT), with a view to strengthening it, we can go back into Table 2 and look under ICT where we find the value constructs that constitute ICT i.e. Coping (with lack of resources), Decision Making, experiential Learning, Independence, Awareness and Reflectivity.

When we use the ‘hidden’ analytical resources of NM, we find a probable cause for the lower score on Innovative and Creative Thinking. The applicant is extremely conflicted ($sp = -79.98$: Low importance is $sp < 35.99$) about the NM construct on coping (construct 9 in Table 2) which set out two alternative points of view one of which a respondent should chose. When describing ‘model nurse’ this would present as “A model nurse thinks ... resource constraints at work are no excuse for lack of kindness and sympathy/pressures on resources can leave less room for kindness and sympathy”. The professional response is the first alternative. The applicant prefers the alternative point of view and it has strong emotional significance for her.

The negativity (dissonance) around this construct is very high. See Figure 2 for a clear picture of the impact of coping on her value and belief system. For her, the uselessness of the aspiration to cope with resource limitations (its low ‘importance’) and its very high ‘emotional significance’ is due to the large amount of negativity associated with it.

In short, this student believes that pressure on resources can leave less room for kindness and sympathy. She sees difficulty coping with this situation and feels strongly about it.

Given the cluster of strong core values (top right corner) that underpins the applicant’s nursing identity, it would be a pity to let this genuine concern fester to possibly undermine her convictions about professional nursing and her leadership potential – which is evident in her flagging of this concern.

Her identity variant is ‘Balanced’ so that she has a coherent sense of work identity and a moderately high sense of self-esteem. She is the sort of person who normally copes well and sensibly with personal differences and difficulties.

3.2.2 Applicant SUI 226

This student presents with a very strong Leadership score on empathy and strong scores on ‘Commitment’ and ‘Decision Making Capability’: see Figure 3. Good scores on Communication Skills, Honesty and Integrity and, to a lesser extent, Accountability fully complement those leadership virtues but scores on Capacity to Inspire Others, Confidence and Innovative and Creative Thinking are not so impressive.

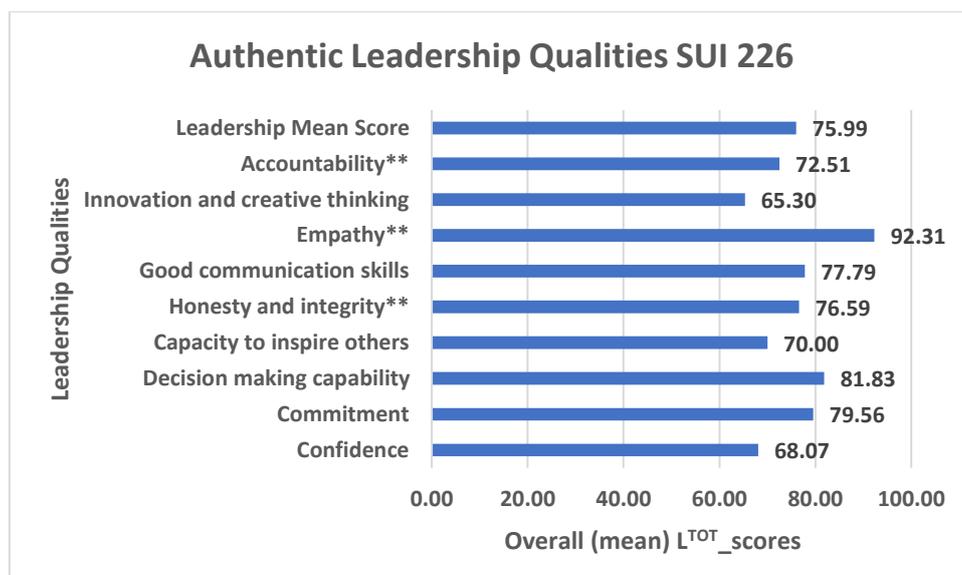


Figure 3: Leadership qualities of SUI 226, a successful applicant

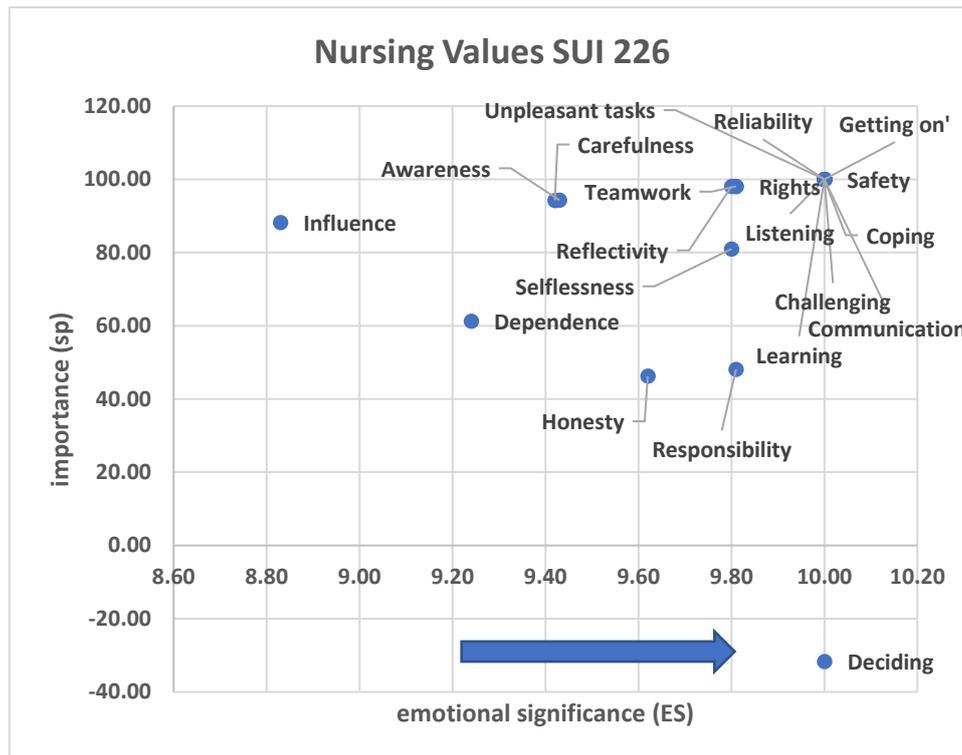


Figure 4: Nine Immutable Core Nursing Values and conflicted decision making (Deciding)

NM analytics can help explore the factors in play here and consider what, if anything, might be done to enhance the less impressive Leadership qualities or at least raise awareness about them to allow their effective management. Before we look at these three qualities it is necessary to deal with (a) a concern about the nursing value Deciding (construct 11) that is linked to DMC and (b) a defensive identity variant (DHSR) both flagged by NM.

Despite scoring well on the leadership quality DMC the student appears to have difficulty with decision making in nursing. One of the factors contributing to DMC is the nursing value 'Deciding' - construct 11 - which presents as "*prefer to make the decisions within my area of competence/in a shared area of competence I sometimes prefer the other person to take decisions*". Analytics shows that the student aspires to the left-hand discourse (in italics) but this choice is associated with substantial negativity.

The effect can be clearly seen in Figure 4 at bottom right. For some reason, the student is discomforted when acknowledging the importance of nurses wanting to make decisions within their area of competence. 'Negative Importance' can mean 'double talk', saying one thing and meaning another. Perhaps she would really prefer some other competent person to make the decisions. In any case this is a vexing matter for her (emotional significance = 10, maximum) and it would be useful to clarify what is going on here for developmental reasons. As we will see in a moment this student has a somewhat defensive type of identity and this may be relevant.

Analytics indicates that the nature of the student's personal identity is an important factor in her leadership style (Identity Variant is DHSR, Defensive High Self Regard). Her appraisal of her success in pursuing her aspirations (self-evaluation) is quite high and identity diffusion is low indicating a very precise and somewhat inflexible sense of what it is to be a nurse. This is a defensive state of mind which does not accept difference as normal and tends to see things in black and white terms -

see Figure 4, top right, cluster of nine nursing values (all have 'importance' 100: 'emotional significance' 10).

Both these factors, Deciding and DHSR, will have a negative impact on Capacity to Inspire Others, Confidence and Innovative and Creative Thinking and the negative score on Deciding (Nursing Value 11) will have reduced the score on all three Leadership qualities.

Confidence and the Capacity to Inspire others will have been reduced somewhat by the student's take on nursing value 08 where the option was to choose either "it is better to be open and honest in everything you do/sometimes it is wiser to manage the truth in the best interests of all concerned. She aspires to managing the truth when the professional preference is to aspire to be open and honest.

One could go on, but the point has been made. This student would probably benefit from an opportunity to reflect on these things. Whether this is done tangentially in a shared lecture experience addressing these as matters of educational importance or face to face as staff development is a matter for tutorial staff.

4. DISCUSSION

4.1 Strengths of NM Leadership

NM - Leadership version - has all the strengths of the main NM psychometric as described in Section 4. The twenty values scored using NM have been allocated selectively to represent leadership qualities. These qualities are difficult to research so that their understanding is constrained by having too little quantitative data. Here we have an approach which uses a person's value and belief system to profile or model their leadership potential in qualitative and quantitative terms that permit us to work on enhancement or at least encouragement of growth in leadership qualities.

4.2 Limitations

The limitations of the core NM approach are discussed more fully in Section 4.2 of the Replication Study.

Briefly: valid and reliable self-reports rely on sound motivation, openness, honesty and astute self-awareness which is difficult to ensure. This is managed in part by encouraging quick intuitive responses. 'Social desirability' bias is minimised by the NM scoring process. NM provides a snapshot of values held at one moment in time taking account of randomly occurring personal factors that influence responses so that some values may vary considerably over time. Some respondents with very high self-regard and very firm preferred views may score exceptionally well when a more balanced and equitable demeanour with a more moderate score may be preferable – a situation best managed at interview.

Suitability in terms of nursing values and attributes can only be part of the process of assessment. There is clearly a need for complementarity in the means of appraisal of nurses and candidates for both develop- mental and recruitment purposes.

There are also limitations associated specifically with NM Leadership. When using NM analytics facility, a certain amount of specialist knowledge and experience in use of the analytics is required. An element of synthesis and subjectivity is involved in interpretation of the data about individual applicants or students. This means, initially at least, that NM and Identity Analysis will be limited to research on leadership in nursing for which this specialist knowledge is available. On the other hand,

this could be an advantage since it would enable idiographic work with acknowledged 'great leaders' in the field to generate some fresh insight into what makes for successful leadership.

Finally, the choice of values used to represent leadership qualities has not been subjected to the degree of developmental testing that it otherwise would and that is acceptable here only because the test is merely being used for demonstration purposes.

5. CONCLUSIONS

The work demonstrated how a NM Leadership instrument with its inherent identity analytics could enhance staff assessment and staff development processes and provide better quantitative and qualitative research data on Leadership in nursing than is currently available.

The instrument could facilitate one to one work by nursing tutors with the leadership qualities of successful applicants. But the version used here would require full developmental testing to ensure validity before application in selection or staff appraisal processes.

NB: References cited can be found in the reference list at the end of the full report.

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Appendices

Appendix A: Figures



NURSE MATCH EVALUATION - 2018 Supervisor's Briefing

(1) **Before anyone logs on**

Thank participants for volunteering to take part in this nursing research project. Tell them success will depend on their commitment to the task and their frankness. We really do want to know what they think about themselves and others. And we will not know whose views they are.

Ensure all UCAS numbers are known. Tell participants what the School Code is.

Tell participants the entire process will be online at www.professionmatch.com.

Online they will be

1. told about the research
2. asked to provide their consent and provide
3. some personal details such as UCAS Code and School Code (see below).

After they provide consent they should

1. PLEASE take time to read **all** the instructions for completion of the test,
2. complete the test and
3. provide feedback on their experience.

(2) **Now ask participants to log on at www.professionmatch.com.**

Monitor the log on process to confirm successful log on. Some participants log on to the wrong site 'professionamatch.com'.

Occasionally because of computer settings an error page appears. Ask them to use another computer and that usually solves the problem. If still a problem then it is usually due to something in the browsers 'cache' – this is a small memory file that keeps a record of what websites you have visited but it also records previous problems and needs to be cleared if there has been a problem accessing our site. Contact Allen Erskine on 07887 941738 immediately for advice.

(3) **Then monitor progress and provide guidance as necessary**

The following points sometimes need re-emphasised or clarified to participants:

- a. We want to know what **you** think about yourself and others
- b. Responses should be intuitive and quite quick: don't overthink
- c. You must not collaborate on responses
- d. Use the whole scale – use the mid-point when you don't know what to think or don't understand the question

(4) **Check each participant completed the Survey Monkey feedback**

When the survey Monkey advert appears on screen the process is complete and the research data will be in the main database.

Figure A1: Supervisors briefing sheet for data collection sessions



NURSE MATCH EVALUATION - 2018

HELP US IMPROVE HOW WE ASSESS APPLICANTS TO NURSING

Hello and thanks for showing an interest in our research project.

We'd like to offer you the opportunity to trial a new tool that Queen's might use to recruit students onto our Nursing and Midwifery degree programmes. We are inviting applicants to both Queen's University Belfast and Ulster University to participate in this research, although the research is being led by Queen's.

Firstly, it's important for you to know that this will have **no bearing whatsoever on your current application to Nursing** - in fact you may already have heard whether you have been asked for interview or not. Even if you haven't been successful in getting an interview this time round, it would be great if you would help us anyway.

As a thank-you, we will run a prize draw which will give you the opportunity **to win a first prize of £200 in Victoria Square vouchers or one of two second prizes of £100 vouchers**. To be entered, all you have to do is complete this test process and give us some feedback.

The new tool has been designed to help us understand how you think about the whole idea of being a Nurse and what sort of values and attributes a good nurse should have. Universities and the profession as a whole are placing more emphasis on 'values' at the moment, based on a concern that, as nursing becomes more clinically complex, some of the basic values that are traditionally associated with the caring profession are becoming lost.

Due to data protection restrictions, the research team that will be carrying out this research do not need to know the names of any student that participates. All we will be gathering is your UCAS number and some basic information which we cannot link with your name.

Please click on the button below to begin the process.

PROCEED



Participant Information Statement

Title of project: "What Matters to Patients": identifying applicants to nursing who have the personal values required to build a skilled and competent workforce and lead the nursing profession in Northern Ireland.

- 1.2 Chief investigator:** Dr Marian Traynor
Co-Investigators: Professor Owen Barr
 Professor Roger Ellis OBE
 Mr Allen Erskine
 Mr Colin McNeill
Project Contact: Dr Marian Traynor
1.3 Planned start date: January 2018
1.4 Planned end date: December 2018

Thank you for taking the time to read this Information Statement. You are invited to participate in the research project that is explained below.

What is an information statement?

The purpose of this information statement is to explain to you, as a potential participant, the details of the research project. Information about the steps and procedures in this project will be clearly explained. Please read this information carefully before agreeing to take part. If you have any questions about the project please do not hesitate to ask us.

What is the research project about?

The purpose of this research study is to determine whether the use of the Nurse Match software, an on-line instrument, as a recruitment method for nursing and midwifery students is more valid, reliable and efficient in assessing values and attributes than the current personal statement.

Who are the researchers?

Dr Marian Traynor, School of Nursing and Midwifery, Queen's University Belfast ; Professor Owen Barr, School of Nursing and Midwifery, Ulster University; Professor Roger Ellis OBE; Mr Allen Erskine, Identity Exploration Ltd.; Mr Colin McNeill, Identity Exploration Ltd.

The research team are working in collaboration with Identity Exploration Ltd which has its registered office at 50 Stranmillis Embankment, Belfast, County Antrim BT9 5FN

Why am I being asked to take part in this research?

You are being asked to take part in this research because you are a student who has recently complete a UCAS application for nursing or midwifery.

What will taking part in this research study require me to do?

You will be asked to complete an online instrument seeking to evaluate values and attributes relevant to Nursing. The duration of this activity should not exceed one hour. The study will take place in one of the computer rooms in your school.

Am I likely to benefit from taking part?

While we are conducting this study with the aim to improve the nursing and midwifery applicant recruitment procedure, we believe that the participants will also benefit by the process of reflecting on issues relevant to nursing while completing the on-line instrument. In addition to that, the third party company Identity Exploration Ltd, which is involved in the development of the Nurse Match software, have offered three prizes to be won by those participating in the trial of the instrument, all prizes are vouchers from Victoria Square Belfast with first prize a £200 voucher and a further two prizes of £100. These prizes are offered as a token of their appreciation for the participants' time.

Will this research be of any benefit to others in the future?

It is hoped that the results of this study will reveal any potential benefits of using the Nurse Match online instrument as a selection method for nursing and midwifery applicants.

What are the possible risks?

There are no risks to you participating in this research. This is not a formal assessment i.e. pass/fail; you can however get general feedback at the end of the study if you so wish. All results will be confidential to the research team and your participation will not affect your application to nursing or midwifery in any way. The aim of this research study is to evaluate the Nurse Match on-line selection tool and not the individual participants. You can also withdraw at any stage of the research with no consequences and in that case all the data relating to you will be destroyed.

What will be done to make sure that any information I provide is kept confidential?

The only personal data about you available to the research team will be your UCAS number, school attended and age. Your UCAS number will be shared with the third party company Identity Exploration Ltd (who have signed a Data Processing Agreement and a Confidentiality Agreement with Queen's University Belfast) for data analysis. All information will be held in a locked filing-cabinet or stored on a computer database program that is password-protected on university premises in keeping with University regulations.

Will I be able to find out the results of this study?

The results will be published when the study is complete and although we do not intend to publish a list of individual scores, this can be made available upon request.

Who has reviewed and approved this study?

The research has been reviewed and approved by the School Research Ethics Committee within the School of Nursing and Midwifery, Queen's University Belfast. It is also been supported by the Burdett Trust for Nursing who have provided a grant to support the study.

Can I withdraw from the project after having agreed to participate?

If you agree to take part, but later change your mind, you can withdraw from this study at any time without providing any explanation and without any consequences for you or your course progress. All data relating to your performance during the research will be destroyed.

Further information

If you require any further information about the study or if for any reason you need to contact a study representative you can contact: Dr Marian Traynor: 02890975847, email m.traynor@qub.ac.uk

Any complaints or concerns

If for any reason you have cause to complain about any aspects of the study, these can be addressed to:

Dr Oliver Perra
Chair of Research Ethics Committee
School of Nursing and Midwifery
Queen's University Belfast
Medical Biology Centre
97 Lisburn Road
Tel 028 9097 23

Thank you for reading this information sheet

If you are happy to participate in this research please click the PROCEED button below

PROCEED

Figure A4: Page 3 Participant Information Statement continued

Informed Consent Form for Participation in a Research Project

Title of project: "What Matters to Patients": identifying applicants to nursing who have the personal values required to build a skilled and competent workforce and lead the nursing profession in Northern Ireland.

Principal Dr Marian Traynor,
Investigator(s): School of Nursing and Midwifery,
Queen's University Belfast.

Please read the following statements carefully and ask your facilitator if you have any questions

- I have received a Participant Information Statement and I understand the purpose of the research.
- I have had the opportunity to ask questions about the research and I am satisfied with the answers I have received.
- I understand that participation in this study is voluntary and that I may withdraw from this study at any time without giving any explanation and without any consequences.
- I understand that I will complete an online instrument which has been developed as a potential selection tool for applicants to Nursing and Midwifery.
- I understand that it is the Nurse Match online instrument as a selection tool that is being tested and not myself.
- I agree that the research team will access my UCAS number, my age, gender and school attended in order to evaluate the Nurse Match instrument and its potential as a selection method to nursing and midwifery.
- I understand that all data relating to me including UCAS number, age, gender and school attended will remain strictly confidential; that it may be looked at by the researchers and that it will become anonymised before any data analysis takes place and that the information will be retained on secure computer storage.
- I agree that my anonymised data will be shared with a third party company, Identity Exploration Ltd.

Should you wish to proceed, please click on the button below to indicate your consent

I CONSENT TO PARTICIPATE IN THIS STUDY AND WILL PROVIDE
MY UCAS NUMBER AND OTHER DETAILS ON THE NEXT PAGE

Figure A5: Page 4 completion of consent form for participation



QUEEN'S UNIVERSITY BELFAST PLEASE TELL US MORE ABOUT

Thanks again for agreeing to participate in this study. We want to be able to analyse our res criteria and we therefore need you to tell us a little about yourself.

Please be sure that the responses are totally anonymous and we have no way of linking this It will only be used for group analysis.

UCAS Code: e.g 136-0160265

School code:

Gender :

Male Female Other

If 'Other' Please specify:

Age Group :

Select Age Group ▼

Do you have experience of providing care or working in a care environment?

Yes No

If yes, please select which of the following best matches your experience. :

Please Select

If you have been employed or volunteered in a nursing or care environment please tell us who you worked/volunteered for:

Figure A6: Page 5 Collection of demographic information

Instructions

Please read these instructions before you start to complete the next steps in the process.

- The questionnaire you are about to complete is a little different than those you may have completed before. You will be presented with two alternative viewpoints and asked to use a scale to tell us how strongly you think these apply either to yourself in different contexts or to other people.
- The approach we take means that you will be asked to apply the same type of judgement multiple times. Please read each context carefully and think about how strongly you feel one side or the other applies in that situation.
- Please use the scale to indicate how strongly you feel that judgement applies in that context. If you think that neither apply or both apply equally then please click the pale centre box.
- A typical choice is presented like this:

Page 1 of 13

A great nurse...

works best when being managed by others

manages time and workloads with minimal supervision

- Please don't take too long deciding between the two options. Your first response is usually the most accurate and will reflect how you really think.
- You may find that not all contrasting viewpoints make sense when applied in that context. It is also likely that sometimes you may not be able to make up your mind which side to choose. This is normal and the appropriate response is to click on the pale centre box.
- You will be asked about yourself in different situations. Please try to consider how you might think or have thought differently in these situations.
- When you are asked about other people you are being asked purely how you perceive them, what you think of them, how you think they would behave.
- Every selection has to be made before the questionnaire can be completed.
- Simply close the web browser to exit.

Thanks again and enjoy the process!

Click on the Proceed button to begin.

Figure A7: Page 6 Instructions for completion of Nurse Match

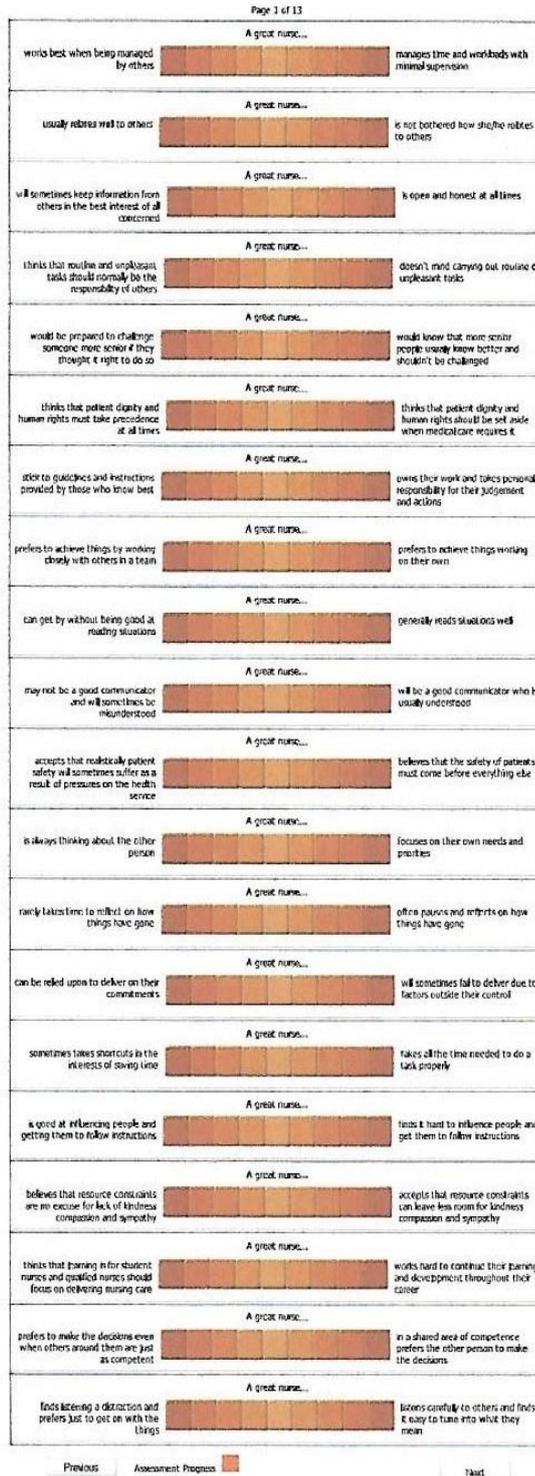
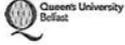


Figure A8: Page 7 Completing the test: example: page 13 as presented to respondents


Queen's University Belfast
Nurse Match Evaluation 2018
 We value highly your honest opinion. Please provide feedback on our values based appraisal process. Don't forget to add your UCAS student number at the end.

1. Was the test instrument easy to complete?
 Yes
 Yes - mostly
 No - some of it not easy
 No
 If you answer 'No' or 'No - some of it not easy' please say why in comment box.

2. Was the test instrument interesting to complete?
 Yes
 Yes - mostly
 No - not really
 No
 If 'No' or 'Not really' please say why in comment box.

3. Was it generally easy to understand the 'questions'?
 Yes - I understood all of them
 Yes - I understood most of them
 No - I only understood a few of them
 No - I understood none of them
 If 'No' what did you find difficult about understanding them. Please use the comment box.

4. When you understood a 'question' were you able to make quick intuitive responses?
 Yes
 Yes - mostly
 No - not always
 No - not at all
 If 'No' why was this? Please explain why in the comment box below.

5. How did you find the test overall?
 Difficult
 Quite difficult
 Quite easy
 Easy
 Whenever you found it 'Difficult' or 'Easy' please explain why in the text box below.

6. Were any nursing values you think to be unimportant used in the instrument?
 Yes
 No
 If 'Yes' please use the comment box to tell us which.

7. Were any nursing values missing (that you expected to see)?
 Yes
 No
 If 'Yes' please use the comment box to tell us which.

8. Did you feel that you could have done with more time to complete the instrument to your satisfaction?
 Yes
 No
 If yes, please use the comment box to tell how much more time you felt you needed.

*** 9. What is your UCAS student number?**

Figure A9: The Feedback Questionnaire

Value profile	Sample	SUI065	SUI225	SUI193
	mean score	top scorer	mid scorer	low scorer
Person Centredness	65.08	94.80	71.82	15.58
Accountability	46.03	89.34	45.34	12.87
Trustworthiness	45.73	88.93	38.17	7.76
Integrity	39.23	82.26	32.49	13.25
Commitment to Development	36.45	94.33	34.22	24.25
Teamwork	54.39	78.98	65.09	9.84
Overall Suitability	47.82	88.11	47.85	13.93

Figure A10: Examples: top, middle, low scorers and group test norms (mean)

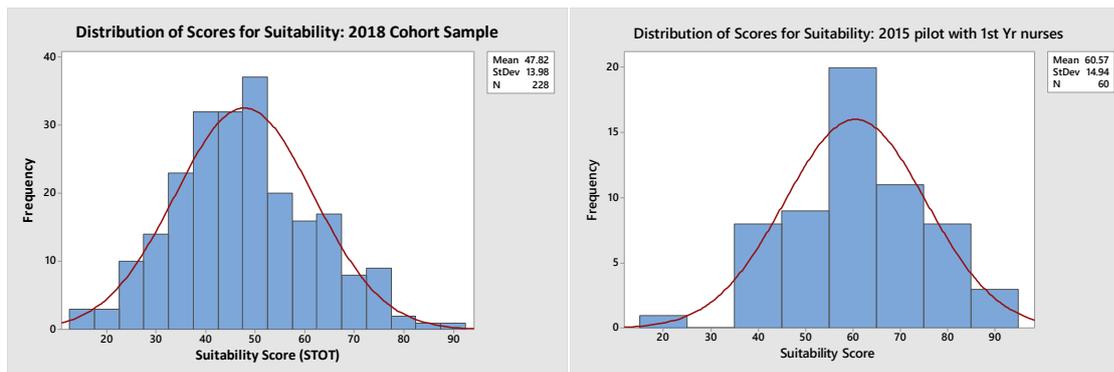


Figure A11: Histogram with normal curve of 'Suitability' scores for the sample from the 2018/2015 cohorts.

Person	Account	Trust	Integrity	Commitment	Team	Suitability	SUI	Rank
Centredness	ability	worthiness		to Pers Dev	work	Score	Number	Order
94.80	89.34	88.93	82.26	94.33	78.98	88.11	065	1
97.32	84.95	83.21	82.74	72.48	91.62	85.39	188	2
86.38	81.03	77.50	76.89	82.67	81.23	80.95	030	3
87.30	76.37	76.59	56.46	89.52	79.95	77.70	206	4
90.54	75.70	83.78	68.90	66.17	75.33	76.73	100	5
90.28	74.40	78.02	68.44	58.57	80.97	75.11	125	6
94.19	69.68	81.48	60.18	52.90	90.80	74.87	226	7
85.09	72.19	81.17	63.33	66.60	79.18	74.59	185	8
79.70	70.97	75.70	73.91	64.64	81.12	74.34	008	9
86.74	73.08	72.44	68.19	61.72	82.18	74.06	148	10
73.82	74.85	81.87	78.45	62.48	69.40	73.48	177	11
90.94	69.42	77.66	64.91	54.07	81.86	73.14	076	12
76.64	69.08	72.70	70.31	66.78	80.12	72.61	048	13
90.08	67.78	66.50	74.16	36.59	93.48	71.43	170	14
89.18	70.74	64.86	68.20	50.17	77.44	70.10	224	15
71.05	67.73	64.92	70.67	75.19	68.56	69.69	147	16
93.65	67.15	67.35	44.26	58.91	86.61	69.65	169	17
78.14	67.98	69.95	62.72	65.20	69.91	68.98	194	18
86.15	65.76	78.00	49.12	56.48	74.20	68.28	090	19
85.84	67.88	62.38	58.77	52.89	79.39	67.86	071	20
85.65	62.39	82.59	64.04	41.72	70.69	67.85	085	21
92.26	68.08	57.92	64.56	49.17	72.96	67.49	027	22
81.21	63.00	64.16	64.49	54.32	76.02	67.20	015	23
85.50	68.40	67.55	58.41	54.97	65.12	66.66	126	24
71.41	66.45	72.19	56.73	70.97	62.02	66.63	038	25
84.62	63.44	62.64	60.13	50.12	77.54	66.41	049	26
84.29	63.41	74.53	55.31	51.17	65.62	65.72	062	27
91.80	67.29	54.81	54.77	42.99	80.50	65.36	066	28
65.38	67.03	61.54	75.38	65.38	57.26	65.33	163	29
94.07	65.69	63.45	52.01	38.74	76.55	65.08	032	30
76.47	63.08	59.82	65.76	53.61	70.30	64.84	160	31
83.24	61.23	70.20	43.59	56.63	72.22	64.52	186	32
79.15	62.10	66.81	57.94	51.19	68.17	64.23	182	33
82.52	58.08	67.56	39.10	60.89	76.73	64.15	102	34
88.67	62.26	60.12	59.52	42.08	68.76	63.57	172	35
80.39	63.59	52.40	69.89	37.09	75.76	63.19	072	36
85.50	60.87	63.19	47.74	50.07	70.91	63.05	142	37
76.04	63.69	61.29	69.30	36.96	67.78	62.51	006	38
75.30	53.33	71.97	64.73	25.40	81.00	61.95	154	39
74.86	61.98	66.36	53.42	56.40	56.24	61.55	215	40
71.42	58.11	64.83	40.51	68.88	64.38	61.35	064	41
82.72	60.57	59.53	53.36	41.22	70.55	61.32	109	42
73.42	63.08	70.04	61.99	39.68	59.61	61.31	189	43

Figure A12 (1): 2018 Cohort: ranked Nurse Match test scores greater than one standard deviation from the mean

Continued

82.92	60.44	53.58	55.13	37.04	77.25	61.06	078	44
81.69	59.30	56.82	43.39	58.29	65.98	60.91	195	45
79.62	59.44	62.85	40.87	53.77	68.24	60.80	058	46
75.11	58.41	65.72	61.26	47.33	55.47	60.55	007	47
82.00	63.99	63.64	57.06	41.60	54.99	60.55	118	48
75.66	62.20	69.22	71.84	18.80	63.56	60.22	016	49
66.40	57.58	45.29	68.14	46.70	74.11	59.70	079	50
88.02	54.72	55.42	21.63	60.47	69.74	58.33	155	51
75.93	57.94	64.37	54.22	36.21	60.99	58.28	082	52
79.00	55.47	54.10	41.76	46.59	71.95	58.15	200	53
72.72	53.38	52.91	49.88	55.33	62.02	57.71	220	54
72.53	56.40	64.96	42.45	48.81	58.16	57.22	083	55
86.84	53.46	66.24	46.82	24.30	65.61	57.21	104	56
69.77	57.53	46.83	52.92	54.49	59.84	56.90	141	57
73.45	54.16	67.93	53.67	31.20	59.84	56.71	095	58
58.46	55.39	53.66	43.86	73.69	55.11	56.70	002	59
65.15	54.39	65.48	45.34	54.46	54.30	56.52	050	60
63.25	55.65	55.46	46.38	55.51	55.50	55.29	198	61
70.59	54.96	43.96	48.64	49.02	60.71	54.65	036	62
73.96	49.23	52.67	43.49	46.23	61.69	54.55	047	63
59.15	49.83	53.05	42.36	67.50	55.34	54.54	111	64
72.12	58.38	56.43	55.08	33.58	48.92	54.09	039	65
65.07	52.67	49.17	54.92	42.15	58.12	53.68	112	66
77.04	54.38	50.57	42.90	44.68	52.16	53.62	127	67
77.22	51.30	53.85	40.96	42.60	54.60	53.42	054	68
83.68	49.08	54.70	27.53	40.62	64.62	53.37	124	69
83.01	48.15	45.79	24.83	46.18	70.36	53.05	031	70
71.13	53.59	48.11	49.86	37.26	58.23	53.03	081	71
73.34	52.84	48.81	48.52	42.96	51.05	52.92	105	72
67.60	59.72	50.55	58.75	33.92	45.43	52.66	202	73
62.51	53.32	51.01	53.81	45.38	49.07	52.52	132	74
70.75	51.76	60.68	42.17	43.51	45.86	52.46	020	75
74.64	47.82	57.62	31.22	43.10	59.50	52.32	173	76
59.40	51.38	60.28	60.25	33.87	48.05	52.20	012	77
64.42	50.49	59.82	37.55	39.57	61.22	52.18	150	78
59.98	53.05	50.69	61.96	37.47	49.51	52.11	092	79
69.67	49.96	33.86	42.10	34.84	82.18	52.10	213	80
62.60	53.97	53.85	54.44	33.83	52.80	51.92	093	81
65.28	52.87	51.77	50.91	36.01	53.84	51.78	117	82
72.90	45.53	43.17	18.11	65.62	65.33	51.78	131	83
62.90	52.39	40.77	43.29	62.25	48.68	51.71	003	84
75.75	48.74	48.32	30.34	40.15	65.16	51.41	183	85
68.81	46.62	40.73	47.58	36.66	67.94	51.39	026	86
74.37	50.65	54.65	38.61	34.94	54.38	51.27	143	87
54.44	53.72	49.57	62.86	37.63	48.50	51.12	181	88
74.26	49.11	61.06	45.29	21.56	54.03	50.89	011	89
61.50	51.09	44.79	45.03	42.50	60.16	50.85	080	90
58.71	49.62	47.31	50.39	39.65	57.85	50.59	120	91
73.95	46.31	47.96	33.24	38.73	63.06	50.54	180	92
70.67	44.31	42.25	18.00	52.97	72.80	50.17	221	93
54.89	46.35	43.27	44.65	45.83	64.05	49.84	075	94
56.92	50.62	47.47	53.04	47.87	42.96	49.81	001	95
60.81	49.14	51.03	42.64	43.56	51.03	49.70	228	96
74.80	47.22	52.75	32.55	41.01	48.87	49.53	159	97
79.26	49.91	45.08	29.04	31.76	61.97	49.50	187	98
71.50	50.44	47.37	25.56	51.03	48.81	49.12	101	99
87.83	44.54	48.21	20.05	21.69	71.99	49.05	146	100
61.59	50.84	56.33	52.84	20.41	50.43	48.74	196	101
80.58	46.88	43.20	51.51	2.57	67.10	48.64	179	102
63.53	52.17	55.18	45.32	36.22	38.57	48.50	097	103
74.42	49.24	33.66	34.06	37.73	60.53	48.28	136	104
77.48	44.78	45.47	49.64	11.93	60.15	48.24	191	105
68.12	48.31	53.69	47.33	22.83	49.10	48.23	203	106
67.68	48.09	49.85	35.38	43.36	44.89	48.21	107	107
78.47	44.93	47.51	28.02	24.84	65.11	48.15	152	108
71.82	45.34	38.17	32.49	34.22	65.09	47.85	225	109
70.06	43.28	49.64	40.43	29.74	53.52	47.78	178	110
78.22	46.10	49.75	24.34	35.24	51.58	47.54	113	111
75.14	46.12	53.85	54.79	2.03	52.23	47.36	130	112

Red shading indicates the presence of a criterion cut off indicating mandatory non-acceptance

Figure A12 (2): 2018 Cohort: ranked Nurse Match test scores less than one SD above the mean

61.34	43.66	33.82	48.43	29.93	64.55	46.96	106	113
73.90	43.11	45.54	32.68	34.19	51.95	46.90	123	114
59.79	46.96	51.37	46.85	29.62	46.34	46.82	086	115
66.02	43.51	52.29	27.30	32.70	58.37	46.70	211	116
68.93	46.44	54.23	32.97	27.38	48.57	46.42	145	117
75.93	45.84	40.12	27.61	26.37	62.58	46.41	056	118
45.73	46.15	43.84	47.54	44.06	50.63	46.33	051	119
60.01	45.09	33.58	30.02	51.65	56.14	46.08	138	120
61.38	48.35	45.28	40.44	33.04	47.99	46.08	034	121
66.22	48.78	54.15	40.63	25.88	40.43	46.02	099	122
81.77	41.91	46.98	29.98	12.06	62.42	45.85	209	123
68.17	40.90	34.59	28.36	33.13	67.05	45.37	110	124
70.34	42.62	45.87	37.31	19.89	56.16	45.36	214	125
58.79	49.04	38.34	36.42	46.33	42.50	45.24	089	126
44.97	46.66	29.39	49.04	38.73	61.07	44.98	044	127
68.18	44.88	44.58	38.12	19.16	54.88	44.97	103	128
59.57	41.24	36.13	37.20	40.04	53.93	44.69	227	129
57.19	38.45	37.02	40.70	32.07	61.62	44.51	063	130
65.44	43.12	43.93	42.52	25.90	45.35	44.38	164	131
61.21	36.62	44.59	24.73	44.18	54.18	44.25	088	132
66.90	43.97	24.07	28.98	48.16	52.98	44.18	024	133
74.30	44.70	33.81	26.38	33.30	51.88	44.06	129	134
66.41	42.08	31.44	38.16	26.59	59.55	44.04	157	135
71.57	44.17	38.18	42.50	18.68	45.78	43.48	023	136
74.46	41.80	28.00	30.97	18.35	65.41	43.17	096	137
69.47	50.22	39.94	45.23	10.92	43.08	43.14	040	138
58.38	46.80	37.45	38.70	34.77	41.83	42.99	151	139
47.66	32.11	32.57	36.04	46.99	62.22	42.93	014	140
58.46	35.14	38.88	31.13	37.72	56.13	42.88	201	141
69.06	38.72	38.21	26.48	29.65	54.66	42.80	135	142
65.60	39.10	44.81	37.73	20.11	47.68	42.51	087	143
75.35	38.58	44.98	20.82	19.65	55.07	42.41	094	144
69.23	44.37	32.30	37.74	21.45	49.13	42.37	167	145
66.38	38.87	43.80	19.63	42.09	42.88	42.27	035	146
64.22	40.92	45.63	38.43	22.64	40.98	42.14	073	147
48.49	43.37	29.85	59.37	30.52	41.08	42.11	046	148
64.42	42.85	39.71	29.70	24.08	51.57	42.05	175	149
63.65	36.44	38.72	26.94	30.81	55.61	42.03	116	150
65.14	41.28	38.32	32.44	12.30	61.30	41.80	140	151
52.19	42.22	34.57	23.23	51.92	46.36	41.75	005	152
59.92	38.58	39.20	41.63	16.51	53.49	41.56	217	153
67.66	37.99	44.14	18.34	31.73	46.63	41.08	061	154
57.04	42.03	38.89	31.14	36.47	40.55	41.02	223	155
47.04	39.79	32.15	38.98	40.09	47.63	40.95	009	156
64.89	41.04	45.50	20.59	30.61	42.99	40.94	021	157
60.35	36.76	42.19	30.43	24.10	51.29	40.85	199	158
54.64	40.76	35.65	35.05	35.14	43.53	40.79	192	159
65.07	40.74	47.30	36.77	10.78	43.18	40.64	122	160
61.87	35.44	38.78	30.69	35.69	41.12	40.60	019	161
69.10	37.55	40.95	21.98	15.86	54.89	40.05	197	162
65.67	36.36	37.01	24.57	32.27	44.36	40.04	166	163
76.91	35.32	40.92	24.29	8.41	54.37	40.04	207	164
73.70	35.20	45.07	22.82	16.56	46.54	39.98	153	165
51.28	35.05	24.92	37.18	36.44	51.91	39.46	084	166
45.88	36.95	51.40	42.83	24.34	34.62	39.34	121	167
55.82	38.19	40.96	22.00	38.04	40.99	39.33	208	168
52.82	39.04	33.96	36.53	32.35	41.17	39.31	033	169
42.59	41.09	31.32	52.22	15.31	50.61	38.86	162	170
56.01	35.91	35.14	24.66	35.31	45.48	38.75	222	171
53.10	36.44	30.48	34.98	20.41	54.69	38.35	041	172
53.81	33.87	37.05	26.01	39.04	40.25	38.34	069	173
47.54	37.91	34.64	29.75	39.40	38.93	38.03	133	174
51.39	38.62	40.60	38.26	22.93	33.49	37.55	067	175
60.62	37.06	47.36	41.99	3.25	33.74	37.34	134	176
30.81	35.07	28.51	23.05	59.14	47.30	37.31	043	177
50.41	35.79	29.19	24.79	36.10	45.76	37.01	053	178
44.33	30.64	26.15	37.76	32.50	50.27	36.94	013	179
57.06	30.76	26.14	19.38	38.85	48.80	36.83	119	180
52.53	44.69	50.65	28.55	13.71	28.22	36.39	070	181
71.08	36.77	37.08	32.85	-1.62	41.89	36.34	052	182
47.86	35.95	29.22	33.36	30.13	39.85	36.06	156	183
56.23	36.03	35.83	24.86	19.15	42.10	35.70	161	184
38.71	32.14	26.65	26.81	38.40	49.70	35.40	137	185
64.34	31.87	32.47	10.74	29.90	42.24	35.26	114	186
52.95	33.33	39.89	31.97	17.14	35.74	35.17	037	187
43.47	29.92	45.65	31.32	25.58	35.02	35.16	184	188
54.64	34.62	40.19	25.86	23.99	29.45	34.79	139	189
71.86	29.97	18.46	-0.42	27.11	57.12	34.02	018	190

Red shading indicates the presence of a criterion cut off indicating mandatory non-acceptance

Figure A12 (3): 2018 Cohort: ranked Nurse Match test scores up to one SD below the mean

35.08	32.14	28.98	34.34	32.18	39.41	33.69	055	191
40.02	35.85	50.50	23.93	41.14	10.52	33.66	010	192
60.89	31.55	35.60	24.35	7.48	40.30	33.36	171	193
60.11	34.08	26.75	26.85	16.66	35.60	33.34	204	194
56.93	28.48	19.14	24.53	21.13	48.73	33.16	025	195
48.46	35.06	29.24	19.74	34.89	30.52	32.98	144	196
45.07	24.95	35.10	14.04	42.39	35.75	32.88	068	197
54.65	34.52	22.09	21.31	24.64	39.27	32.75	158	198
52.87	23.05	21.01	15.39	28.46	53.23	32.33	059	199
37.20	26.03	27.93	34.21	20.71	46.20	32.05	128	200
59.04	27.39	28.57	15.32	18.79	40.52	31.60	077	201
40.40	29.48	27.25	27.95	26.07	37.30	31.41	168	202
35.60	22.12	28.30	23.93	31.92	45.30	31.19	115	203
35.98	25.24	23.44	22.87	40.67	38.70	31.15	212	204
52.26	33.84	32.67	14.84	15.04	37.43	31.01	174	205
43.64	26.54	16.81	18.64	36.51	42.99	30.86	042	206
48.69	29.99	25.46	25.91	19.68	34.50	30.71	210	207
44.01	22.55	21.29	23.95	7.15	65.27	30.70	218	208
50.24	26.86	35.52	22.68	19.03	29.32	30.61	108	209
40.88	22.96	9.91	22.24	26.98	51.73	29.12	045	210
50.85	24.24	18.08	22.97	16.36	41.55	29.01	205	211
31.53	26.62	12.43	23.03	33.51	41.23	28.06	028	212
48.70	22.04	20.60	16.90	11.31	43.13	27.11	190	213
31.62	22.55	28.68	19.17	24.60	34.86	26.91	219	214
32.81	18.85	18.56	7.91	36.24	42.04	26.07	029	215
40.66	20.48	0.88	28.11	16.60	48.14	25.81	022	216
38.33	25.35	19.16	20.48	17.72	30.30	25.22	165	217
42.16	20.21	19.68	20.42	7.96	40.04	25.08	098	218
53.13	20.99	22.11	12.19	4.92	33.15	24.42	074	219
53.37	20.77	17.79	-1.20	16.93	36.94	24.10	004	220
32.44	19.19	12.24	13.15	30.02	36.96	24.00	149	221
41.03	22.21	19.09	12.57	25.00	23.76	23.94	057	222
41.04	7.57	31.48	9.93	8.86	28.55	21.24	017	223
38.97	16.72	16.71	8.33	13.01	31.63	20.89	216	224
27.99	13.72	11.67	5.69	27.75	26.79	18.93	176	225
33.26	18.63	11.89	11.95	5.76	21.63	17.19	060	226
38.90	18.11	15.34	-2.56	17.51	14.85	17.02	091	227
15.58	12.87	7.76	13.25	24.25	9.84	13.93	193	228
65.08	46.03	45.73	39.23	36.45	54.39	47.82	mean	

Red shading indicates the presence of a criterion cut off indicating mandatory non-acceptance

Figure A12 (4): 2018 Cohort: ranked Nurse Match test scores > 1 SD below the mean

Appendix B: Tables

Table B1: Entities used in the replication study (italics indicate pilot study)

	Relevant entities (including aspects of self)
01	Ideal self
02	Self at school or work (<i>Self at work</i>)
03	Self at home
04	Self under pressure
05	Me two years ago
06	Me in five years' time
07	A disliked person (<i>The person I most dislike</i>)
08	A model nurse
09	A ward sister
10	Patients (<i>A typical patient</i>)
11	A bad nurse
12	My best friend
13	My parents

Table B2: The bi-polar attributes and values used in this study and the pilot study (italicised version)

	Professional Value	Contrasting Value
C 1	People's dignity and human rights always come first <i>(Patient dignity and human rights must come first)</i>	Sometimes need for help comes before people's dignity and human rights <i>(Sometimes medical care needs come before patient dignity and human rights)</i>
C 2	The safety of people in the workplace must come before anything else <i>(The safety of patients must come before anything else)</i>	Realistically safety at work may suffer as a result of pressure on staff and work resources <i>(Realistically patient safety may suffer because of pressure on staff and hospital resources)</i>
C 3	Routine and unpleasant tasks are part of everyday life for all <i>(Routine and unpleasant tasks are part of the everyday role of all nurses)</i>	Routine and unpleasant tasks are the responsibility of others <i>(Routine and unpleasant tasks should normally be the responsibility of less skilled nurses)</i>
C 4	People work best when working closely with others in a team <i>(Nurses work best when working closely with others in a medical team)</i>	People work best on their own <i>(Nurses work best when their individual competence character and decision making is encouraged)</i>
C 5	Is good at influencing people and getting them to follow instructions <i>(Can influence people and get them to follow instructions)</i>	Finds it hard to influence people and get them to follow instructions <i>(Finds it hard to influence people and get them to follow instructions)</i>
C 6	Learning and developing competencies should be a lifelong process for all staff <i>(Learning and developing competencies should be a lifelong process for all nurses)</i>	Learning and developing competencies is mainly for new workers, qualified people deliver the goods or services <i>(Learning and developing competencies is mainly for student nurses, qualified nurses mainly deliver nursing care)</i>
C 7	Can listen carefully and tune into what people mean <i>(Listens carefully and can tune into what others mean)</i>	Finds listening a distraction and prefers just to get on with the job <i>(Finds listening a distraction and prefers just to get on with the job)</i>
C 8	It is better to be open and honest in everything you do <i>(It is better for a nurse to be open and honest in all things)</i>	Sometimes it is wiser to manage truth in the best interests of all concerned <i>(Sometimes it is wiser to manage the truth in the greater interest of all concerned)</i>
C 9	Resource constraints at work are no excuse for lack of kindness and sympathy <i>(Resource constraints are no excuse for a lack of kindness compassion and sympathy)</i>	Pressure on resources can leave less room for kindness and sympathy <i>(Accept that pressures can leave less room for kindness compassion and sympathy)</i>
C10	You should be prepared to challenge someone more senior if you think it right to do so <i>(One should be prepared to challenge someone more senior if it is felt to be in the interests of the patient)</i>	You should not challenge someone more senior in any circumstances <i>(One should not challenge someone more senior in any circumstances)</i>
C11	Prefers to make the decisions within their area of competence <i>(Enjoy making decisions within their area of competence)</i>	In a shared area of competence sometimes prefers the other person to take decisions <i>(In a shared area of competence sometimes prefers the other person to take decisions)</i>
C12	Owens their work and takes personal responsibility for their judgement and action <i>(Owens their work and takes personal responsibility for their judgement and action)</i>	Adheres strictly to guidelines and instructions provided by those who know best <i>(Adheres strictly to guidelines and instructions which are at fault if things go wrong)</i>
C13	You should take the time necessary to do a job properly <i>(One should take the time needed to do the task properly)</i>	You must be quick and do the best you can in the time available <i>(One must be quick and do the best one can with the task in the time available)</i>
C14	Is a good communicator, easily understood <i>(Is a good communicator, always understood)</i>	Is not a good communicator, often misunderstood <i>(Is not a good communicator, often misunderstood)</i>
C15	Usually relates well to others <i>(Relates well to others)</i>	Often misunderstands others and has problems relating to them <i>(Often misunderstands and has problems relating to others)</i>
C16	Can be relied upon <i>(Can be relied upon)</i>	May not meet commitments <i>(Real world can affect reliability)</i>
C17	Works best with minimal supervision <i>(Does the job with minimal supervision)</i>	Works best when managed by others <i>(Works best when managed by others)</i>
C18	Generally, understand situations <i>(Generally, understands situations)</i>	Sometimes misunderstands situations <i>(Sometimes misunderstands situations)</i>
C19	Often pauses and reflects on how things have gone <i>(Often pauses and reflects on how things have gone)</i>	Rarely takes time to reflect on how things have gone <i>(Rarely takes time to reflect on how things have gone)</i>
C20	Is always thinking about the other person <i>(Is always thinking about the other person)</i>	Focuses on their own needs and priorities <i>(Focuses on their own needs and priorities)</i>

Table B3: Nurse Match: feedback from students on the pilot and replication studies

Pilot Study	%	%	Replication of Pilot Study
STUDENT NURSES (N = 63)			NURSING APPLICANTS (N = 225)
Easy/mostly easy to complete	98	94	Easy/mostly easy to complete
Easy/mostly easy to understand	95	97	Easy/mostly easy to understand
No key nursing values missing	94	83	No relevant nursing values missing
Interesting to complete	90	65	Interesting/mostly to complete
Not too challenging to complete	90	19	Difficult/quite to complete
Responses easy and intuitive	84	93	Responses easy and intuitive
Issues raised were important	83	88	No irrelevant issues raised
Felt needed more time to complete	8	6	Felt needed more time to complete
FREE TEXT synopsis			FREE TEXT synopsis
Different: puzzling questions: obvious answers to a nurse			Different; made you think: easy straightforward allowing intuitive responses but some testing questions posed; lengthy and repetitive nature, boring tedious and difficult to understand; use of some 'entities' found puzzling;
			Lists of attributes were suggested that need not/might have been tested for. Most had in fact been included; some 'need not' seemed ill-informed (communication, commitment, reliability, caring, listening ...). Those not included were noted for future reference.

Appendix C: One Table

Table C1: The full set (N = 228) of applicant leadership scores rank ordered.

R/O	SUI	CONF	COMM	DMC	CIO	H&I	GCS	EMP	ICT	ACC	L_score
1	65	91.19	88.10	89.29	88.98	88.41	85.66	83.84	90.42	87.58	88.16
2	188	84.91	88.96	85.70	90.67	85.44	97.32	94.13	78.17	87.22	88.06
3	30	83.49	83.02	78.80	84.45	77.78	88.90	81.45	85.55	76.66	82.23
4	206	79.06	85.24	83.90	79.29	80.27	70.76	86.97	83.76	79.21	80.94
5	169	69.09	84.76	83.78	74.29	84.63	70.27	88.32	71.31	68.32	77.20
6	148	72.87	75.95	75.37	77.62	75.06	85.30	84.09	66.48	73.13	76.21
7	226	68.07	79.56	81.83	70.00	76.59	77.79	92.31	65.30	72.51	75.99
8	125	71.52	72.07	75.45	75.17	71.42	86.02	86.72	66.49	75.05	75.54
9	8	73.47	81.59	75.73	72.75	72.06	75.88	81.86	72.22	71.85	75.27
10	100	75.38	72.57	72.74	74.57	72.20	85.09	76.54	76.34	70.33	75.09
11	185	69.80	83.81	78.00	70.40	84.22	66.46	75.74	74.79	70.97	74.91
12	224	71.69	76.48	71.96	80.20	68.23	86.61	84.94	59.06	73.85	74.78
13	170	68.78	68.79	69.24	76.75	74.92	93.21	91.28	57.30	66.62	74.10
14	27	68.87	84.11	68.49	80.44	79.70	79.80	76.91	61.50	65.04	73.87
15	48	73.53	71.54	72.96	73.07	65.51	79.57	82.63	71.53	70.93	73.48
16	76	68.55	72.58	75.15	70.55	74.53	75.38	84.09	68.83	69.33	73.22
17	66	62.67	70.78	68.57	77.05	63.95	95.00	89.85	53.94	70.53	72.48
18	71	63.26	74.60	68.50	73.26	69.56	86.75	80.69	60.75	68.78	71.80
19	194	69.71	76.22	73.51	70.11	67.01	73.17	74.46	68.54	70.31	71.45
20	177	69.90	65.65	78.41	67.42	70.09	72.56	70.87	69.37	76.81	71.23
21	172	74.45	73.34	68.45	78.90	67.24	79.71	76.07	54.79	66.01	71.00
22	49	66.15	72.73	71.84	71.85	66.96	77.51	82.92	58.34	67.27	70.62
23	147	73.52	69.97	64.58	73.00	57.53	80.71	74.39	71.03	66.49	70.14
24	32	60.74	73.71	69.57	70.44	72.44	78.81	86.40	51.21	67.68	70.11
25	126	66.37	82.58	68.09	71.96	82.94	70.30	64.28	62.25	60.92	69.97
26	72	62.45	71.81	63.06	76.46	65.19	90.09	85.03	42.31	67.69	69.34
27	78	57.69	75.15	71.71	67.76	77.88	62.90	80.33	58.05	61.94	68.16
28	160	69.16	67.79	60.96	71.83	57.88	83.63	74.58	64.13	60.26	67.80
29	15	67.60	66.63	65.18	68.41	70.83	75.19	77.85	59.12	58.47	67.70
30	109	62.50	76.63	67.15	69.12	68.71	73.70	77.33	51.51	62.25	67.66
31	163	72.78	76.92	64.10	70.63	70.94	73.08	55.77	62.64	61.54	67.60
32	90	64.14	62.96	66.02	64.24	66.43	80.35	73.58	70.27	59.41	67.49
33	182	62.62	68.73	65.96	67.88	66.28	76.92	71.25	56.14	67.20	67.00
34	6	58.91	73.57	68.54	67.17	71.69	74.27	68.42	55.43	64.83	66.98
35	79	65.41	73.76	60.73	73.03	60.38	81.21	74.25	53.87	57.69	66.70
36	186	58.07	71.72	72.90	60.38	68.60	62.63	75.80	65.23	63.24	66.51
37	102	57.43	72.01	69.37	61.26	66.40	64.16	82.44	61.72	62.83	66.40
38	62	64.11	71.06	64.95	66.95	70.31	70.02	67.24	61.16	58.68	66.05
39	142	61.43	68.05	64.28	65.83	69.70	72.63	74.01	59.40	56.13	65.72

40	58	58.49	75.67	70.76	63.99	71.32	56.89	69.10	61.27	62.91	65.60
41	155	60.22	63.51	68.29	65.94	60.25	65.28	80.72	63.47	61.45	65.46
42	200	60.10	69.57	67.35	64.97	58.31	71.36	79.40	57.51	59.76	65.37
43	38	63.78	65.90	67.37	63.66	60.03	68.39	63.87	66.95	67.92	65.32
44	215	63.18	77.63	65.18	66.07	72.27	59.10	55.99	65.35	60.11	64.99
45	118	64.91	66.15	64.51	69.47	60.29	77.58	62.09	53.59	62.22	64.54
46	64	63.67	69.86	65.68	62.03	63.67	62.47	69.24	65.83	57.50	64.44
47	195	60.25	64.91	59.49	66.94	59.62	76.76	72.65	56.78	59.50	64.10
48	85	61.00	60.60	65.72	56.69	61.97	67.71	74.30	52.68	63.97	62.74
49	220	66.38	57.33	56.25	68.74	49.82	78.66	70.53	56.28	55.46	62.16
50	141	63.67	65.70	62.08	66.43	54.02	70.30	63.66	54.01	58.51	62.04
51	213	54.11	61.03	55.05	64.08	46.24	82.44	86.93	54.12	51.51	61.72
52	189	57.02	65.37	63.01	60.94	65.96	67.65	57.27	53.54	58.76	61.06
53	31	52.89	61.39	61.19	61.52	56.98	69.45	82.27	48.24	52.63	60.73
54	95	60.82	73.87	60.34	62.58	70.25	64.77	53.34	48.82	51.35	60.68
55	104	58.87	66.14	57.64	62.68	67.08	74.31	64.00	45.47	48.86	60.56
56	36	59.09	63.62	59.63	64.87	58.16	52.03	62.36	60.10	54.47	59.37
57	154	53.94	57.67	57.34	54.96	62.04	76.32	73.47	43.68	52.85	59.14
58	131	57.34	63.76	62.92	56.67	54.62	57.55	75.57	52.82	50.07	59.03
59	105	56.44	75.14	57.80	61.16	59.80	55.48	61.16	48.47	54.37	58.87
60	47	58.29	64.85	54.20	62.26	58.10	62.88	67.13	50.50	50.95	58.80
61	187	54.90	60.94	59.72	63.42	53.05	71.06	65.98	47.17	50.50	58.53
62	7	62.33	56.10	58.17	59.45	53.46	66.28	59.39	52.57	57.31	58.34
63	112	55.43	53.43	58.00	59.65	42.62	75.76	66.54	52.56	57.69	57.96
64	124	49.58	66.75	58.60	55.26	58.07	59.64	73.54	43.21	54.93	57.73
65	2	60.93	56.97	57.39	58.14	53.97	52.03	59.37	66.56	53.84	57.69
66	183	54.19	63.07	58.73	58.89	55.71	58.35	68.01	50.08	50.64	57.52
67	39	57.87	60.89	56.78	63.42	57.99	67.33	49.94	47.71	55.45	57.48
68	81	53.76	61.86	57.18	61.18	51.60	69.32	60.71	46.46	55.00	57.45
69	83	52.31	61.77	60.74	52.35	57.09	61.86	63.91	44.37	61.59	57.33
70	146	44.90	60.72	57.20	57.28	53.89	70.36	81.44	39.45	50.53	57.31
71	136	54.47	56.80	57.90	62.41	48.44	64.82	71.14	48.13	50.80	57.21
72	179	51.37	69.37	54.27	62.76	66.38	65.48	67.97	27.64	49.18	57.16
73	202	54.91	65.92	52.68	67.22	59.19	66.65	48.42	40.91	58.33	57.14
74	127	57.98	58.59	54.41	62.12	52.85	57.88	63.12	44.57	59.02	56.73
75	3	58.99	59.37	52.59	60.54	43.08	63.49	59.65	61.87	50.64	56.69
76	111	59.02	57.40	52.46	58.57	45.11	65.11	63.03	55.69	53.41	56.64
77	16	56.23	56.85	53.16	53.34	72.16	69.61	60.27	37.16	48.62	56.38
78	80	57.79	55.38	53.75	58.97	51.83	67.88	62.20	48.21	48.78	56.09
79	82	57.55	59.37	47.18	64.02	62.91	58.41	52.46	49.57	51.78	55.92
80	92	58.51	65.00	51.78	62.15	52.20	63.10	48.54	49.69	51.81	55.87
81	198	53.96	62.11	55.83	57.56	63.71	51.20	49.96	56.47	51.73	55.84
82	50	54.25	59.76	57.96	52.31	61.80	51.92	53.04	57.35	50.79	55.47

83	26	51.48	56.35	48.37	59.21	47.93	67.32	73.10	42.85	49.68	55.14
84	180	45.61	67.98	57.15	53.33	60.21	48.13	70.29	39.36	53.82	55.10
85	54	52.37	53.39	56.38	55.71	53.40	57.46	61.24	49.18	53.69	54.76
86	228	61.19	65.24	56.16	59.39	58.38	47.17	44.59	50.58	48.88	54.62
87	221	51.52	47.32	56.13	52.95	38.93	64.83	76.70	57.70	45.17	54.58
88	56	53.77	50.72	52.58	61.53	49.83	72.50	64.17	42.01	42.92	54.45
89	138	54.11	57.80	52.53	58.56	43.37	55.82	66.07	53.75	47.04	54.34
90	143	52.72	57.59	51.99	55.23	53.85	63.11	59.27	47.14	47.15	54.23
91	96	44.20	60.65	48.93	61.41	43.18	73.59	78.49	25.04	52.25	54.20
92	24	54.32	52.02	49.18	63.15	33.10	69.16	67.99	52.85	45.85	54.18
93	101	52.34	53.64	58.04	54.70	53.26	55.47	57.16	51.12	50.69	54.05
94	75	52.46	51.89	48.29	55.09	46.20	73.89	65.37	48.39	43.22	53.87
95	11	52.22	60.86	56.88	53.10	56.60	58.20	55.47	41.64	49.56	53.84
96	110	45.13	60.09	51.45	53.77	50.15	65.54	69.54	45.19	43.01	53.76
97	44	52.08	55.07	50.88	57.75	37.42	68.32	62.30	51.74	47.22	53.64
98	173	52.71	53.79	52.28	55.74	55.29	54.86	61.09	49.91	46.62	53.59
99	113	49.29	55.76	59.15	53.64	54.74	51.23	59.82	50.04	48.46	53.57
100	191	53.25	58.69	51.96	58.43	53.99	61.89	62.11	36.61	44.47	53.49
101	132	52.77	54.17	54.16	55.21	57.71	68.14	50.33	36.57	52.32	53.49
102	120	55.41	53.61	52.43	57.12	52.57	56.21	56.25	50.57	46.10	53.36
103	106	51.92	55.29	46.22	59.43	43.19	71.42	70.42	37.97	43.14	53.22
104	1	54.66	58.30	55.25	55.20	52.96	51.93	51.30	43.30	55.99	53.21
105	225	45.03	47.46	50.76	56.39	44.36	68.99	78.61	35.15	51.58	53.15
106	152	47.48	51.25	52.71	54.45	56.25	65.67	69.64	37.96	42.71	53.13
107	181	48.17	69.99	50.36	53.18	55.63	54.55	44.81	43.76	52.42	52.54
108	93	49.97	56.98	51.00	52.73	54.04	63.84	50.20	44.39	49.48	52.51
109	150	49.64	51.19	55.75	48.22	56.41	48.16	58.38	52.36	47.34	51.94
110	129	51.75	51.99	50.57	57.46	43.02	61.56	67.27	32.46	50.84	51.88
111	117	52.57	47.23	54.55	49.94	51.38	62.12	55.82	42.84	50.17	51.85
112	20	44.74	60.52	52.29	48.94	54.80	56.32	48.30	46.40	53.99	51.81
113	89	53.39	59.86	53.74	58.87	53.84	46.38	42.26	48.35	48.05	51.64
114	123	53.79	53.91	46.09	56.56	47.43	56.22	57.35	48.88	42.36	51.40
115	12	52.23	61.19	46.74	55.76	59.17	54.14	43.22	38.20	51.23	51.32
116	227	58.81	40.74	43.06	59.07	36.28	71.76	68.50	39.89	41.04	51.02
117	63	50.76	54.13	47.36	53.60	44.53	66.92	63.49	41.41	36.27	50.94
118	209	41.38	47.12	50.19	52.07	40.94	73.33	74.04	27.80	51.39	50.92
119	34	47.94	54.65	51.37	54.17	49.94	61.00	49.72	39.44	47.60	50.65
120	107	49.23	61.37	51.75	50.30	52.80	50.31	47.15	44.82	47.79	50.61
121	130	47.16	58.86	51.42	52.95	59.03	59.54	49.48	30.60	46.19	50.58
122	23	52.55	48.12	47.26	58.70	46.17	63.09	59.67	30.27	47.18	50.34
123	178	49.36	48.77	47.41	50.64	35.68	68.37	64.65	41.78	45.77	50.27
124	157	48.46	41.45	37.87	62.11	40.41	78.61	72.13	28.46	42.34	50.20
125	203	47.45	53.89	49.98	51.89	52.54	61.85	45.42	39.91	46.68	49.96

126	175	52.36	51.46	46.71	57.23	41.36	65.03	50.38	45.21	38.22	49.77
127	167	41.38	58.42	46.31	56.58	53.59	55.65	58.64	24.99	52.14	49.74
128	135	43.77	59.32	45.74	53.15	44.77	57.15	61.50	38.58	42.18	49.57
129	159	45.05	51.78	50.63	45.89	50.18	48.10	57.22	44.66	49.00	49.17
130	145	47.90	50.74	55.71	46.84	56.17	35.24	51.98	52.87	43.84	49.03
131	103	47.33	52.18	41.62	55.84	50.24	66.25	54.11	30.50	42.57	48.96
132	97	44.61	53.09	53.41	48.16	50.87	55.12	39.48	43.12	51.70	48.84
133	46	51.72	63.11	41.87	56.74	37.03	61.02	44.73	36.98	45.32	48.72
134	116	47.80	52.54	46.99	51.59	45.80	57.57	60.13	36.37	39.62	48.71
135	86	47.85	56.49	51.57	49.45	55.23	43.74	41.80	44.80	46.38	48.59
136	196	43.75	48.88	44.82	46.72	47.85	66.51	49.37	40.83	45.21	48.22
137	211	38.86	54.76	49.97	47.50	50.78	48.07	51.80	43.60	48.26	48.18
138	214	40.98	47.74	45.66	49.30	50.35	59.79	65.53	27.27	46.84	48.16
139	164	52.40	44.55	44.81	52.05	49.67	57.86	55.39	35.85	40.12	48.08
140	40	47.41	50.87	43.80	56.79	51.46	57.69	48.98	28.39	45.97	47.93
141	51	46.88	48.78	52.30	44.87	39.18	47.12	49.86	56.40	45.50	47.88
142	151	48.66	50.05	48.87	52.37	49.00	47.45	46.47	41.86	44.41	47.68
143	5	47.55	53.72	48.82	48.53	45.33	44.17	52.74	45.34	42.90	47.68
144	9	49.92	57.07	41.49	55.38	39.19	54.68	45.03	46.98	38.70	47.60
145	84	49.62	53.81	43.27	54.51	37.92	56.02	53.94	40.19	36.01	47.25
146	14	44.79	46.17	36.89	48.85	30.93	69.61	69.35	40.94	36.12	47.07
147	197	42.62	53.22	45.93	51.41	50.71	50.66	56.98	34.19	37.10	46.98
148	18	39.85	48.09	42.92	53.68	26.27	69.62	69.51	33.47	38.87	46.92
149	73	45.57	59.18	43.83	48.95	47.53	48.99	47.28	32.44	45.61	46.60
150	99	47.48	42.40	47.40	49.36	51.17	59.56	41.38	36.46	43.35	46.51
151	94	40.93	48.95	46.78	45.78	46.13	55.58	57.05	36.88	38.13	46.24
152	140	33.77	42.68	46.38	45.22	41.09	61.28	66.64	31.24	44.57	45.87
153	199	36.74	54.04	49.14	42.32	52.78	53.99	55.13	24.81	38.75	45.30
154	201	51.34	34.74	45.88	46.79	40.56	51.27	59.34	42.12	35.27	45.26
155	35	41.90	47.38	47.80	43.49	40.12	50.47	49.87	44.05	41.18	45.14
156	192	44.00	48.53	43.90	48.40	44.31	48.51	50.25	35.80	42.40	45.12
157	19	42.04	55.35	41.83	44.79	36.76	49.21	51.50	41.31	41.33	44.90
158	223	40.61	45.50	45.90	46.97	35.92	51.25	46.35	45.48	44.43	44.71
159	88	39.46	48.59	43.90	39.98	46.21	47.08	62.08	32.94	41.58	44.65
160	162	43.79	51.32	40.62	51.86	43.42	54.84	42.47	33.53	38.02	44.43
161	53	37.90	55.68	47.78	42.85	39.90	42.77	49.68	39.04	43.07	44.30
162	207	31.16	37.22	48.79	42.62	37.37	56.45	72.68	24.17	47.87	44.26
163	222	43.94	44.19	44.13	47.26	38.77	50.70	49.23	42.66	37.07	44.22
164	87	38.17	44.85	40.70	44.51	40.76	58.80	54.70	30.38	42.10	43.89
165	133	33.06	59.13	45.35	44.07	48.57	39.98	45.81	30.70	47.02	43.74
166	21	35.58	47.59	45.30	43.23	44.85	46.02	50.84	34.93	44.84	43.69
167	33	43.03	46.62	45.08	46.86	41.20	46.85	44.62	37.30	41.34	43.66
168	61	39.30	41.03	44.67	45.21	37.58	52.00	52.53	36.68	43.61	43.62

169	114	47.95	52.20	43.31	47.68	39.58	44.14	44.63	41.02	30.04	43.40
170	13	44.73	49.62	37.33	48.49	37.52	47.05	51.56	35.71	35.41	43.05
171	166	41.93	39.87	43.48	47.27	38.58	44.70	50.56	41.26	38.64	42.92
172	41	41.85	44.28	38.54	46.43	37.91	56.15	52.12	35.43	32.73	42.83
173	158	46.11	54.28	37.66	55.62	38.13	42.69	37.82	35.43	34.66	42.49
174	217	43.34	38.47	37.87	45.29	48.41	54.75	53.34	28.57	31.86	42.43
175	208	40.80	49.35	45.41	39.88	42.59	42.60	41.55	39.77	38.61	42.29
176	43	41.81	54.87	41.24	42.29	32.84	35.18	38.50	58.37	33.48	42.06
177	153	40.99	42.72	40.90	41.52	43.03	51.19	54.10	24.75	36.62	41.76
178	52	38.76	46.84	42.08	46.73	44.82	48.28	49.68	16.72	41.21	41.68
179	161	38.38	52.73	38.89	45.70	40.56	45.77	41.87	32.88	36.99	41.53
180	137	41.01	48.20	39.12	45.44	38.29	45.46	42.89	40.83	30.04	41.25
181	122	42.08	38.54	39.28	45.32	46.15	46.04	42.01	28.74	39.91	40.90
182	204	43.83	39.92	38.23	49.26	38.95	52.77	45.83	24.84	33.32	40.77
183	119	42.26	30.26	36.73	46.71	29.47	53.83	62.16	32.82	32.16	40.71
184	69	38.63	36.98	39.35	41.75	35.73	49.20	47.17	32.46	37.66	39.88
185	171	35.51	51.64	43.83	39.52	46.47	42.15	42.28	20.96	35.58	39.77
186	59	33.40	44.87	38.05	37.15	32.89	46.06	65.89	25.10	30.32	39.30
187	144	41.39	47.41	39.62	44.30	36.86	33.39	31.21	41.51	35.86	39.06
188	134	38.99	45.37	38.01	39.67	44.60	47.20	37.68	23.92	35.27	38.97
189	45	37.24	38.42	33.93	46.38	26.35	50.25	62.93	20.92	33.11	38.84
190	67	39.39	44.64	37.91	42.62	45.95	40.87	32.85	28.26	36.93	38.82
191	77	38.88	45.71	38.64	41.18	30.34	41.56	47.80	30.97	32.03	38.57
192	22	35.18	51.89	33.67	44.68	31.99	48.58	59.27	11.56	30.24	38.56
193	25	40.37	27.34	35.51	42.88	31.69	50.51	60.87	29.97	27.63	38.53
194	156	34.18	27.71	36.42	42.86	34.24	56.67	55.19	18.49	40.14	38.43
195	210	41.90	45.15	35.84	43.70	32.90	40.96	40.12	28.17	31.04	37.75
196	42	33.96	45.96	36.03	40.37	30.26	35.90	45.72	35.85	32.14	37.36
197	37	35.29	42.47	36.98	38.33	39.60	44.67	37.64	21.03	38.71	37.19
198	55	35.95	36.00	39.27	40.38	35.63	39.87	38.21	29.85	37.98	37.02
199	121	33.54	46.81	35.83	35.69	45.67	28.92	27.75	38.26	37.58	36.67
200	70	29.54	43.61	40.61	31.21	46.51	39.51	28.62	29.76	37.94	36.37
201	205	27.65	43.78	32.33	38.17	26.44	38.99	53.00	21.85	37.73	35.55
202	128	33.62	41.93	31.25	34.29	31.03	50.84	42.65	27.73	23.49	35.20
203	139	35.85	35.42	35.92	38.36	36.38	38.92	29.24	30.00	35.82	35.10
204	218	29.81	25.89	30.37	37.56	24.44	58.14	68.26	14.26	27.04	35.08
205	28	34.38	38.61	30.75	40.06	25.97	37.08	44.74	33.15	29.06	34.87
206	168	34.79	50.07	33.86	36.12	35.22	30.64	31.44	31.64	27.83	34.62
207	174	26.22	22.37	35.30	34.97	35.25	54.86	49.34	11.86	36.47	34.07
208	190	32.91	41.02	31.95	37.77	24.52	35.98	46.55	25.55	28.74	33.89
209	212	29.50	45.18	25.21	37.45	29.46	34.34	42.08	28.13	31.88	33.69
210	68	34.56	35.76	31.17	33.04	33.37	37.58	40.04	30.84	26.78	33.68
211	165	35.10	44.69	34.99	38.48	32.59	31.54	28.20	24.94	26.03	32.95

212	108	29.77	34.13	32.65	33.64	28.50	39.67	38.91	21.66	34.52	32.60
213	115	32.70	18.95	27.13	32.52	27.51	50.56	45.86	29.32	20.20	31.64
214	29	35.89	32.20	31.37	29.91	28.65	34.78	46.72	29.02	16.11	31.63
215	149	35.18	37.65	25.73	36.79	25.19	39.52	38.73	24.88	18.29	31.33
216	57	28.81	39.82	25.97	37.30	29.73	33.90	35.12	25.23	23.51	31.04
217	4	32.34	20.05	32.85	33.44	13.74	36.09	52.21	28.44	25.09	30.47
218	184	30.76	25.51	31.86	26.79	38.29	24.65	36.11	29.12	28.67	30.19
219	98	35.10	23.71	25.24	31.13	26.31	44.55	44.80	19.35	13.58	29.31
220	74	24.87	30.95	23.50	35.02	22.73	38.60	40.36	13.79	29.85	28.85
221	10	31.13	18.40	32.53	23.97	32.86	31.29	20.60	28.19	31.98	27.88
222	219	30.73	18.66	27.74	24.33	20.99	38.15	30.37	28.85	20.09	26.66
223	216	25.94	30.00	19.91	34.17	24.47	37.89	30.71	14.61	16.93	26.07
224	176	23.81	23.25	16.06	26.63	14.00	22.03	33.55	34.30	12.62	22.91
225	60	20.31	28.10	22.72	23.92	15.34	23.50	23.47	18.44	21.16	21.89
226	91	23.55	16.20	26.12	24.67	12.21	23.33	18.24	27.47	18.43	21.14
227	17	9.23	9.90	15.81	14.64	19.78	41.92	46.71	-13.84	20.83	18.33
228	193	21.72	16.93	15.93	18.26	12.46	14.42	16.44	18.00	12.93	16.34
	Mean	49.57	54.47	50.58	53.70	49.47	58.30	58.36	43.21	47.03	51.63
	SD	13.20	14.99	14.11	13.35	15.42	15.25	15.74	15.51	14.17	13.40