The development of a new method of idiographic measurement for dynamic assessment intervention

Emma Hurley, Raegan Murphy

Abstract: This paper proposes a new method of idiographic measurement for dynamic assessment (DA) intervention. There are two main methods of measurement for DA intervention; split –half tests and integrated scoring systems. Split-half tests of ability have proved useful from a research perspective. Integrated scoring systems coupled with case studies are useful from a practitioner perspective. The purpose of this research is to bridge the gap between research and practice by developing a methodology that is compatible with both. To this end the paper proposes a measureable idiographic method of measurement, which utilises multi-dimensional scaling (MDS) and general procrustean analysis (GPA) to analyse the result of card-sort data gathered from a learner across the entire intervention. This approach provides a method of assessment, which is both compatible with individual intervention and suited to building a body of evidence-based research for DA. An example of the method in practice is given for illustrative purposes. The initial results suggest that this approach provides a methodology that satisfies the requirements of both practitioners when formulating targeted intervention and researchers who require methods of measurement of change in ability of the individual over time.

Key words: dynamic assessment; idiographic measurement; multi-dimensional scaling; general procrustean analysis; change-based assessment; personal construct theory; implicit association test.

Introduction

Ireland has an inclusive education framework, which was initially introduced in the 1998 Education Act on foot of an EU directive regarding class-

room integration. Students in formal education are taught based on chronological age. Classrooms consist of students of the same age and of varying ability, including children with mild general learning difficulties and Downs Syndrome. Individual learning support is currently accessed through assessment by an educational psychologist. A child must be diagnosed as being below average ability to qualify for support. Currently students with specific learning difficulties are poorly supported. Children, who would benefit from learning support, do not qualify for support under these grounds. Such groups include, among others, second language students, minority groups such as asylum seekers or members of The Travelling Community (a native ethnic minority group in Ireland). Specific grants are available to schools with high numbers of second language students, asylum seeking children and low-socioeconomic standard students. In an inclusive classroom, where the breath of ability is wider than had previously been the case, this presents difficulties both for the teacher and the learners (Lodge & Lynch, 2004). However the Irish education system as it pertains to assessment is still very much grounded in a normative, psychometric system. This system made sense when classrooms were segregated according to ability but the heterogeneous nature of the modern classroom requires a different approach. Dynamic assessment is well posed to resolve many of these challenges. It offers the possibility of providing learning support to students regardless of their source of difficulty. However, DA itself has issues of its own to address in order to establish itself as a solid methodology for targeted, individualised learning support.

In 1998 Sternberg and Grigorenko identified what they described as the macro and micro-requirements for the successful progression of dynamic assessment in science and practice. This suggests a need to go back to basics regarding theory formulation. Since that paper there have been a number of published works seeking to address this issue (Lidz & Elliott, 2000; Murphy, 2011; Sternberg & Grigorenko, 2002). By macro-requirements Sternberg and Grigorenko are referring to the philosophical and theoretical underpinnings of research and practice. It is useful to consider why DA lacks a firm foundation in this regard. In relation to macro-requirements perhaps one of the great disadvantages dynamic assessment faces is one of historical timing.

By the time DA emerged as a method of learning support, the psychometric school had already strongly established itself as the principle theoretical approach towards assessment in educational psychology. The birth of formal secondary education and psychometric evaluation of performance in

Europe occurred at roughly the same time, the turn of the 20th Century. This came about very soon after the first experimental labs were set up for the study of psychology from a scientific perspective. The focus of psychology in general and, by extension, educational psychology was staunchly nomothetic.

The streaming of students according to ability was also grounded in the prevailing philosophy and historic context of the time. It was asserted that ability, once measured, would not significantly change over the course of education. Binet's work (1905) on intelligence testing, was as a result, largely misunderstood and formed the basis for static, psychometric testing. Works by Vygotsky (1978) and Luria (1976) meanwhile, remained unpublished in the West until the 1970s. This resulted in educational psychology being strongly identified with a nomothetic, norm-based approach; the philosophical foundations of which lay in genetic pre-determination of intelligence and ability. Thus it was a logical progression to draw on nomothetic models of measurement and teaching. This had been the dominant model ever since.

The focus of much DA research has been to undermine some of the key arguments of this dominant approach; principally that cognitive ability is not modifiable. Inroads in this regard have been moderately successful. Using nomothetic methods of analysis as a primary method of evaluation of DA is problematic however and suggests that DA is on the periphery of a dominant theory rather than an approach in its own right (Haywood, 2008; Murphy, 2011; Sternberg & Grigorenko, 2002).

A previous paper proposes such a framework; namely, integrated social-learning theory (ISLT). (Hurley, 2013a). ISLT combines writing, research and theory from socio-cultural learning theories and person-centred theories with research and theory on idiographic measurement. The purpose of proposing this integration of compatible theories is to expand the framework within which DA is situates itself to allow current gaps in research and practice to be usefully addressed.

Vygotsky (1978), Feuerstein (1979) and Bruner's (1960) theories on the context of learning are well documented. Social learning theory also includes the work of Bandura (1971), Bronfenbrenner, (1979) and Rogoff (2003). The influence of context on learning is an integral aspect of these theorists. The concepts described are similar to the assertions made by Harré in more recent works such as The Single Self (1998). While the experimental school of psychology assumes reality is objective, social psychology assumes that the individual's experience of reality is subjective. Logically, such theories fit well with the work of Mischel (1973) who emphasises the context-specific nature

of cognitive social learning and Kelly's personal construct theory (1955). The principle difficulty then is that in order to provide a body of evidence-based research DA must draw on compatible theories of measurement. Van Geert has already made progress in relation to scientific observation of dynamic systems in teaching (1994) and is the only writer in DA whose method of measurement satisfies the criteria necessary for scientific research in DA as described by Sternberg and Grigorenko (2002).

As stated earlier nomothetic models of research have proved moderately successful in eroding the notion that intelligence is immutable. In this context this is a valid approach. However DA is principally interested in the individual. Such models are not suitably informative for DA practice at the level of the individual. The alternative is to use case study or integrated methods of measurement within intervention sessions to evaluate learning progress. These methods are useful at the level of the individual and are information rich but they do not allow for the adequate method of comparison crucial to evidence-based practice and research. While the idiographic nature of these approaches are suited to DA a measurable method of individual assessment is needed.

There have been a handful of papers which have strongly advocated for an idiographic approach to research in psychology in general (Allport, 1937; Barratt, 2003; Harré, 1998 & Runyan, 1983).

Within this philosophy;

Each person is initially conceived of as a possibly unique system of interacting dynamic processes, the unfolding of which gives rise to an individual life trajectory in a high-dimensional psychological space. (Molenaar, 2004, p. 2002)

Finally the role of the mediator must be considered. Nomothetic approaches and the philosophy ingrained in this approach demands that intervention be standardised. The assessor must be objective. This is not compatible with targeted, individualised learning support. However with clarity of purpose and inclusive framework, ISLT argues that it is possible to standardise the role of the mediator without detracting from the dynamic nature of DA intervention. In fact this issue has been largely addressed by Lidz's mediated learning experience or MLE (1991). Still some would argue that there is too much scope for interpretation regarding correct procedure within an intervention session. Drawing from principles described by Rogers (1955), for example, addresses some of these concerns. Rogers' theory of moving toward the ideal-self from the actual-self (1955) is similar to Vygotsky's ZPD (1978).

Utilising the very clear procedures Rogers outlines regarding client/professional interaction allows for a standardisation of behaviour within sessions without detracting from the necessary dynamic nature of such interaction.

Therefore the assumptions of ISLT are that ISLT places itself as a viable, rational alternative to nomothetic, psychometric approaches to assessment and learning in a psycho-educational setting and hence the focus of research is idiographic. The individual cannot be considered without the social or cultural context. The person's experience of their world is subjective. The dynamic nature of learning is a core aspect of ISLT and learning ability is malleable. The aim of intervention is the maximisation of learning potential and ISLT recognises that the goal of self-actualisation in learning is copasetic with person-centred approaches in psychology in general.

Outcomes of a Clear Theoretical Framework

Diagnosis is not necessary for support; rather, those 'not-flourishing' within the education system are assessed using suitable methodology and DA intervention. Drawing on the collective theories of the writers mentioned gives DA a clear theoretical framework within which to situate itself coupled with a clear methodology for research and practice. Although learning potential should be maximised and regard for the malleability of ability be emphasised, learning support is nonetheless a finite exercise. As such, intervention tailored to the individual requires the efficient use of resources.

In order to provide evidence-based research within this framework, research into measurable methods of assessment should be developed. The protocol for studies carried out is contained in the methodology section of this paper. The flowing is a discussion of the methods used.

Elements of the current methodology: Open card-sort

Card-sorts are grounded in Kelly's personal construct theory (Fransella, 2005; Fransella, Bell & Bannister, 2003; Kelly, 1955). The card-sort technique was developed by Kelly as a method of structuring idiographic data; the resultant grid giving a structured representation of the person's subjective world and their place in it relative to the people or institutions in that world. Typically the method is used in a clinical or counselling setting as a tool for bringing into focus how the person experiences their own world, how they view themselves in it and how they relate to the people in their world. A multiple card-sort provides a snapshot in time of the person's own

subjective reality. The method has been used in areas of addiction and anger management intervention for example; card-sort results are compared across the span of intervention to ascertain if the client is moving in a positive direction (Hammond & O'Rourke, 2007). From the grids produced during the card-sort process it is possible to extrapolate information regarding improvement or decline in areas such as self-esteem and self-efficacy. The current research utilises an open, multiple card-sort technique. The purpose of this approach is to elicit how the participant views their world with a minimum of interference from the researcher or mediator.

Multi-dimensional scaling

The data from the card-sort sessions is then subjected to multi-dimensional scaling (Kurskal & Wish, 1978). The purpose of this technique is to represent the position of multiple data points in Euclidian space (Young, 1987). Multi-dimensional scaling (MDS) techniques transfer the data collected from card-sort sessions into visual representations of that data. Data from each sort is mapped onto a multidimensional space (Steyvers, 2002; Whaley & Longoria, 2008). MDS, a scale reduction technique, reduces this multi-dimensional space into a two-dimensional representation of that space (Buja, Swayne, Littman, Dean & Hoffamnn, 2008). Points on the map represent elements (or in this case people) and their relationship to the individual. Using Euclidian geometry, points on the resultant map represent a person's position in their subjective world in relation to other people in the world (Hammond & O'Rourke, 2007). The parameters of the map are dictated by the person's construal of the constructs that they produced during the card-sort process (the number of levels they identified for each construct) combined with the number of card sorts that were elicited during that session. Each map represents a slice of time in that person's existence. Over the course of intervention subsequent 'snapshots' using this technique may be taken to evaluate change.

The constructs provided by the individual during the assessment phase give insight to the person's self-concept. Using a method of comparison it is possible to extrapolate how the person views themselves in terms of self-esteem, self –efficacy, intelligence and other constructs of importance to the learning process. By comparing their position on the map with other individuals it is possible to see those individuals on the map with which they most closely identify. The subsequent conclusions drawn by the mediator are interpretive. Does the person identify with a positive or negative peer group? Does the person identify with the formal education with which they are engaged? Does the person have a positive view of teachers and if so are they positioned closely on the map with such people or at a distance?

General Procrustean Analysis (GPA)

Each life-space map produced using multi-dimensional scaling has its own parameters dictated by the combination of constructs elicited and the number of levels identified by the learner for each construct. In order to usefully compare maps across time it is necessary to subject maps to general procrustean analysis, which transposes the maps generated during the MDS onto a common space, rendering them measurably comparable.

By taking a snapshot of that person's universe across >1 times prior to intervention we can examine these patterns and trajectories and estimate the likelihood of speed and direction of movement of the individual's elements across times. In order to establish a baseline the first two sets of card-sort data (T1 and T2) are subjected to GPA. This provides us with a centroid map that takes account of error or change prior to intervention. This baseline map is then used for comparison with subsequent maps. Given that the distances between elements on these maps both within and across times can be measured in a meaningful way, we can then measure the impact of an intervention on an individual.

By examining the baseline and subsequent movement of the individual through their own universe or subjective world and by taking into account the subsequent positioning of themselves relative to other people or elements on the map we can assess the efficacy of the intervention.

Implicit association test (IAT) to measure implicit attitudes to education

An expected outcome of intervention is the useful engagement of the individual in their educational environment. In keeping with the idiographic focus of this study an idiographic method of measuring change in attitude; an implicit association test was used (Greenwald, McGhee & Schwartz, 1998). It is hypothesised that as the individual becomes more effective as a learner, so too will their attitudes to learning improve.

The picture IAT measuring attitudes to formal education (Hurley, 2013b) consists of eight neutral images as measured by the International Affective Picture System (Lang, Bradley & Cuthbert, 2008) and eight formal education images, eight positive words and eight negative words. Words used required a low level of literacy (reading age 8) and are combined with visual stimuli in order to control for literacy effects and avoid cultural bias. It is hypothesised that the combination of these methodologies of measurement will provide DA with a suite of idiographic tools for individual assessment that will use-

fully inform intervention from a practitioner perspective while meeting the scientific standards of measurement required for evidence-based research.

Methodology

This study tests the viability of an idiographic method of assessment that preserves the richness of a case study assessment while allowing for scientific measurement of change and as such is a pilot of the proposed methodology. The purpose of this study from which this example is taken was to test the viability of the methodology with individuals identified as not flourishing with the formal education system in Ireland. Kevin, aged 17, was participating in a government-funded music project, which supports school leavers from challenging backgrounds. Kevin had been suspended seven times during his secondary education and exhibited anti-social tendencies. At the time of the first session Kevin was unemployed and living with his parents.

Protocol

Session 1 - Card-sort.
Two week break
Session 2 - Card-sort, IAT test.
Sessions 3, 4, 5 - DA intervention (one session a week for three weeks).
Session 6 – Card-sort and IAT test.
Session 7, 8, 9 - DA intervention (one session a week for three weeks).
Session 10 - Card-sort, IAT test exit interview.

Four card-sorts are carried out. The first two card-sorts prior to intervention give a centroid configuration, or baseline, for comparison with subsequent sorts. GPA allows co-ordinates in the multi-dimensional spaces to be compared in a meaningful, robust manner. The third card-sort was carried out at the mid-point of intervention and the fourth upon completion of the intervention sessions.

The intervention consisted of six DA intervention sessions comprising puzzles and tasks targeting cognitive reasoning exercises, meta-cognition, focus and memory. Sessions took place once a week and lasted between an hour to an hour and thirty minutes. Three IAT tests were undertaken at the beginning, middle and end of the intervention process (times 2, 6 and 10).

The Protocol for card-sort sessions

The mediator begins with a pile of blank cards and a marker. The participant is invited to name the people currently interacting with them on a regular basis. The participant begins to name people. Typically the person will name their immediate family and friends first. The mediator writes a name and their relationship to the participant on each card. When the process is exhausted the mediator prompts the participant to name anyone they may be forgetting. The purpose is to gather the names of all of the people the participant interacts with on a regular basis regardless of the opinion the participant may have of them.

Once this process is complete the participant is asked to name a construct. Constructs elicited must fall along a polarised continuum. Again it is important not to direct the participant. Participants will ask what is meant by this, prompts such as 'what is important to you?' "What do you not like?" are acceptable. Once a theme is elicited it may be necessary to "ladder-up" (Kelly, 1955) in order to reach the kernel of the construct the participant is describing. For example if a participant cites 'family' as something that is important to them in order to isolate the concept it is necessary to enquire further. "Why is family important to you?" Common responses such as "because I can depend on them", "because they love me no matter what" can be further laddered until clear constructs such as trust, love, dependability are reached. The participant is then invited to sort the cards they have generated into levels along the construct. The participant begins with the first card and considers how they would categorise that person. They then compare this with their second card, placing this card to the left or right (or with) the first depending on whether that person scores higher or lower on that construct. Using this method of comparison the participants places all of their cards on the table. This produces a sort based on the person's own definition of the construct and their own perception of the number of levels that construct can have based on their own experience. Each level is then given a rank score. Cards are rank-scored on a continuum from negative to positive. The most positive = 1, followed by increasingly negative scores (2, 3, 4 and so on depending on the number of levels elicited). Scores for each sort are then recorded. This process is repeated until the participant can no longer generate constructs. For subsequent card-sort sessions the steps are the same. No reference is made to constructs elicited in previous sessions unless the participant expressly names them themselves. Therefore the data collected consists of a number of open card-sorts based on a number of constructs in any one session.

IAT test protocol

The IAT test is a computer-based task, which lasts approximately ten minutes. Similar to a Stroop task, words and images flash on-screen (1935). Participants are asked to match and sort words and images into pleasant and unpleasant (good and bad) according to the images or words that appear in the centre of the screen. Within the task are trials, which instruct the participant to sort negative words with neutral images, positive words with neutral images, negative words with formal education images and positive words with formal education images. The participant hits either the 'E' or 'I' key on the keyboard to sort images into their correct category for that trial. The combination which is most congruent with the person's own attitudes (say school/bad, neutral/good) results in a faster reaction time for selection, conversely the combination which is least congruent with the persons own, implicit attitude results in deeper processing and so reaction times for selection into the correct category for that trial are slower. Reaction times for the participant are recorded by the computer program, resulting in two reaction times per millisecond; one for school/bad, neutral/good and one for school/good, neutral/bad. The differential between the two, represented as seconds to two decimal places gives an indication of the degree (mild to extreme) to which the person holds that attitude. For the purposes of this paper we are interested in the change in attitude of the individual to formal education over the course of intervention.

In the example given to follow, four multiple-open card-sorts were carried out. MDS and GPA analysis were carried out using software developed by Sean Hammond (2014) based on equations first described in Lingoes, Roskam, and Borg (1979).

Ethics

The study was ethically approved by the Ethics Committee in University College Cork (2012). People engaging in the program from which this example is drawn were given a presentation and talk as to the purpose of the study. They were given examples of the types of exercises that would be involved in the intervention phase. They were shown how the IAT test worked and how the card-sort would be carried out. It was explained that literacy was not a requirement to take part in the study. Participants were offered a small incentive for completing the study – a €20 voucher of their choosing. Participants were then given consent forms that they could either return to the researcher or the co-ordinator of the project. Eleven people returned signed consent forms. The Psychological Society Code of Ethics was adhered to (2008).

Results

The first map (Figure 1) indicates that Kevin identifies strongly with his immediate family. There is however some distance between him and his older brother and grandfather. Interestingly he sees himself as different from his peers, friends and in particular some people he admires such as his tutor and his friends brother (who is in the Navy). Kevin has expressed a desire to join the Navy.

There is also a distinct grouping of women he views in a positive light – his friend, the project co-ordinator and one of his tutors. These people are positioned away from him in a similar manner to the 'positive male' group.

There is also a very clear division in the map between everyone and Pa, Kevin's acquaintance. While it might be useful to exclude this person from the analysis this extreme positioning of an individual Kevin dislikes indicates a positive orientation towards the other people in his world.

```
        ME/younger bro/other family          Grandad  older bro
                mother Dad
            Aunty       Godfather
                                                    wayne acq
Thomas    Fr bro/John tutor*     Pro co-ord /art tutor/ sharah fr (F)
          Ian friend


                Cian fr













        Pa(acq)
```

Figure 1: Map at time 1 participant 1

Figure 2, below, is the second map from Kevin. What is interesting here is the similarity between the two maps. The purpose of taking a number of card-sorts prior to intervention is to provide a centroid map or baseline for comparison. General Procrustean Analysis reveals that these maps are indeed very similar with goodness of fit scores of .82 and .83 to the centroid respectively suggesting high stability (low levels of change) within the individual's dynamic system.
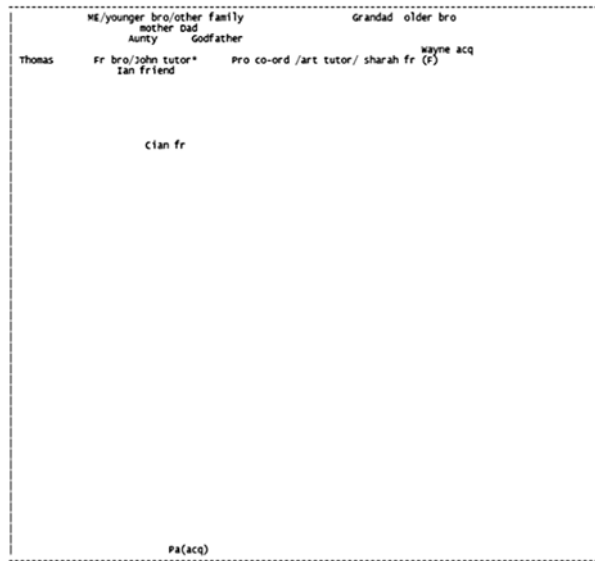
Figure 2: Map at time 2 participant 1.

The map below (figure 3) represents Kevin's perception of his social world and his place in it after three intervention sessions. The map is similar to an account of descriptive analyses in a nomothetic context. It provides an overview of initial data. Subjective interpretation of the map on the part of the mediator is possible at this juncture. For example it can be seen that Kevin now identifies more strongly with his peer group than his immediate family and he aligns himself with peers he sees to be mature indicating identification with a positive peer group. However actual change or movement can only be fully established by referring to GPA output for goodness of fit, uniqueness and co-ordinate comparisons.
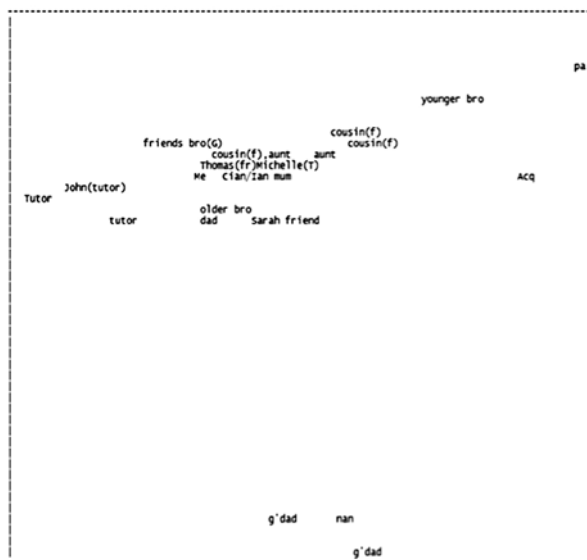
Figure 3: Map at time 3, participant 1.

GPA analysis

A perfect fit = 1. A fit of 1 indicates no change or departure from the initial configuration. Uniqueness is commonly construed as error; for idiographic purposes uniqueness indicates change or difference between configurations after intervention and hence a less good fit indicates change.

Table 1
Degree of changes at times three and four.

Case	Weights	Fit	Uniqueness
3	0.7257	0.7440	0.4465
4	1.2743	0.8052	0.3517

Comparison of times 3 and 4 with centroid configuration

These results indicate that the greatest change occurs at time 3, after three sessions of intervention; uniqueness = .45 with a lesser degree of uniqueness compared to the centroid configuration at time 4 after six sessions of intervention; uniqueness= .35. These results indicate that the intervention had an effect however this effect decreased between times three and six of the intervention sessions.

These results indicate the intervention effected change but after an optimal number of sessions it was effective at a decreasing rate.

Results from card-sorts over the course of intervention can effectively direct and target intervention and give an indication of optimal number of sessions required per participant.

Results from IAT test

Kevin's IAT scores indicate that his attitude to education has changed over the course of intervention.

Table 2

IAT scores - measuring attitudes to formal education (reaction times in seconds)

	Neutral good/school bad	Neutral bad/school good	Difference
Time 1	1013.83	1234.1	-220.27
Time 2	931.88	1057.8	-125.92
Time 3	982.05	844.3	137.75

Results indicate that Kevin has a negative attitude to education initially however this attitude had changed steadily from negative to positive over the course of intervention. He now maintained regular eye contact and smiled. Kevin was asked if his IAT scores were an accurate reflection of his attitude to learning. He was enthusiastic in confirming this. Kevin's primary reason for his positive attitude to the study was the collaborative nature of the dynamic assessment process. He felt that he was an active agent in the process. He didn't, as he put it "just have to sit down and shut-up." This was a common theme among participants in this study. He also liked being able to say what he would like to target in terms of learning. In conclusion, the measurement method used provides a scientific basis for measuring change. From a practitioner perspective the life-space maps provide a clear indication of the movement of the individual in terms of self-esteem and self-efficacy in particular. The use of cognitive-reasoning puzzles to maximise learning potential during support sessions improves performance and transfers to real-world situations including more effective engagement in education and work settings.

Discussion

Results from multi-dimensional scaling (MDS) and general procrustean analysis (GPA) of the data gathered using an open card-sort technique indicate that the development of a measurable idiographic tool for the assessment of a cognitive reasoning intervention firmly grounded in dynamic assessment is a very viable methodology. Further, data generated from the procrustean analysis of the data results in data co-ordinates comparable both within and across life-space maps. This allows for a quantitative measurement of qualitative change resulting in unique measurement method particularly suited for use in a one-to-one psycho-educational setting. This method of idiographic measurement integrates assessment and intervention in a manner that is useful to both the practitioner and researcher alike.

There were some difficulties with the study. Initially it was intended that the protocol for this study last thirteen weeks. It was intended that a baseline (centroid map) be generated by carrying out the card-sort with each participant three times over a six-week period prior to the commencement of intervention. This would give a more robust measure of change over the course of intervention. However it quickly transpired that participant fatigue (or more accurately boredom) was an issue with this approach. Therefore it was decided to reduce initial card-sorts from three to two for this initial study. Since then a number of changes have been made to the card-sort section of the study. This makes this element of the study less effortful for the participant. It is also worth noting that fatigue may not be such an issue with younger participants who are the focus of upcoming studies who may engage with the card-sort process differently. A pilot study of the card-sort process suggests that more positive engagement by younger participants is likely. In any case a computerised participant-interactive version of this card-sort process would reduce participant fatigue and is under consideration.

The issue of transference of knowledge and its application in the classroom setting was not fully addressed in this study, although reports from tutors of the individuals are positive. Future research should incorporate reliable data on performance of the individual in the education setting before and after intervention. The lasting effects of intervention should be accounted for in future studies by taking card-sort measures and IAT scores one month after intervention. This methodology is potentially a valuable contribution to measurable idiographic methods in dynamic assessment and marries well with Paul Van Geert's dynamic systems theory (1994). A clear philosophical foundation briefly described here (ISLT) provides a framework for further investigation.

References

Allport, G. W. (1937). *Personality: A psychological interpretation.* New York: Holt.

Bandura A. (1971). *Social learning theory.* Stanford*:* General Learning Corporation.

Barrett, P.T. (2003). Beyond psychometrics: measurement, non-quantitative structure, and applied numerics. *Journal of Managerial Psychology, 18*(3), 421-439.

Binet, A., & Simon, T. (1905). Application des methods nouvelles au diagnostic du niveau Intellectual des anormaux d'hospice et d'école primaire. [Application of new methods for the diagnosis of intellectual level of abnormal persons in institutions and elementary schools]. *Année Psychologique*, 11, 245-336.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design.* Cambridge, MA.: Harvard University Press.

Bruner, J. S. (1960). The process of education. Cambridge, Mass: Harvard University Press.

Buja, A, Swayne, D., Littman, M.L. Dean, N., & Hoffamnn, H. (2008) Interactive data visualization with multidimensional scaling. *Journal of Computational and Graphical Statistics, 17*(2), 444–472.

Education Act (1998). Dail Eireann Ireland.

Feuerstein, R. (1979). *The dynamic assessment of retarded performance.* Baltimore, MD.: University Park Press.

Fransella, F. (2005). *the essential practitioners' handbook of personal construct psychology.* John Chichester, UK: Wiley & Sons.

Fransella, F., Bell, R., & Bannister, D. A. (2003). *Manual for repertory grid technique.* UK: John Wiley & Sons.

Hammond, S. (2014). *MDA and GPA software for analysis of idiographic data form multiple card-sorts.* Copyright 2014.

Hammond, S., & O'Rourke, M. (2007). The measurement of individual change: A didactic account of an idiographic approach. *Psychology, Crime & Law 13*(1), 81 – 95.

Harré, R. (1998). *The singular self: An introduction to the psychology of personhood.* London: Sage.

Haywood, H. C. (2008). Twenty years of IACEP, and a focus on dynamic assessment: Progress, problems, and prospects. *Journal of Cognitive Education and Psychology. 7*(3), 419-442.

Hurley, E. (2013a). Integrated social learning theory - A dynamic alternative to current theory and practice in psycho-educational assessment and intervention for marginalized individuals. Presentation *IACEP Conference, Leiden*, The Netherlands.

Hurley, E. (2013b). An IAT test measuring attitudes to formal education. Copyright E. Hurley.

Kelly, G.A. (1955). *The psychology of personal constructs.* New York: Norton.

Kruskal, J.B., & Wish, M. (1978). *Multidimensional scaling.* Sage University Paper series on Quantitative Applications in the Social Sciences. Beverly Hills and London: Sage Publications.

Lang, P.J., Bradley, M.M., & Cuthbert, B.N. (2008). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual.* Technical Report A-8. University of Florida. USA.

Lidz, C. S. (1991). *A Practitioner's guide to dynamic assessment.* New York : Guilford Press.

Lidz, C.S., & Elliott, J.G. (2000). *Dynamic assessment: Prevailing models and applications.* USA: Elsevier Science.

Lingoes, J.C., Roskam, E.E., & Borg, I. (1979). *Geometric representations of relational data- readings in multidimensional scaling.* USA: Mathesis Press.

Lodge, A., & Lynch, K (2004). *Diversity at school.* Dublin: The Equality Authority.

Luria, A.R. (1976). *Cognitive development: Its cultural and social foundations.* USA: Harvard University Press.

Luria, A.R. (1979). *The making of mind: A personal account of soviet psychology.* Cambridge, MA.: Harvard University Press.

Mischel, W. (1973). Toward a cognitive social learning reconceptualization of personality. *Psychological Review, 80*(4), 252-283.

Molenaar, P.C.M. (2004). A manifesto on psychology as idiographic science: bringing the person back into scientific psychology, this time forever. *Measurement, 2*(4), 201-218.

Murphy, R. (2010). *Dynamic assessment, intelligence and measurement.* London: Wiley & Sons. London.

Psychological Society of Ireland. (2008). *Code of professional ethics.* Dublin: Psychological Society of Ireland.

Rogers, C. (1959). A theory of therapy, personality and interpersonal relationships as developed in the client-centered framework. In S. Koch (Ed.). *Psychology: A study of a science. Vol. 3: Formulations of the Person and the Social Context.* New York: McGraw Hill.

Rogoff, B. (2003). *The cultural nature of human development.* New York: Oxford University Press.

Runyan, W.M. (1983). Idiographic goals and measures in the study of lives. *Journal of Personality. 51*(3), 413-437.

Sternberg, R. J., & Grigorenko, E. L. (2002). *Dynamic testing: The nature and measurement of learning potential.* Cambridge: Cambridge University Press.

Steyvers, M. (2002). Multidimensional scaling. In: *Encyclopedia of cognitive science.*

Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology. 18*(6), 643-662.

Van Geert, P. (1994). *Dynamic systems of development.* UK: Harvester Wheatsheaf.

Vygotsky, L. S. (1978). *Mind in Society: The development of higher-order psychological processes.* Cambridge, MA: Harvard University Press.

Whaley, A., & Longoria, R.A. (2008). Preparing Card Sort Data for Multidimensional Scaling Analysis in Social Psychological Research: A Methodological Approach. *The Journal of Social Psychology, 148*(2), 105-115.

Young, F.W. (1987). *Multidimensional Scaling: History, Theory, and Applications.* New York: Erlbaum Associates.

Authors:

Emma Hurley
University College Cork
College of Arts, Celtic Studies and Social Sciences
School of Applied Psychology
Cork Enterprise Centre, North Mall
University College Cork
Cork
Ireland
Email: emma.hurley@ucc.ie

Raegan Murphy, Ph.D.
University College Cork
College of Arts, Celtic Studies and Social Sciences
School of Applied Psychology
Cork Enterprise Centre, North Mall
University College Cork
Cork
Ireland
Email: raegan.murphy@ucc.ie