

Speech-Language Evaluation of Closed Head Injured Subjects in South Africa: Cultural Applicability and Ecological Validity of a Test Battery

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ABSTRACT

This paper addresses the communicative outcome of a group of closed head injured (CHI) subjects in South Africa. Communicative outcome is evaluated on one test battery currently used for medico-legal assessments in South Africa. It was found that a number of the tests were sensitive to breakdown in this sample, but that the demographic factors of first language and pre-injury education significantly affected performance on some tests. Many test performances were significantly related to return to work, thus confirming the importance of communicative skills in the workplace, and the speech-language pathologist's role in vocational assessment and rehabilitation.

OPSOMMING

Hierdie verslag spreek die gevolge van geslote hoofbeserings by 'n groep Suid-Afrikaanse proefpersone aan. 'n Spesifieke toetsbattery wat tans in Suid Afrika vir regsmediese evaluasies gebruik word, het gedien as instrument om die proefpersone se kommunikasievermoëns te ondersoek. Sommige toetse was sensitief vir kommunikasie uitvalle maar sekere demografiese faktore, b.v. moedertaal en opvoedkundige peil voor die hoofbesering, het die proefpersone se prestasie op sommige toetse beïnvloed. Baie van die toetse het 'n duidelike verband getoon met die proefpersone se vermoë om terug te keer werk toe. Die belangrikheid van kommunikasie-vermoëns binne die beroepskonteks en die spraak-taalterapeut se rol in beroepsevaluering in rehabilitasie word dus bevestig.

KEY WORDS: closed head injury; communicative outcome; return to work

INTRODUCTION

Speech-language pathologists in the medico-legal field are called upon daily to describe and quantify communicative deficits as a result of closed head injury (CHI). These clinicians, however, have little empirical or policy-related guidance as to which tests are indeed sensitive to breakdown in the South African population, and how performance may be affected by certain demographic and cultural factors, for example, educational level. This is important to know when one considers the vast discrepancies in such socio-economic indicators in South Africa. Further, the medico-legal professional is required to prognosticate, beyond a reasonable doubt, whether or not the patient will be able to return to work. Again, this is currently taking place with little scientific insight regarding which communicative skills are most important in the workplace, and which tests are most useful to measure them.

The above difficulties faced by the South African speech-language pathologist are highly significant in the light of the extremely high incidence of CHI in South Africa, cited as 316/100 000 (Neill & Brown, 1990), approximately 50% higher than abroad. In addition, dwindling insurance and

third party payouts demand that professionals ensure that they are using culturally appropriate and functionally valid tests in order to ensure the strongest possible case for their clients. This study was hence aimed at determining the sensitivity of a test battery already used by a practice involved in medico-legal assessments in South Africa, the effects on performance of early demographic and injury variables, and which test performances were most closely related to return to work. In order to contextualise the results of this study, previous research documenting communication breakdown following head injury will be discussed, as well as the impact of early variables on test performance and research documenting the relationship between communicative skills and vocational success.

1. COMMUNICATIVE BREAKDOWN FOLLOWING CLOSED HEAD INJURY

There has been much debate in the literature regarding the nature and mechanisms underlying communication breakdown following CHI. Early studies in the 1970's and early 1980's assessed and classified the communicative breakdown using traditional aphasia tests. The inci-

dence of classical aphasic syndromes found within the CHI population ranges from 2% (Heilman, Safran & Geschwind, 1971) to 30% (Sarno, 1988). Hartley and Levin (1990) point out that the lower incidence of classical aphasias tends to be associated with samples of consecutive cases of head injury, which contain a wide range of severity levels, while higher incidences have been reported in samples of CHI admissions to rehabilitation centres, which are likely to be mainly severe injuries.

A number of specific linguistic deficits have also been found to occur relatively often in the absence of a classical aphasic syndrome, and have been termed "subclinical aphasia" (Sarno, 1988). The most common deficit is anomia, measured usually on a confrontation naming task such as the Boston Naming Test (Heilman, Safran & Geschwind, 1971; Levin, Grossman & Kelly, 1976). Verbal fluency tasks have also been found to be sensitive measures of anomia (Walsh, 1991). In addition, impaired auditory comprehension, particularly of complex commands as measured by the Token Test, has been found to occur relatively often (Levin et al., 1976; Sarno, 1988; Kreutzer, Gordon, Rosenthal & Marwitz, 1993).

More recently, the focus of CHI assessment has shifted to the investigation of more naturalistic forms of language use, these being discourse and pragmatics. It is not surprising that the use of such different tests has led to the identification of very different types of communication impairment. One of the earliest studies which investigated the discourse of CHI individuals found it to be characterised by impoverished productivity in terms of the number of words produced, the rate of speech, and the percentage of syllables in mazes (Wyckoff, Jensen & LaPointe, 1984). The amount of content was also consistently reduced in comparison to controls, and the subjects used fewer cohesive ties per communication unit. The researchers summarise these findings by describing CHI discourse as limited in "quantity, efficiency and connectivity" (Wyckoff, Jensen & La Pointe, 1984).

Other studies investigating discourse have confirmed deficits in the following areas: discourse cohesion (Mentis & Prutting, 1987; Liles, Coelho, Duffy & Zalagens, 1989); discourse superstructure and story grammar elements (Chapman, Culhane, Levin et al., 1992; Liles et al., 1989); coherence (Chapman et al., 1992; Glosser & Deser, 1990); and productivity (Hartley & Jensen, 1991; Mentis & Prutting, 1987; Liles et al., 1989).

Within the realm of pragmatics, deficits have been found to occur in all three of the nonverbal, interactional and propositional aspects of communication (Hartley, 1990). Nonverbal deficits in the paralinguistic features of speech fluency, rate of speech and voice quality (Marsh & Knight, 1991), fluency (Hartley & Jensen, 1991) and prosody (Milton, Prutting & Binder, 1984) have been found. The interactional aspects of communication have also been found to be significantly affected after CHI. In particular, inappropriate turn-taking behaviours have been noted (Milton, Prutting & Binder, 1984; Coelho, Liles & Duffy, 1991), as well as deficits in "partner-directed behaviour" (Marsh & Knight, 1991). McDonald (1993) demonstrated significant difficulties in the CHI individual's ability to meet the informational needs of their listeners. Similarly, Irvine (1984) demonstrated disrupted interpersonal skills on Scale A (response to interlocutor) on Penn's (1985) Profile of Communicative Appropriateness. Finally, researchers have demonstrated difficulties in the propositional

aspects of communicative interaction following CHI. These include difficulties in topic selection, maintenance, relevance and quantity of verbal output (Milton et al., 1984; Ehrlich, 1988; Penn & Cleary, 1988).

At this point, it seems to be important to gather information about how a South African sample of CHI individuals perform on a battery of tests in order to confirm patterns of breakdown, as well as which tests appear to be most sensitive in measuring this breakdown.

2. **IMPACT OF EARLY VARIABLES ON OUTCOME/TEST PERFORMANCE**

Given the fact that about 88% of the South African population is not first language English speaking, and that about 25% are illiterate (Central Statistical Services, 1994), understanding the impact of demographic factors on test performance is of paramount importance in South Africa. In most outcome studies, researchers have attempted to identify factors in the head-injured patient's past and related to the injury itself that can account for the outcomes they describe. Few studies, however, have investigated the impact of these effects on communicative outcome. It is only very recently that a systematic discussion of the possible effects of such factors on test performance has been made and preliminary investigations carried out (Coelho, 1995). The need for this empirical information in South Africa is great, particularly in the light of our multicultural and multilingual society, with such a large disparity in socio-economic status among its inhabitants. It is almost impossible to comment on test performance without it.

3. **IMPACT OF COMMUNICATIVE DEFICITS ON RETURN TO WORK (RTW)**

Return to work following head injury abroad, and particularly in South Africa is a major concern as insurance and other resource allocations for CHI individuals diminish. However, few outcome studies have included the assessment of the impact of communication difficulties on the CHI patient's ability to return to work. In the studies which have assessed this relationship, researchers have used widely differing measures of communicative functioning, from standardised aphasia tests to questionnaire items, thus making comparison and generalisation difficult. Also, researchers have tested their subjects at different times post-onset. Those testing in the acute stage have measured the prognostic value of early language breakdown on later vocational performance (i.e., communicative functioning as a predictor of future performance), while those who have tested breakdown in the chronic stage measure the relationship between communicative and vocational performance at the same time (i.e., communicative functioning as an indicator of outcome). This is useful in that it allows researchers to make hypotheses as to which deficits are affecting performance at the time of testing.

Testing in the acute stage of recovery, Dresser, Meirovsky, Weiss et al. (1973) found that the early presence of aphasia was a significant predictor of future unemployment. Similarly, Najenson, Groswasser, Mendelsohn and Hackett (1980) found the early presence of aphasia to have an important influence on rehabilitation outcome, and a significant effect on vocational functioning on follow-up.

Considering communication breakdown as a late indicator of outcome, Brooks, McKinlay, Symington et al. (1987) found that ratings of communicative impairment by relatives or significant others were significantly related to failure to return to work. Two particular communication deficits, the ability to carry on a conversation and to understand a conversation, were highly significant. In a meta-analysis of the predictors and indicators of work status, Crepeau and Scherzer (1993) were able to compare five studies which investigated the relationship between communicative abilities and return to work, and found their results to be relatively homogeneous with communicative abilities having a moderate correlation with return to work. However, they stress that due to the differing measures used in the various studies, it was difficult to come to a closer understanding of exactly what fosters a strong relationship between communication and return to work.

It appears that no detailed study correlating performance on a battery of communication tests and vocational status has been carried out to date. Also, it is only recently that speech-language pathologists have begun working in close collaboration with the vocational rehabilitation team in attempting to evaluate systematically the communicative requirements of the workplace (Fraser & Baarslag-Benson, 1994).

The aim of this study, therefore, was to evaluate a particular communication test battery, developed and currently used by a speech therapy practice in South Africa, in terms of the following three aspects:

1. sensitivity to breakdown in the chronic stage of recovery;
2. effects of early demographic and injury variables on test performance; and,
3. the relationship between test performance and occupational status.

METHODOLOGY

A group of fifty CHI subjects who had been evaluated for medico-legal purposes, was selected based on the following criteria:

1. The subjects had to speak English as a first language, or at least with enough proficiency not to require an interpreter during testing. This limited the cultural diversity of the sample, but aimed to ensure greater test validity;
2. The subjects had to be of working age at the time of testing;
3. Sufficient information had to be available regarding all the communicative functioning, demographic and injury-related variables, and occupational functions for data analysis.

The medico-legal reports of the subjects who fulfilled these criteria were reviewed in detail, and the relevant data was captured on a data recording form, and transferred into a computerised database devised by the first author (Watt, 1996). The aim of this form was to provide a standard method of analysing the reports and recording the data. It includes 197 variables, including demographic information of age at onset, time since onset, gender, pre- and postinjury educational levels, pre- and postinjury occupational types and status; injury-related information of severity, cause of injury and surgical procedures; and early postinjury variables, e.g., therapy received. The form was designed to be similar to that designed for the Model Sys-

tems Database for Traumatic Brain Injury that has been established in the United States of America (Dahmer, Schilling, Hamilton et al., 1993) in order to make it comparable to international databases and yet feasible in a country with fewer resources for detailed assessment and data gathering. Table 1 summarises the demographic, injury and early post-injury factors investigated in this study.

The communication parameters included on the form are comprehensive in scope and reflect the assessment battery (detailed in table 2) of the speech-language pathologists who conducted the medico-legal assessments. This battery was devised on the basis of substantial experience with a wide range of medico-legal assessments (>200), and taps a range of cognitive and linguistic domains, including hearing, motor speech abilities, receptive language, expressive language, reading, writing, verbal reasoning, and pragmatics. The battery utilises a mix-

TABLE 1: Characteristics of the sample

Characteristic		Percentage
Age at onset	Mean: 29y 10mo Sd: 12y 10mo	
Time since onset	Mean: 3y 5mo Sd: 1y 5mo	
Gender	Male Female	74 26
First language	English Afrikaans Zulu/Xhosa Sotho Other European	62 16 8 6 8
Pre-injury education	Matriculation certificate or less Post secondary school training or qualifications	50 50
Pre-injury occupational type	Manual worker Clerical/technical Professional/executive Student	12 22 40 26
Pre-injury occupational status	Competitively employed full time Full-time student	74 26
Injury severity	Mild Moderate Severe	18 12 70
Therapy received post-injury	Speech-language Occupational Physio- Cognitive Counselling Vocational Social services	24 20 52 6 2 2 2

ture of standardised as well as modified, adapted, and novel or clinician-constructed items that have been developed over time in an attempt to meet the unique needs of the South African head injured population. This appears

to have been essential in the face of a shortage of relevant materials, and too great a dependence on inappropriate overseas tools.

The form does not record exact test scores, as these are

TABLE 2: Outcome on the Communicative Test Battery

Task	Missing	Adequate	Not adequate	Mild	Moderate	Severe
Hearing	-	39	11	2	3	6
Motor speech						
Dysarthria	-	34	16	6	4	6
OPE	-	28	22	14	7	1
Dysphagia	-	40	10	5	4	1
Voice	-	34	16	6	6	4
Fluency	-	28	22	9	13	-
Reception						
Token Test	5	18	27	11	10	6
CELF(ambiguities)	9	19	22	12	8	2
CELF(relationships)	12	15	23	12	7	4
TOLC (ambiguities)	26	14	10	3	6	1
Normal conversation	2	42	6	6	-	-
RHCB (alternate word meaning)	28	12	10	8	2	-
RHCB (verbal humour)	43	2	5	2	2	1
Expression						
Word-finding ¹	2	14	34	13	13	8
Verbal fluency	3	12	35	17	12	6
Narrative discourse	3	25	22	9	10	3
Procedural discourse	2	40	8	5	2	1
Syntax ¹	1	44	5	5	-	-
Paraphasias ¹	1	42	7	5	2	-
Perseverations ¹	1	45	4	1	3	-
Serial speech	1	48	1	-	-	1
Reading²						
Comprehension	2	31	17	7	9	1
Drawing inferences	11	12	27	10	13	4
Memory	16	17	17	7	7	3
Writing³						
Letter formation	2	20	28	26	1	1
Spelling	4	28	18	11	4	3
Verbal⁴ reasoning						
Speed	4	27	19	18	1	-
Arithmetic	3	22	25	13	10	2
Pragmatics⁵						
Topic control	-	28	22	6	12	4
Relevance	1	31	18	8	9	1
Turn-taking	-	37	13	5	7	1
Quantity	2	29	19	5	13	1
Eye contact	1	38	11	-	11	-
Gesture	1	42	7	3	4	-
Posture	1	45	4	-	4	-

KEY:

- 1: assessed in spontaneous speech
- 2: assessed using the TOLC inferences subtest and/or an informal fable task
- 3: assessed in spontaneous writing task
- 4: assessed in clinician-constructed verbal arithmetic task
- 5: assessed in spontaneous speech

often not reported in medico-legal reports, which usually describe the performance qualitatively and interpret the test scores. Hence the researchers classified performance on a five point scale according to whether it was above average (1), average (2), intact but slow or showing mild difficulties (3), moderate difficulties (4), and marked or severe difficulties (5), on the basis of the medico-legal report. This appeared to be the most appropriate way of capturing the data. A measure of inter-rater reliability was calculated to ensure that the data-capturer was able to extract this information reliably. An independent speech pathologist completed the "communication" section of the database form for one fifth of the sample, and inter-rater reliability was calculated using Cohens's kappa, a stringent measure of agreement that corrects for chance agreement (Howell, 1992). The following mean kappa values were obtained:

- per subject 0.62;
- per construct: motor speech 0.86, receptive language 0.62, expressive language 0.81, reading 0.87, writing 1, verbal reasoning 0.6, pragmatics 0.73.

These values indicate "substantial" to "almost perfect" levels of agreement (Landis & Koch, 1977) and suggest that the data was recorded sufficiently reliably from the medico-legal reports.

The data was analysed according to the three aims. Frequency counts were used to organise the group data, while relationships between variables were calculated using cross-tabulations and chi squared analysis. When sample sizes were small, Fisher's Exact Probability test was used (Siegel, 1956). The five point rating scale describing communicative performance was collapsed into two categories, namely adequate (ratings of 1 and 2) and inadequate (ratings of 3, 4 and 5) in order to be compatible with 2 x 2 contingency tables. This system is similar to the cut-off systems employed by Kreutzer, Gordon, Rosenthal and Marwitz (1993).

RESULTS AND DISCUSSION

1. SENSITIVITY OF THE TEST BATTERY

Table 2 describes the communicative performance of the subjects on the communication test battery. The column labelled "missing" indicates the number of subjects for whom data on a particular test was missing. This figure reveals how the test batteries used changed according to the needs of the patient.

Hearing

The occurrence of a hearing loss as a result of the head injury in 22 % of this sample is substantially higher than that reported by Giles and Clark-Wilson (1993) of 6 to 8 % of all hospital trauma admissions. It is significant that despite this high incidence, few, if any, had been referred to an audiologist before the time of the medico-legal assessment, which took place a mean of three years post-injury.

Reception

It would appear from Table 2 that the receptive battery used is indeed sensitive to breakdown in comprehen-

sion in this sample as over half of the subjects manifested difficulties on the Revised Token Test, the subtest used from the Clinical Evaluation of Language Function (CELF)(processing relationships and ambiguities) and the Right Hemisphere Communication Battery (RHCB) verbal humour subtest. Just under half manifested difficulties on the Test of Language Comprehension (TOLC) inferences subtest and the alternate word meanings subtest of the RHCB. The most discriminative test on which the most subjects performed poorly was the Revised Token Test, which is considered to be fairly specific and highly diagnostic of comprehension difficulties (Howieson & Lezak, 1992). This finding confirms previous reports of the prevalence of a specific linguistic deficit in auditory comprehension in the absence of traditional aphasia following closed head injury.

It is interesting to note that few of the subjects appeared impaired in spontaneous conversation. This illustrates the ease with which comprehension difficulties may be masked in conversational exchanges, very often the only medium on which other professionals base their referral to a speech-language therapist.

Expression

The profile of communicative performance on the expressive tests clearly indicates which tests are sensitive to breakdown in this South African CHI sample. Nearly 70 % exhibited word finding difficulties in connected speech, which confirms previous reports (Thomsen, 1975; Levin, Grossman & Kelly, 1976; Sarno, 1984), although these authors relied more on confrontational naming tasks for diagnosis. Poor verbal fluency measures also confirm the previously cited sensitivity of this procedure (Walsh, 1991). The narrative discourse task was the third measure which appeared to be very sensitive to breakdown. Although discourse analysis was not detailed, this finding confirms others' results (Kaplan, 1987; Liles et al., 1989; Hartley & Jensen, 1991).

Reading

The assessment of reading appeared to be well justified by the poor performance of the individuals, particularly for deeper level comprehension such as drawing inferences from the text. This is what is referred to as intratextual processing (Ulatowska, Chapman & Johnson, 1992) such as making inferences on the TOLC or recognising the moral of a fable. As with auditory comprehension, these results highlight the importance of assessing deeper comprehension abilities which would otherwise be missed in basic comprehension tasks.

Verbal reasoning

Regarding verbal reasoning abilities, the results indicate that tests of arithmetic ability, particularly those which are verbally mediated and require understanding of verbal concepts, are highly sensitive to breakdown following head injury. There was a dissociation between speed of processing and arithmetic ability on these tasks. This was characterised by very quick and impulsive calculations with incorrect answers by some and extremely slow working with ultimately correct answers by others. This has implications both for therapy and for vocational placement.

Pragmatics

The pragmatic categories included in the data recording form did not appear to be very sensitive to breakdown in this sample. This may have reflected insufficiently detailed pragmatic analysis. Although there were subjects who manifested difficulties on all of the parameters described, none of these were very great, the most sensitive measure being that of topic control (44% had difficulties), quantity of verbal output (38%) and relevance (36%). The presence of these difficulties does confirm previous reports of pragmatic breakdown following head injury (Milton, Prutting & Binder, 1984; Penn & Cleary, 1988). Interesting significant relationships between the non-verbal behaviour of eye contact and the pragmatic behaviours of topic control and relevance were found. A possible explanation for this may be that eye contact is essential for gaining important cues from the listener which help to regulate and monitor turns and relevance.

In summary, it appears that the communication test battery used for this sample was sensitive enough to detect breakdown in performance in nearly all communicative spheres. Most of the difficulties experienced by this group confirm previous studies and indicate that such difficulties are persistent, even up to a mean of three years

post-injury. These findings have great implications for the role of the speech-language pathologist in the rehabilitation of this clinical population.

2. EARLY PREDICTORS OF COMMUNICATIVE PERFORMANCE

The impact of early demographic and injury related variables on communicative test performance was assessed. Table 3 highlights the relationships that were found to be significant at $\alpha=0.05$.

The subjects' first language was found to be the most significant factor affecting communicative performance. This indicates that first language European language speakers (i.e., English, Afrikaans and other European languages e.g., German) performed significantly better than subjects whose first language was an African language. This does not necessarily mean that these tests have no place in a South African test battery, as a number of these tests were also significantly related to occupational outcome (see below). However, it does mean that therapists must be aware of this factor, as well as which tests are not affected by first language (e.g., pragmatic functioning) and therefore to include these for valid testing.

It is striking how small an impact injury severity had

TABLE 3: Significant predictors of communicative outcome (df=1 except for severity where df=2)

Test	Gender	First language	Education	Severity
Hearing	-	0.034 *	-	-
Dysarthria	-	-	-	4.24x10 ³ **
OPE problems	-	-	-	0.016 *
Token test	-	0.031 *	-	-
Understanding normal conversation	-	0.033 *	-	-
Narrative discourse	-	0.040	-	-
Procedural discourse	-	-	0.050 *	-
Reading: comprehension	-	5.47x10 ⁻³ **	0.015 *	-
Reading: drawing inferences	-	-	X ² =4.41 *	-
Reading: memory	-	0.044	-	-
Writing: letter formation	X ² =4.11	-	-	-
Verbal reasoning: arithmetic	X ² =5.09	-	-	-

* significant at 0.05

** significant at 0.01

on general communicative functioning in the chronic stage of recovery. Severity of injury was significantly related only to motor speech abilities as manifested in dysarthria and OPE difficulties. It appears that, as far as the speech-language pathologist is concerned, injury severity may have less of a role to play, particularly in expressive and receptive language, than other cultural factors such as first language and pre-injury education.

3. RELATIONSHIP BETWEEN COMMUNICATIVE PERFORMANCE AND RTW.

Performance on each of the communicative tests was correlated with the occupational status of the subjects, i.e., employed or unemployed. Table 4 highlights the significant relationships found between test performance and return to work.

These results show that adequate performance on at least one test in nearly every communicative domain was significantly related to the ability to return to work. This is encouraging regarding the communicative domains tapped in the assessment as well as the tests used for this purpose. The importance and value of the Revised Token Test appears to be underscored by the very strong relationship between performance on this test and return to work. Since, as mentioned previously, the Token Test has been described as relatively specific to, and therefore strongly diagnostic of language comprehension difficulties (Howieson & Lezak, 1992), this finding can confidently be interpreted as confirming the essential role of high level language comprehension abilities within the functional context of the workplace.

The strong relationship between the reading measures and return to work is possibly related to the nature of the sample, the majority of the subjects having been employed in clerical or professional capacities in which reading is essential. These results reveal the high premium placed on literacy in the vocational context.

Surprisingly, none of the pragmatic parameters were significantly associated with whether or not the subject was able to return to work. This is a counter-intuitive result, as many authors suspect that poor pragmatic skills,

particularly interpersonal aspects of communication, would have severe vocational consequences after head injury (Hartley, 1995; Sarno, 1988). It was, however, found that poor turn-taking abilities and abnormal quantity of verbal output were significantly associated with the downgrading of those who had returned to work (X^2 values of 5.109 and 7.670; $\alpha=0.05$). In other words, a significant number of the working subjects who presented with these symptoms had been downgraded at work, either in terms of the time commitments of the job (e.g., part time v. full-time) or the employment conditions (e.g., competitive v. sympathetic employment).

These findings add more empirical weight to the importance of communicative skills in the workplace, and thus address an important gap in the literature. They also provide convincing support for the functional appropriateness of the tests in this communicative test battery, particularly for the medico-legal assessment, as well as the role of the speech-language pathologist in the vocational rehabilitation team for CHI individuals.

SUMMARY AND CONCLUSIONS

These results have important clinical implications for the South African speech pathologist involved in the assessment of CHI individuals. They indicate that communicative breakdown is pervasive and persistent following closed head injury, affecting particularly high level linguistic abilities, and that there are a number of tests available, both standardised and non-standardised, which are sensitive to this breakdown. Clinicians must, however, be aware of how the South African cultural and socio-economic milieu affects performance on some of these tests, and interpret their results accordingly. They should also be sure to include tests in their battery appear to be less affected by such variables (e.g., verbal reasoning tasks and pragmatic skills evaluation). In addition, these results highlight the integral importance of communication skills in the workplace, and how poor performance on a number of tests is significantly related to a failure to return to work.

There is a need for the development of policy guidelines by the profession as a whole to guide the continued development and fine-tuning of a sensitive, valid and reliable test battery for the assessment of communicative breakdown following CHI. It is evident that at the present time South African clinicians are using vastly different assessment tools with little empirical basis for their test selection. Results such as these may have relevance in the setting up of such guidelines. Such a policy may also then have implications for the clinician's dealings with insurance companies, providing therapists with greater empirical and political support for their evaluation procedures, results and prognoses.

A number of implications for future research also emerge from these finding. Firstly, the study should be expanded and replicated with a larger number of subjects, particularly of the smaller groups represented here, such as the first language African language speakers. In doing so, the methodology of this study has implications for the possible compilation of a national database for head injury in South Africa such as that set up abroad (Dahmer et al., 1993). A necessary precursor to such a database would be consensus regarding a common minimal test battery for all participating speech therapists and, again,

TABLE 4: Communicative tests significantly related to RTW (df=1)

Construct	Test	X ² value
Motor speech	OPE	6.148 *
Reception	Token Test	13.500 ***
Expression	Narrative discourse	4.627 *
Reading	Comprehension	9.52 ***
	Inferences	5.110 *
	Memory	7.771 **
Verbal reasoning	Speed	5.101 *

* significant at 0.05
 ** significant at 0.01
 *** significant at 0.005

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the issue of policy guidelines governing such decisions is applicable here.

The empirical confirmation of the importance of communicative skills in the workplace also has implications for further research. While these results confirm the importance of specific communicative skills, such as comprehension, expression and reading, in successful vocational outcome, further research is necessary to determine whether the pattern of demands differs across different occupations. A tool for measuring the communicative demands of a specific workplace is currently being developed at the University of the Witwatersrand, which will be used by clinicians to conduct on-site job skill assessments.

In conclusion, this study has highlighted the areas of persistent weakness in communicative functioning of a group of CHI subjects in South Africa. Tests sensitive to this breakdown have been identified, as well as which test performances are affected by demographic factors such as pre-injury educational level and first language. In addition, test performances most closely related to successful reintegration in the workplace have been identified. These results support the role of the speech-language pathologist in the long-term rehabilitation of CHI individuals particularly in the occupational sphere.

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INFORMATION FOR CONTRIBUTORS

The South African Journal of Communication Disorders publishes reports and papers concerned with research, and critically evaluative theoretical and philosophical conceptual issues dealing with aspects of human communication and its disorders, service provision, training and policy.

The South African Journal of Communication Disorders will not accept material which has been published elsewhere or that is currently under review by other publications

MANUSCRIPT STYLE AND REQUIREMENTS

Manuscripts should be accompanied by a covering letter providing the author's address and telephone numbers. All contributions are required to follow strictly, the style specified in the *Publication Manual of the American Psychological Assoc.* (3rd ed., 1983) (APA Pub. Man.), with complete internal consistency. **Four** copies of triple-spaced high quality type-written manuscripts with numbered pages, and wide margins should be submitted. They should be accompanied by **ONE** identical disc copy of the paper. Filenames should include the first author's initials and a clearly identifiable keyword or abbreviation thereof and should be type-written on the last line of the last page of the Reference List (for retrieval purposes only).

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References should be cited in the text by surname of the author and the date, e.g., Van Riper (1971). Where there are more than two authors, after the first occurrence, *et al.* after the first author will suffice, except for six or more when *et al.* may be used from the start. The names of all authors should appear in the Reference List, which should be listed in strict alphabetical order in triple spacing at the end of the article. All references should be included in the List, including secondary sources, (APA Pub. Man. 1983, p. 13). Only acceptable abbreviations of journals may be used, (see DSH ABSTRACTS, October; or *The World List of Scientific Periodicals*). The number of references should not exceed much more than 30, unless specifically warranted.

EXAMPLES

- Locke, J.L.** (1983). Clinical Psychology: The explanation and treatment of speech sound disorders. *J. Speech Hear. Disord.*, 48 339-341.
- Penrod, J.P.** (1985). Speech discrimination testing. In J. Katz (Ed.), *Handbook of clinical audiology* (3rd ed.). Baltimore: Williams & Wilkins.
- Davis, G.A. & Wilcox, M.J.** (1985). *Adult aphasia rehabilitation: Applied pragmatics*. San Diego, CA: College-Hill.

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Acceptable manuscripts may be returned to the author for revision. Additional minor changes may also be made at this stage, but a note on the manuscript acknowledging each alteration made by the author, required. The paper is then returned to the editorial committee for final editing for style, clarity and consistency.

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Manuskripte behoort deur 'n dekkingsbrief vergesel te word wat die skrywer se adres en telefoonnommers bevat. Daar word van alle bydraers verwag om die styl, soos gespesifiseer is in die *Publication Manual of the American Psychological Assoc.* (3rd ed., 1983) (APA Pub. Man.), nageset te volg met volledige interne ooreenstemming. Manuskripte moet getik, van hoë gehalte en in drievoud spasiering met wye kantlyne wees. Vier kopieë van die manuskrip moet verskaf word. EEN hiervan moet 'n identiese skyfskopy van die artikel wees. Lêername behoort die eerste skrywer se voorletters en 'n duidelike identifiseerbare sleutelwoord of afkorting daarvan in te sluit en moet op die laaste lyn van die bladsy van die verwysingslys getik word (slegs vir naslaan doeleindes).

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Verwysings in die teks moet voorsien word van die skrywer se van en die datum, b.v., Van Riper (1971). Wanneer daar egter meer as twee skrywers is moet daar na die eerste verskaffing van al die outeurs, van *et al.* gebruik gemaak word. In die geval waar daar egter ses of meer outeurs ter sprake is moet *et al.* van die begin af gebruik word. Al die name van die skrywers moet in die Verwysingslys verskyn wat aan die einde van die artikel voorkom. Verwysings moet alfabeties in trippel spasiering gerangskik word. Al die verwysings moet in die Verwysingslys verskyn, insluitende sekondêre bronne, ("APA Pub. Man." 1983, p.13). Slegs aanvaarbare afkortings van tydskrifte se titels mag gebruik word, (sien "DSH ABSTRACTS, October"; of *The World List of Scientific Periodicals*). Die aantal verwysings moet nie meer as 30 oorskry nie, tensy dit geregverdig is.

LET OP DIE VOLGENDE VOORBEELDE:

Locke, J.L. (1983). Clinical psychology: The explanation and treatment of speech sound disorders. *J. Speech Hear. Disord.*, 48, 339-341.

Penrod, J.P. (1985). Speech discrimination testing. In J. Katz (Ed.), *Handbook of clinical audiology* (3rd ed.). Baltimore: Williams & Wilkins.

Davis, G.A. & Wilcox, M.J. (1985). *Adult aphasia rehabilitation: Applied pragmatics*. San Diego, CA.: College-Hill.

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