Title:

Measuring task embedded information processing capacity during occupational performance: an application of Rasch Measurement

Authors:

Melissa T Nott, BAppSc(OT)Hons

PhD Candidate, Faculty of Health Sciences, The University of Sydney

Christine Chapparo, MA, PhD, DipOT (NSW)

Senior Lecturer, Faculty of Health Sciences, The University of Sydney

Contact:

Melissa Nott

School of Occupation and Leisure Sciences

Faculty of Health Sciences

The University of Sydney

PO Box 170

LIDCOMBE NSW 1825

Phone: (02) 9351 9509

Fax: (02) 9351 9197

mnot2529@mail.usyd.edu.au

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Abstract: Rasch analysis methods have been applied to data derived from the Perceive, Recall, Plan and Perform (PRPP) System of Task Analysis; a standardised, criterion referenced assessment developed for occupational therapists to assess cognitive information processing through task analysis.

Methods

Data has been collected from adults and children with information processing difficulties. Performance of functional tasks was assessed in the hospital environment, at home, school, work, and in the community. Tasks were selected according to the person's level of ability at the time of assessment, the person's life roles and environmental influences.

Results

A linear continuum of item difficulty measures and person ability measures was created. The hierarchical ordering of items conformed to the hypothesised order of skill acquisition based on an information-processing model, and demonstrated goodness-of-fit with the Rasch model. Items and person demonstrated excellent separation reliability. The item hierarchy was compared and contrasted between adults and children, between different diagnostic groups and between persons with information processing difficulties and matched controls. The ordering of persons on the linear continuum clearly differentiated between these sub-groups in the analysis.

Key words: information processing, task analysis, occupational therapy, assessment, Rasch analysis

1. INTRODUCTION

Occupational therapists use functional assessments to determine an individual's level of performance on particular tasks and activities and to identify the individual's underlying capacities and limitations. Functional assessments are often observational in nature, in which the occupational therapist observes and assesses the performance of an individual client in a particular context. The Perceive, Recall, Plan and Perform (PRPP) System of Task Analysis is an assessment system specifically designed to enable occupational therapists to examine an individual's cognitive information processing through task analysis methodology, and enables simultaneous measurement of occupational mastery, information processing capacity, and contextual influences (Chapparo & Ranka, 1997).

The PRPP System of Task Analysis is a standardised, two stage, criterion referenced assessment. Unlike traditional methods of psychological testing, in which all clients are administered the same test components, this client centered approach enables assessment and retraining in any task selected as a priority by the client and/or carer. The underlying assumption of the assessment system is that cognition makes an indispensible contribution to occupational performance, and that the capacity of people to process the cognitive demands inherent in everyday tasks can be identified and used to determine the need for occupational therapy intervention (Chapparo & Ranka, 1997; Chrenka, Hutton, Klinger & Aptima, 2001). The purpose of the assessment is to identify difficulties in specific information processing strategies during task performance and to provide a focus for intervention.

The PRPP System is a two-stage analysis. Stage 1 employs a standard behavioural task analysis whereby task performance is broken down into steps, and errors in performance are identified, generating an overall measure of mastery for specific and relevant occupations (Kirwan & Ainsworth, 1992). Stage 2 focuses on information processing behaviours required for performance by using a cognitive task analysis, and is the focus of this paper. Cognitive task analysis is a family of assessment methods that describe the cognitive processes that underlie performance of tasks and the cognitive strategies used to respond adeptly to complex situations (Militello & Hutton, 1998; Schraagen, Chipman & Shalin, 2000).

The PRPP System conceptually divides cognitive processing strategies used during task performance into four categories: sensory perception (Perceive), memory (Recall), response planning and evaluation (Plan), and performance monitoring (Perform). These are depicted as the central 'quadrants' in the PRPP Model (Figure 1, Chapparo & Ranka, 2005). **Insert Figure 1 near here**

The PRPP conceptual model (Figure 1) roughly mirrors the staged processing flow of information that is found in most models of information processing (Figure 2). Information processing theory is one of the predominant theories of cognition (Eysenck & Keane, 2000), and along with occupational performance (Chapparo & Ranka, 1997), forms the theoretical basis of the PRPP assessment system. **Insert Figure 2 near here**

Information processing models trace the flow of information from initial reception, organisation and processing of the information, through to formulating and enacting a response to the information (See Figure 2). The human brain, or information processor, receives information as input, stores it in memory, organises the information, facilitates various strategies for problem solving and decision making, and generates a response to the information (Goetz, Hall & Fetsco, 1989; Huitt, 2003).

1.1. The Rasch Model

The type of information collected using the PRPP System of Task Analysis can be effectively analysed using Rasch models. Some of the inherent difficulties encountered when applying traditional test methods can be overcome.

Observational based assessments, including task analysis, produce estimates of ability based on ordinal rating scales. These are often treated as interval level data but fundamentally are not. This has previously limited the range of statistical procedures available to examine the findings of observational based assessments. Rasch measurement provides an avenue to overcome this limitation by converting the ordinal rankings into interval measures by logistic transformation into equal-interval units expressed as logits (log odds unit: Bond & Fox, 2001). These interval measures can then be summed to provide an accurate total PRPP measure. Previously, summing of the raw ordinal scores lead to difficulties in interpreting this score, as the process of summing all items on the assessment assumed that all items were equal in difficulty. In reality, items on the PRPP System of Task Analysis are known to examine different aspects of information processing that require varying levels of skill and ability. Transformation of raw ordinal ratings to linear measures ensures that individuals who score well on more difficult items are more fairly rewarded by a greater contribution towards their total PRPP measure in comparison to individuals who do well at the easier items and are unable to perform the more complex information processing tasks.

The unit of examination to which the PRPP System is usually applied in a clinical context is an individual client. In a research context, this may expand to a small sample of clients who share a specific diagnosis or clinical feature; however within these small samples, individuals continue to demonstrate unique variations of diagnosis specific behaviours. Small sample sizes and individual variation has previously been a limitation when working with traditional test methods as adequate power could not be achieved in parametric statistics. Rasch analysis methods are capable of measuring item and person parameters on relatively small samples, and can be applied to pilot research and early stages of assessment development.

As mentioned above, the PRPP System departs from traditional methods of psychological testing whereby each client is required to answer every test item or perform the same assessment tasks. The PRPP System of assessment is based on analysing performance of a relevant life task that is selected by the client, carer and therapist, as a priority for assessment and treatment. This unique feature results in data collected using a standardised behavioural observation protocol, across a wide variety of occupational tasks and activities. This has previously been a limitation when applying traditional test methods, as many data analysis models require all subjects to have completed the same set of tasks. Rasch analysis methods allow individual clients to perform different tasks and enables coding of this within the person variable name or as a separate factor in multi-faceted models of Rasch analysis.

Rasch analysis methods also provide a significant advantage over traditional test methods, by accommodating larger amounts of missing data. Cases that may have previously been excluded from analysis due to missing data points can be included in a Rasch analysis, as the model is able to accurately estimate a person or item parameter from a smaller subset of data points. This is particularly useful in the context of clinical research, when clients are not always available for data collection at the required time, do not always attend appointments, or in situations where raters are located across sites and are not able to observe and score all clients.

The Rasch model is particularly useful for investigating aspects of human performance with developmental aspects such as information processing. Rasch models incorporate the key property of sensitivity to ordered skill acquisition, enabling the estimation of developmental distances between skills or between individuals (Bond & Fox, 2001).

2. METHODS

2.1. Sample

The sample included in this analysis represents several diagnostic groups; different age groups and various occupational performance contexts (Refer to Table 1). **Insert Table 1 here.**

2.2. Procedures

Two data collection methods were used. The PRPP System of Task Analysis was used to measure task performance following direct observation or via questionnaire. Adults with traumatic brain injury (TBI), schizophrenia and children with learning difficulties were assessed by an occupational therapist using the PRPP System of Task Analysis following direct observation of task performance.

Primary school teachers completed the PRPP Questionnaire, rating the information processing skill of each child during social participation activities in the classroom. This included children with learning difficulties and matched controls. Adults with chronic pain self-rated their performance during work tasks using the PRPP Questionnaire. These clients were also assessed by an occupational therapist using the PRPP Questionnaire.

A 3-point scale was used in the direct observation method, whereby each descriptor behaviour (represented in the outer ring of the PRPP System Figure 1) is scored according to the following scale:

1= performance does not meet criterion expectations; performance inhibited

2= performance meets criterion expectations but indicates concern due to timing or prompts needed

3= performance meets criterion expectations; reasonable time; without assistance or prompts

The questionnaire offered a greater range of response categories, also used to score each descriptor behaviour. A 5-point scale was used to rate each information processing skill area, whereby:

1= very seldom able to do this

2= seldom able to perform; considerable effort required or difficulty experienced

3= sometimes able to do this OR able to do but extra effort required or difficulty experienced

4= usually able to do this; occasional extra effort required or difficulty experienced

5= almost always able to do this; no extra effort required or difficulty experienced

2.3. Data analysis

Raw ordinal scores for each descriptor item from the PRPP scoring sheets were entered into the WINSTEPS programme for Rasch analysis (Linacre, 2006). Two forms of analysis were performed. The first analysis examined the information processing abilities of persons and the difficulty of the PRPP items. Each item score represented an individual descriptor from the PRPP System of Task Analysis (n=34). Each person score represented a unique client/task/rater combination. In some instances, clients performed more than one task and/or were rated by more than one rater; therefore one client may be represented several times in the data set (n= 422). Although using data from clients tested repeatedly is a potential limitation of this study, this reflects the usual clinical practice of assessing a single person performing a number of tasks of different difficulty levels.

Each person participated in occupational tasks relevant to their age and occupational goals. For children these included school tasks such as cutting and pasting, and social participation tasks. Tasks performed by adults included self care tasks such as grooming, dressing and eating, meal preparation tasks, and work tasks such as administrative work and manual labour. A coding letter was included in each person label to identify the task performed.

The second form of analysis involved exporting the “Person measures” which represent the client’s total PRPP measure (information processing ability) after calibration using Rasch analysis. These linear measures were then subjected to univariate analysis using SPSS. Differences between groups were considered significant at $p<.05$.

3. RESULTS & DISCUSSION

3.1. Creating a linear continuum of information processing skills

Logarithmic transformation of raw ordinal scores to interval measures using Rasch analysis has provided a linear continuum along which the 34 test items were measured. These 34 items represent the 34 PRPP descriptors on the outer circle of the PRPP System of Task Analysis (Figure 1). This process calibrates each item to reflect the level of difficulty, or level of person ability required to respond correctly to the item.

Before examining the hierarchical order of items, the degree to which each item fits with the Rasch model was examined. When an observed pattern of responses fails to conform to the expectations of the Rasch model, the mean square residual and the t-statistic provide an indicator of how unexpected the response pattern is. For the purpose of this study, items having mean square values that deviated more than 1 ± 0.4 in addition to a standardised t value greater than +2 or less than -2 were highlighted for further investigation (Bond & Fox, 2001; Wright & Linacre, 1994). Fit statistics are provided in Table 2. The PRPP items ‘Judges’ and ‘Coordinates’ were targeted for further examination as the both the outfit mean square and residual values for these items fell outside the above stated parameters. Very low fit statistics such as these indicate overly predictable response patterns, that is, the item is behaving too consistently. **Insert Table 2 near here.**

A principal component analysis was conducted to further examine model fit. The empirical variance (88.3%) very closely matched the modelled variance (88.5%) indicating that the PRPP System of Task Analysis conforms to the expectations of the Rasch model.

Table 2 displays the PRPP items in order from most difficult at the top to least difficult at the bottom. Rasch calibrated measures for PRPP items range from 31.38 logits to 64.96 logits with a mean = 50.23 logits (SD = 7.86). Values have been rescaled to a range of 0-100 for clarity of reporting and interpretation.

This hierarchy of items represents the hierarchical acquisition of information processing capacities as suggested by the PRPP System and the underlying models of information processing upon which it is based. The order is congruent with the staged flow of information processing (Refer to Figure 2: Bohannon & Bonvillian, 2005; Huitt, 2003; Lerner, 1997). Items representing early stages of sensory input and registration such as noticing, recognising and categorising items in the surrounding environment, matching aspects of objects and the environment, and recalling how to use objects are ordered in the lower portion of the hierarchy indicating the need to acquire automaticity in these Sensory Register and Short Term Memory processing strategies before progressing to higher order skills.

Complex cognitive processing involving executive functions such as analysing, questioning and judging aspects of behaviour, identifying obstacles to performance, sequencing and choosing task actions are ordered in the upper portion of the hierarchy. These processes are represented in the Executive Control component of the information processing model.

Items reflecting recall abilities such as contextualising to time, place and duration, recall of body use and recall of task steps are ordered throughout the hierarchy supporting the fundamental functional role of these strategies at all levels of information processing and occupational performance. Skills related to the fundamental processes of recognising, categorising, and labelling aspects of task performance are represented in the lower portion of the continuum. These skills form a foundation upon which more complex interactions between short-term and long-term memory can occur. These individuals demonstrate the ability to contextualise to place before being able to contextualise to time in regards to recalling appropriate procedures for task performance. The most complex of these recall skills was the ability to contextualise to task duration.

Information processing skills that support performance are located in the mid section of the continuum with some items extending higher. The ability to achieve good flow in task performance, that is, between task steps and sub-tasks was the highest ordered item from the Perform quadrant. The abilities to adjust to the task demands, calibrate, coordinate, and time actions were located near the mean measure of item difficulties.

3.2. Item and person reliability

The separation reliability for items and persons was excellent. Reliability of persons = 0.94 indicating that 4 levels of performance can be statistically discriminated in this sample. Higher levels of separation suggest greater sensitivity of the PRPP System in identifying different levels of information processing ability. The reliability of items = 0.99, indicating that the sample is large enough to locate items precisely on the latent trait, and separate these items into 8 or 9 different strata.

3.3. Comparing the linear continuum of information processing across different groups

3.3.1. Information processing in adults and children

The PRPP System was developed for assessment of adults and children. When performing age appropriate tasks, the information processing requirements of occupational performance should be similar in adults and children. The underlying information processing model is equally applicable to both adults and children. Children participated in school tasks such as cutting and pasting, and social participation tasks. Adults performed self care tasks such as grooming, dressing and eating, meal preparation tasks, and work tasks such as administrative work and manual labour.

The hierarchical order of items varied slightly when compared between adults and children (Refer to Table 3). In general, more complex skills related to executive functions remained in the highest portion of the hierarchy, with less complex skills related to perception of sensory information from the environment and short-term memory operations are located in the lower portion and mid-area of the hierarchy. **Insert Table 3 near here.**

A between groups analysis, based on linear person measures, supports the premise that information processing requirements during occupational performance are similar for adults and children, as differences between information processing measures of adults and children were not statistically significant when performing age appropriate occupational tasks [$F_{(1,414)} = 1.38$, $p = .24$].

3.3.2. information processing differences between diagnostic groups

Information processing difficulties can be observed during task performance of people with various diagnoses. Using Rasch analysis, the sensitivity of the PRPP System in identifying differences between persons with different diagnoses was examined.

It was anticipated that adults with TBI would experience difficulty with the greatest number of descriptor items indicating global information processing difficulties, as these clients were assessed during acute rehabilitation. It was anticipated that clients with chronic pain who were working in various forms of employment would demonstrate the highest level of information processing during task performance, and perform well on more difficult descriptors or items. Children with learning difficulties were expected to cross the span of information processing abilities as a range of diagnoses from mild to significant learning difficulties were included in this broad diagnostic group. Difficulties with specific descriptor items and an ability to perform others were anticipated in this sample of children with learning difficulties. Adults with schizophrenia were expected to demonstrate relatively high levels of information processing as all were residing in the community in supported living arrangements.

One type of task was performed by each diagnostic group, that task being the occupational goal at the time of therapy intervention. Adults with TBI performed self care tasks, children with learning difficulties engaged in school tasks and social participation tasks, adults with schizophrenia performed meal preparation tasks and adults with chronic pain were assessed performing usual work tasks.

This predicted ordering of client groups is clearly demonstrated on the map of person abilities in Figure 3. Controls are located at the highest part of the map, along with the majority of adults with chronic pain and schizophrenia. Children with learning difficulties are spread from the lowest to highest levels of ability, while adults with TBI are represented in the lowest portion of the ability continuum. **Insert Figure 3 near here.**

The mean total PRPP measure for each diagnostic group is shown in Table 4. As per the predicted order of client abilities, adults with TBI achieved the lowest mean measure, followed by children with learning difficulties, adults with schizophrenia and the highest mean measure was achieved by clients with chronic pain. A between groups univariate analysis, based on linear person measures, clearly demonstrates the statistically significant differences in information processing ability between each diagnostic group [$F_{(3,358)} = 66.6$, $p < .000$]. **Insert Table 4 near here.**

3.3.3. Clients and matched controls

Further evidence for the face validity of the PRPP System of Task Analysis is generated by the ability to differentiate between persons with information processing difficulties and matched controls. Ordering of persons on the linear continuum (Figure 3) clearly differentiates between these groups.

This is substantiated using univariate analysis of between group differences based on linear person measures. Differences between adults with pain and matched controls were statistically significant [$F_{(1,70)} = 21.08$, $p \leq .000$] as were differences in information processing capacity between children with learning difficulties and matched controls [$F_{(1,99)} = 27.43$, $p \leq .000$].

4. CONCLUSIONS

Rasch analysis methods have provided an effective way to analyse the type of data collected in clinical situations by occupational therapists using the PRPP System of Task Analysis. Through the creation of linear measures, clients can be compared across different tasks and contexts; compared with other clients; and compared across different time periods. In this study, clients have been compared across different age groups, diagnostic groups and with healthy matched controls. The underlying concepts and constructs of the PRPP System of Task Analysis have been consistently demonstrated and supported using Rasch analysis, providing further information on the reliability and validity of this instrument.

When applying Rasch analysis, the individuality of each client is maintained within the larger sample; however, entire samples can also be examined using group based measures. The flexibility to examine each client's performance at the PRPP descriptor level or as a total PRPP measure is a great advantage for therapists. A client's performance on individual descriptor items is used to form the basis for planning intervention, while the client's total PRPP measure can be reported to the clinical team to demonstrate functional change.

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TABLES

Table 1: Sample characteristics

	Traumatic brain injury	Learning difficulties with controls	Learning difficulties	Chronic pain with controls	Chronic schizophrenia
n	5	44	25	18	9
age group	Adults	Children	Children	Adults	Adults
tasks	Self-care tasks	Social skills	School tasks	Work tasks	Meal preparation
context	Inpatient rehabilitation	School classroom	School classroom	Workplace	Supported community living
number of raters	8	1	1	2	3

Table 2: Hierarchy of PRPP items following Rasch calibration

ITEM	Measure (logits)	Std Error	INFIT MnSq	INFIT *t* std	OUTFIT MnSq	OUTFIT *t* std
Judges	64.96	.89	.75	-3.4	.56	-2.3
Analyses	64.71	.89	.83	-2.2	.63	-1.9
Questions	61.06	.85	1.10	1.3	.97	-.1
Chooses	60.60	.85	.80	-2.9	.83	-1.0
Identifies obstacles	59.68	.84	.86	-1.9	.84	-1.0
Monitors	57.99	.84	.87	-1.7	.86	-.9
Sequences	56.66	.83	.84	-2.3	.70	-2.2
Organises	56.22	.83	.68	-4.8	.61	-3.0
Flows	54.80	.83	.99	-.1	1.02	.2
Recalls steps	54.27	.83	1.29	3.5	1.05	.4
Searches	53.67	.83	.94	-.8	.92	-.5
Contextualises to duration	53.45	.84	.98	-.2	.98	-.1
Modulates	52.70	.84	.90	-1.3	1.00	.1
Calibrates	52.32	.84	.90	-1.3	.94	-.4
Adjusts	52.30	.84	.93	-.9	1.04	.4
Times	52.25	.84	.98	-.2	1.00	.0
Coordinates	50.70	.84	1.22	2.7	1.69	4.3
Persists	50.12	.85	1.16	2.0	1.32	2.2
Continues	49.89	.85	.76	-3.3	.62	-3.1
Contextualises to time	49.88	.86	1.39	4.4	1.29	2.0
Locates	49.50	.85	1.12	1.5	1.09	.7
Uses body	49.50	.85	.79	-2.9	1.38	2.6
Maintains	49.19	.85	1.19	2.3	1.38	2..6
Stops	46.78	.86	1.03	.4	.97	-.1
Discriminates	44.32	.88	1.24	2.8	1.52	3.1
Starts	44.06	.88	1.11	1.4	1.05	3.1
Contextualises to place	43.73	.90	.80	-2.5	.61	-2.9
Labels	42.83	.89	1.05	.6	1.12	.8
Knows goal	42.79	.89	1.14	1.7	1.08	.5
Notices	42.36	.90	1.09	1.0	1.68	3.6
Matches	40.06	1.25	1.15	1.2	1.10	.5
Uses objects	38.78	.94	1.17	1.9	1.10	.6
Categorises	34.31	1.01	.95	-.5	.88	-.5
Recognises	31.38	1.07	.96	-.4	.87	-.4
MEAN	**50.23**	**.88**	**1.00**	**-.2**	**1.02**	**.1**

Table 3: Hierarchy of PRPP items for adults and children

Hierarchy for CHILDREN	Hierarchy for ADULTS
Analyses	Judges
Chooses	Analyses
Judges	Questions
Sequences	Chooses
Organises	Identifies obstacles
Identifies obstacles	Monitors
Monitors	Sequences
Flows	Organises
Recalls steps	Flows
Times	Recalls steps
Discriminates	Searches
Contextualises to duration	Adjusts
Modulates	Contextualises to duration
Searches	Modulates
Uses Body	Calibrates
Questions	Coordinates
Calibrates	Times
Continues	Contextualises to time
Persists	Locates
Adjusts	Persists
Maintains	Continues
Knows goal	Maintains
Uses objects	Uses body
Matches	Stops
Coordinates	Notices
Contextualises to time	Labels
Locates	Starts
Starts	Contextualises to place
Contextualises to place	Discriminates
Stops	Knows goal
Labels	Matches
Categorises	Uses objects
Notices	Categorises
Recognises	Recognises

Table 4: Mean total PRPP measures for each diagnostic group

	n	Mean	Std deviation
Chronic pain	40	65.1	11.8
Schizophrenia	75	61.5	7.1
Learning difficulties	79	46.2	23.4
Brain Injury	168	33.6	17.8

FIGURES

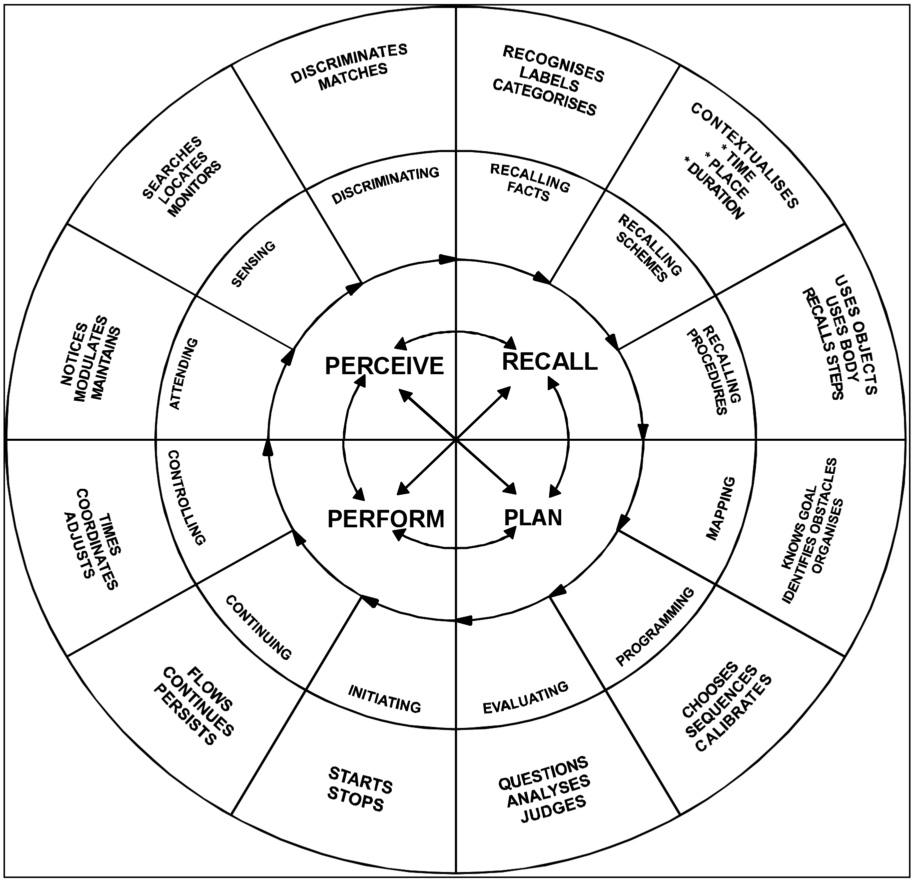

Figure 1: The PRPP System of Task Analysis

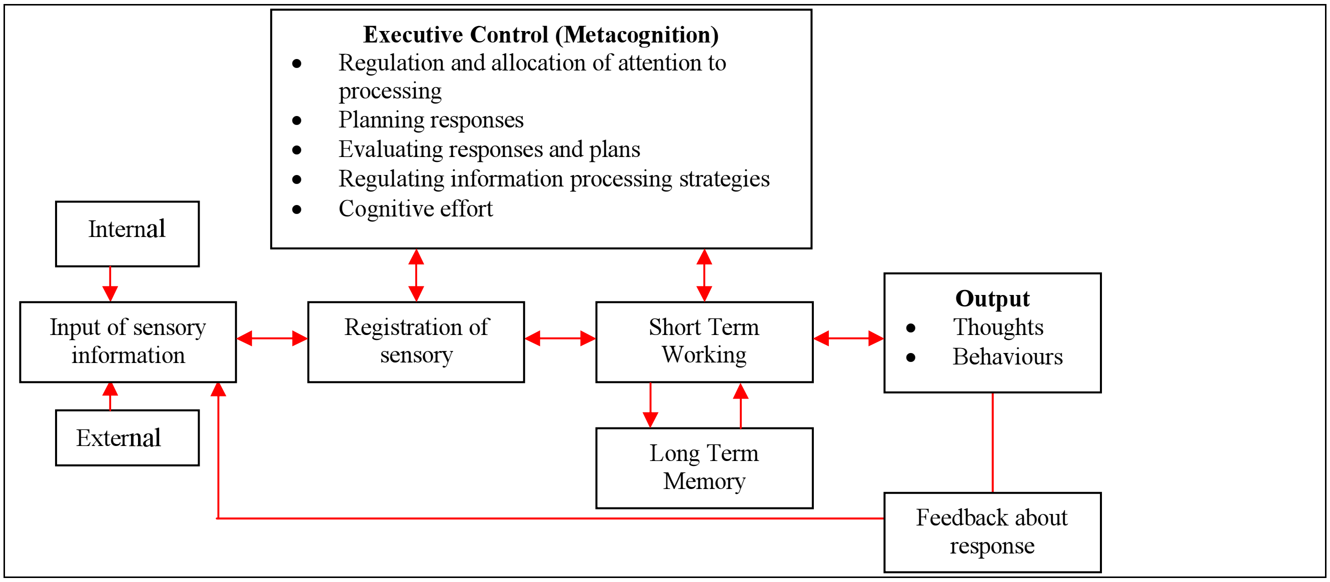

Figure 2: Information Processing Model (Adapted from Lerner, 1997)

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MEASURE  ITEMS   PERSONS
       <harder>|<more able>
   90          +  C  C  C  C  C  C  C  C  C  C  C  C  C  C  C  L  L  P  S
               |  C  C  C  C  P
               |
               |
              K|
               |  C  C  C  L  L  P  P  T
               |
   80          +
               |  C  C  P  P  S  S
               |
               |  C  C  C  C  C  L
               |  C  C  P  S
               |
               |  C  L  L  L  P  S  S  S
   70          +  C  L  L  L  P  P  P  P  P  P  P
              S|  C  L  L  L  P  S
               |  C  C  L  L  P  P  S  S  S  T
               |K C  L  P  S  S  T
           XX  |  C  C  C  C  L  L  P  P  S  S  S  S  S  T  T
               |  C  C  C  L  L  P  P  P  P  S  S  S  S  S  S  S
            X  |  C  S  S  S  S  T  T
   60      XX  +  C  L  P  P  P  S  S  S  S  S  S  S  S  S  S  S  S  S  S  S  S
                  S  S  S  S  S  S  S  S  T  T
            X  |S C  C  L  S  S  S  S  S  S  T  T
            X  |  C  C  C  L  L  P  S  S  T
            X  |  C  L  S  S  S  S  S  S  T  T
          XXX  |  C  L  L  L  P  P  P  P  P  P  S  S  S  S  T  T  T
        XXXXX  |  L  L  L  P  S  S  T  T  T
              M|  C  L  L  L  L  S  S  T  T
   50  XXXXXX  +M L  L  P  T  T  T  T  T  T
            X  |  L  L  T
            X  |  L  L  L  L  P  T  T  T  T
               |  L  P  T  T  T  T  T  T  T  T  T  T
          XXX  |  L  L  L  L  P  T  T  T  T  T  T
          XXX  |S L  T  T  T  T  T
               |  L  L  L  T  T  T  T  T  T  T  T  T  T  T
   40       X  +  T  T  T  T  T  T
            X  |  L  L  L  T  T  T  T  T  T  T
               |  L  L  L  L  T  T  T  T  T  T  T  T  T  T  T
               |  L  T  T  T  T  T  T  T  T  T  T  T  T  T
            X S|K L  L  T
               |  T  T
            X  |  L  L  T  T  T  T  T  T  T
   30          +  L  T  T  T
               |  L  T  T  T
               |  T
               |  L  T  T
               |  T  T  T
               |  T
               |  L  T  T  T  T  T  T
   20          +
              K|  T  T
               |  T  T  T
               |
               |
               |  T  T  T  T
               |  T  T  T  T  T  T  T
   10          +  L  L  L  L  L  L  L  L  L  L  T  T  T  T  T  T  T  T  T  T  T
                  T  T  T  T  T  T  T  T  T  T
       <easier>|<less able>
```

Figure 3: Person-Item variable map

[Key: T=TBI; L=learning difficulty; S=schizophrenia; P=pain; C=control; X=item, M=mean; S=1 SD; K=2 SD]