

THE EFFECT OF THE MANIPULATION OF CERTAIN LINGUISTIC VARIABLES
ON LANGUAGE COMPREHENSION IN ALZHEIMER'S DISEASE

Dilys Margaret Jones

A dissertation submitted to the Faculty of Humanities, University of the Witwatersrand,
Johannesburg, in fulfilment of the requirements for the degree Master of Arts (Speech
Pathology)

Johannesburg, 2005

ABSTRACT

Comprehension was assessed under various conditions in nine subjects with probable Alzheimer's Disease. Four linguistic variables were selected, namely syntactic complexity, the use of pronouns, directness and literality. Each variable was assessed in sentences in a simple form and in a complex form. Discourse passages which included all of the variables were then constructed, and these tasks were also administered in simple and complex forms. All subjects performed qualitatively and quantitatively better under the simple conditions than under the complex for all four of the variables assessed. However, this effect was more marked in the sentence tasks than in the discourse tasks. Furthermore, individual subjects responded differently to the manipulation of the variables. Results of the study suggest that modifying the variables investigated can improve the comprehension of people with moderate to severe Alzheimer's Disease. This has important implications for the training of caregivers and conversational partners, and suggests that this type of indirect intervention may be an effective way for speech therapists to provide clinical services to people with dementia in South Africa.

DECLARATION

I declare that this dissertation is my own unaided work. It is submitted for the degree of Master of Arts (Speech Pathology) in the University of the Witwatersrand, Johannesburg. It has not been submitted for any other degree or examination in any other university.

Dilys Margaret Jones

31st day of October 2005

To my mother, May Jones, in loving memory.

ACKNOWLEDGEMENTS

I wish to acknowledge my sincere thanks to the following people, without whom this project would never have been completed:

My supervisor, mentor and friend, Professor Claire Penn, Chair of the Discipline of Speech Language Pathology and Audiology, University of the Witwatersrand, for her endless patience and belief in me, her vision and insight, and for first instilling in me the passion for communication impairment.

My colleagues in the Discipline of Speech Language Pathology and Audiology, University of the Witwatersrand for all of their help, support and many hours of fruitful discussion, especially Heila Jordaan, Nola Watt, Gill Shaw-Ridley, Karen Levin and Janet Slotow-de Picciato.

Mr Peter Fridjhon, School of Statistics and Actuarial Science, University of the Witwatersrand, for his advice on statistical procedures.

My subjects and their families, for their participation in the study, and for sharing so many insights with me.

Alzheimer's and Related Disorders Association of South Africa and the matrons of the various frail care facilities who assisted me to locate potential subjects.

My husband, Bruce Armstrong, for all his love and support, both emotional and technical. I would never have finished without him.

CONTENTS

	Page
CHAPTER 1 INTRODUCTORY PERSPECTIVE	1
CHAPTER 2 COMMUNICATION IN ALZHEIMER'S DISEASE	6
An overview of Alzheimer's Disease	6
Communication in Alzheimer's Disease	10
Intervention in Alzheimer's Disease	15
CHAPTER 3 MEMORY AND COMPREHENSION IN ALZHEIMER'S DISEASE	19
Models of normal memory	19
Memory in Alzheimer's Disease	22
Models of normal language comprehension	25
The relationship between memory and comprehension	27
Memory and comprehension in normal aging	29
Comprehension in Alzheimer's Disease	30
CHAPTER 4 METHODOLOGY	35
Aims of the study	35
Participant selection	36
Participant description	37
Procedure	39
Sentence comprehension task	40
Discourse comprehension task	45
Data analysis	48
CHAPTER 5 RESULTS AND DISCUSSION	50
Results of GDS rating scale and ABCD	50
Results of sentence comprehension tasks	53

Results of discourse comprehension tasks	64
General discussion	69
 CHAPTER 6 CONCLUSIONS	 74
Limitations of the study	74
Conclusions	74
Implications for further research	77
Clinical implications	78
Concluding remarks	79
 APPENDICES	
Appendix A: Modifications to the ABCD	81
Appendix B: Sentence comprehension tasks	82
Appendix C: Discourse comprehension tasks	86
 LIST OF REFERENCES	 87

LIST OF TABLES

	Page
Table 1: Participant Description	38
Table 2: Examples of stimuli from each subtest of the sentence comprehension task	43
Table 3: Age, GDS rating and performance on the ABCD	50
Table 4: Mean construct scores	52
Table 5: Average improvement in score from complex to simple for each subtest (sentences)	54
Table 6: Average improvement in score from complex to simple for Syntax subtest	54
Table 7: Percentage of incorrect responses for each sentence type in Syntax subtest	56
Table 8: Average improvement in score from complex to simple for Pronouns subtest	57
Table 9: Average improvement in score from complex to simple for Directness subtest	59
Table 10: Average improvement in score from complex to simple for Literality subtest	60
Table 11: Average improvement in score from complex to simple condition for each subtest (discourse)	64
Table 12: Average improvement in score from complex to simple for “Farmer and Sons” subtest	65
Table 13: Average improvement in score from complex to simple for “Royal Scandal” subtest	66

LIST OF FIGURES

	Page
Figure 1: Criteria for clinical diagnosis of Alzheimer's Disease	7
Figure 2: Model of normal discourse comprehension	28
Figure 3: Results of Syntax subtest	55
Figure 4: Results of Pronouns subtest	57
Figure 5: Results of Directness subtest	60
Figure 6: Results of Literality subtest	61
Figure 7: Improvement from complex to simple for all variables and all participants	63
Figure 8: Results of "Farmer and sons" subtest	65
Figure 9: Results of "Royal Scandal" subtest	67
Figure 10. Proposed model for the factors affecting language comprehension	77

CHAPTER ONE

INTRODUCTORY PERSPECTIVE

This study investigated comprehension in Alzheimer's Disease (AD), with the specific focus on how it may be improved or facilitated by modifications made by the interlocutor. Interlocutors usually intuitively change the style and/or content of their language when conversing with various types of population, as, for example, when speaking to a second-language speaker or in conversation with a young child. When confronted with a conversational partner who has difficulty in understanding, it is thus natural for many speakers to attempt to simplify or modify their language, and, indeed, many publications geared for the caregivers of dementing individuals (eg. Mace and Rabins, 1992; Rau, 1993) suggest that carers try to do so. What is not clear is the extent to which this strategy is actually successful in enhancing comprehension on the part of the demented person, nor which aspects of modified communication play the greatest role.

The purpose of this study was to address this question, with a view to training caregivers to manage the comprehension problems associated with AD as effectively as possible. Despite the fact that there is universal agreement about the centrality of comprehension to successful communication, it remains a relatively underexplored domain in most areas of speech-language pathology. The study thus also aimed to provide some additional insights into the way people with AD understand, or fail to understand language, and to show the potential role of the speech therapist in this largely neglected group.

As a practising clinician in daily contact with patients suffering from a range of neurogenic communication disorders, my conviction continues to grow that few things affect quality of life in a more pervasive and terrifying way than communication impairment. It is my belief that

communicatively impaired elderly people are among the most marginalised groups, particularly in developing, youth-oriented, "new" societies such as South Africa. This is particularly so in the case of elderly people who also suffer severe cognitive impairments. One of the reasons for this, particularly in institutional settings, may be that caregivers feel that their efforts are futile in working with patients who are unable to respond normally to conversation and whose condition deteriorates irrespective of their interventions. As a result, as Maxim and Bryan (1994) point out "... levels of expectation are extremely low within the care sector. Residents are frequently not given the opportunity to utilise the skills they have" (p224). It thus seems clear that there is a two-fold need for intervention for dementing individuals: to establish ways of enhancing communication, at however limited a level, and to equip caregivers with the skills to recognise and facilitate successful communication.

In a survey conducted among speech-language therapists in South Africa, Mdlalo (1994) found that although almost all respondents perceived the need for intervention for patients with dementia, actual service provision to this population was very limited. Likewise, Harris (1992) in a local study found that very few families of demented patients received consistent support or intervention from any type of professional. Indeed, several current studies even question the ethics of intervention for patients with degenerative conditions in the face of vast numbers of under-serviced populations with more "treatable" conditions.¹ Eg. Cipolat, 2001, 28% of whose respondents, South African speech therapists, felt that it was unethical to provide speech therapy to patients with Parkinson's Disease given the shortage of health care resources. With the current focus on primary health care in South Africa and the growing HIV/AIDS crisis, it is likely that this problem will continue. The need is thus clear for the development of cost- and time-effective intervention procedures. These must, however, be theory-driven, and demonstrably effective. Clearly, in the South African context where even people with disorders with better

¹ This view is not in line with the policy of the South African Speech Language and Hearing Association that all patients have the right of access to treatment, nor with the National Health Plan for South Africa which states that "... every person has the right to optimal health care" (African National Congress, 1994, p7).

prognosis are underserved, these interventions must be geared towards caregiver training. Camp (2001) throws out the challenge to researchers that two transitions are required in dementia research: Firstly, the emphasis on efficacy (demonstrating that an intervention works under “laboratory” conditions) needs to shift to an emphasis on effectiveness (demonstrating that the intervention works in real-life contexts as well), and secondly researchers need to embrace the attitude that “... interventions are not truly effective unless they are disseminated” (p496) and implemented on a large scale.

Camp (2001) suggests, further, that effective interventions for dementia should meet the following criteria:

- they should be sufficiently robust to be effective in a variety of settings
- they should work across a range of levels of severity and types of dementia
- they must be able to be delivered effectively by existing caregivers and professionals
- they must fit within existing health care systems
- they should be tied to reimbursement (Camp, 2001, p498)

These criteria are of particular relevance and importance in the South African context.

This study, then, attempts to begin to explore some of these issues. The performance of nine subjects is investigated across a range of comprehension tasks, in which various linguistic variables are manipulated. Group trends are highlighted, but the subjects are essentially treated as single cases, since the heterogeneity of the sample, and indeed of the AD population in general, precludes large group studies. Given the study's ultimate focus on intervention, it was attempted to make the research procedures as naturalistic as possible, although this obviously has negative implications for its replicability.

Chapter two provides a review of the literature on communication in AD in general, together with a review of current intervention procedures for AD, while chapter three examines memory and comprehension in more detail. The research methodology is described in chapter four and the results are presented and discussed in chapter five. Chapter six contains the general discussion and conclusions, and implications of the study are discussed.

Perhaps one of the greatest shortcomings of qualitative, descriptive research is its potential for bias, and this point must be raised now. To some extent, negative perceptions of dementia, and indeed, of healthy aging, are reinforced by the literature which consistently focuses on identifying areas of deficit, rather than strength. One of my biases is that all people are capable of communicating on some levels, however basic that may be, and that an expectation of communicative success on the part of the interlocutor is more likely to facilitate it in the dementing person. This was borne out by my interactions with many severely demented individuals in the course of this research, even in those who were too severe to participate in the study.

The study of people with dementing conditions, particularly those in the more advanced stages of the disease process, is fraught with methodological difficulties. The personal challenge to the clinical researcher seeking to combine objectivity with empathy and to bridge the gap between theory and therapy is no less great. This is aptly summed up in the words of Mary Jo Santo Pietro, a prolific researcher in the area:

".. it (AD) .. is like a deep, dark secret. It got me thinking about the essence of life and personality and personhood. When you're not what you know and what you remember, who are you? It feels as though every day I am dealing with the most profound questions, with the mystery of life itself."

(cited in Goldberg, 1996, p31).

Dementia care in South Africa presents unique challenges to clinicians. Despite the dramatic changes which have ensued since the onset of democracy in 1994, there remains a dichotomy

between the “first world”, urban, mostly white population and the “third world”, rural, mostly black population. Dementia poses interesting challenges for both groups: Among affluent communities, emigration has taken a very high toll on the elderly, with many elderly people being institutionalised in South Africa while their adult children reside in other countries. Rapid urbanisation and upward socioeconomic mobility have sadly brought with them an increase in this phenomenon in black communities as well. Traditionally, institutional care for the elderly was non-existent in black communities, but this is changing rapidly. While the elderly become increasingly marginalized in affluent sectors of the community, their role as productive contributors appears to be increasing in poorer rural areas. A recent newspaper article suggested that in two of the rural provinces (Mpumalanga and Eastern Cape) 70 to 80% of the elderly population were the sole breadwinners in their extended families because of the AIDS pandemic (Ntshingila, Gules and Pather, 2005). Even if this figure is only partially correct, it suggests that massive health promotion efforts are required to help elderly people to fulfill this role. Clearly, also, however, it suggests that there will be ever-increasing numbers of elderly people with dementia who do not have family members to care for them. Appropriate, efficient and effective training of caregivers for dementing individuals in this country is thus critical.

CHAPTER TWO

COMMUNICATION IN ALZHEIMER'S DISEASE

AN OVERVIEW OF ALZHEIMER'S DISEASE

'Dementia' is defined by the American Psychiatric Association's Diagnostic and Statistical Manual (DSM IV, 1994) as "a loss of intellectual abilities of sufficient severity to interfere with social or occupational functioning" and is characterized by deterioration in multiple areas of cognition which must include both short and long term memory and at least one of the following: impairment of abstract thinking; impairment of judgement; or impairment of higher cortical functions including language. Dementia may be reversible or irreversible, and is classified by some (Cummings and Benson, 1983) as affecting mainly cortical (eg. Alzheimer's Disease and Pick's Disease) or subcortical structures (eg. Progressive Supranuclear Palsy and Parkinsonism). More current authors (eg. Osimani and Freedman, 1995) argue that this distinction is controversial since there is a high degree of overlap between behaviours formerly considered to be either "cortical" or "subcortical" in origin. Although there are many causes of dementia, including degenerative diseases such as Alzheimer's disease and Huntington's disease, endocrine metabolic diseases and toxic diseases (Cummings and Benson, 1983), Alzheimer's disease is the most common aetiology of irreversible dementia (Benson, 1986; Bayles and Kaszniak, 1987; Maxim and Bryan, 1994; Bayles, 2001).

Alzheimer's disease was first described by Alois Alzheimer in 1907, when he reported the case of a 56 year old woman who, for five years before her death, presented with progressive, severe memory loss, progressive disorientation, difficulty with spoken language, reading and writing, and an inability to learn new information. Post mortem examination revealed an atrophic brain with changes in the neurons that have now come to be called neurofibrillary tangles (Benson, 1986).

According to Cummings and Benson (1983) and Benson (1986) there was for many years a controversy as to whether senile and presenile forms of Alzheimer's disease represent the same clinical entity or not. However, it has now come to be generally accepted that the term reflects the entire spectrum of progressive degenerative dementia, since the disease process is identical in both senile and presenile forms (Maxim and Bryan, 1994). Furthermore, since a definite diagnosis of Alzheimer's disease can be made only with histopathological evidence from post mortem (McKhann, Drachman, Folstein, Katzman, Price and Stadlan, 1984), the term Dementia of the Alzheimer's type (DAT) or probable Alzheimer's Disease has come to be used (Bayles and Kaszniak, 1987). Diagnosis of probable AD is made on the basis of the clinical signs described in figure 1 below, in the absence of other systemic, neurological or psychiatric disorders (McKhann et al, 1984).

Criteria for the clinical diagnosis of probable Alzheimer's disease include: - dementia established by clinical examination and documented by the Mini-Mental Test or some similar examination and confirmed by neuropsychological tests; - deficits in two or more areas of cognition; - progressive worsening of memory and other cognitive functions; - no disturbance of consciousness; - onset between ages 40 and 90, most often after age 65; - absence of systemic disorders or other brain diseases that in and of themselves could account for the progressive deficits in memory and cognition. The diagnosis of probable AD is supported by: - progressive deterioration of specific cognitive functions such as language, motor skills and perception; - impaired activities of daily living and altered patterns of behaviour; - family history of similar disorders, particularly if confirmed neuropathologically; - laboratory results of normal lumbar puncture, normal pattern or nonspecific changes in EEG, evidence of cerebral atrophy on CT with progression documented by serial observation.
--

Figure 1: Criteria for clinical diagnosis of Alzheimer's disease (McKhann et al, 1984, p940; Ripich and Zioli, 1998)

Cummings and Benson (1983) describe the clinical features of DAT as being steadily progressive intellectual deterioration without periods of remission. The disease process can conveniently be divided into three stages, with disturbance in memory usually being the first noticeable symptom. During the first stage there is evidence of poor judgement and

reasoning, the patient may become careless at work and may become lost in familiar surroundings. Word finding difficulties are common at this stage. In the second stage, recent and remote memory become more severely impaired, there are marked language problems and apraxia and agnosia. Personality changes become evident. In the final stage, all intellectual functions have deteriorated severely, motor disabilities are apparent and the patient is mute and incontinent. Helm-Estabrooks (2001) aptly sums up this process:

“An analogy for AD is that it is the reverse of a Polaroid snapshot that slowly develops, with the subject appearing first as a faint shadow and then becoming increasingly distinct until the picture is clear. In contrast to the Polaroid process, AD causes all that makes us unique, intelligent humans to slowly fade away, leaving only the physical entity” (p247)

Death usually occurs between six and twelve years after onset as a result of aspiration pneumonia or infections. Personality and social behaviour are found to remain disproportionately intact in the early stages, despite intellectual deterioration. Depression is common early in the course of the illness, but diminishes as the intellectual impairment progresses (Cummings and Benson, 1983).

Bayles (2001) and Osimani and Freedman (1995) describe the neuropathological changes that occur in AD. These are the development of neurofibrillary tangles (described by Cummings and Benson, 1983, as neurofibrils which are contorted, thickened and conglutinated), neuritic plaques (minute areas of tissue degeneration) and granulovacuolar degeneration (the presence of fluid filled spaces and granular debris). Neuritic plaques are widely agreed to consist of an accumulation of a protein known as beta amyloid (and most current pharmacological research is focused on this so-called “amyloid cascade hypothesis” as having potential for drug intervention) (Selkoe, 2001; Lee et al, 2004). Lee et al (2004), however, argue that it is by no means clear whether the accumulation of beta amyloid is the cause or the effect of the disease process, and suggest that beta amyloid might even play a protective role in the diseased brain. In addition, in the brains of AD sufferers there is cortical atrophy and the volume of white matter is decreased. This is evident in the widened sulci and the dilation of the lateral

ventricles. In general, medial temporal structures of the brain tend to be implicated early on in the disease process with relatively greater involvement of the temporal-parietal association areas than the frontal (Henderson, 1996).

Neurochemical deficiencies are well documented in AD. Cummings and Benson (1983) comment that acetylcholine, choline acetyltransferase and acetylcholinesterase have all been shown to be decreased in AD. According to Osimani and Freedman (1995), the cholinergic system of the nucleus basalis of Meynert is typically severely affected in AD. Since this has a very complicated network of feed-forward and feed-backward pathways and cortical projections, it is felt that this may play an important role in dementias generally and in AD specifically.

Although the neuropathology of AD is well known, no single aetiological factor has, as yet, been identified (Scheibel and Wechsler, 1986; Bayles, 2001). However, various causes have been hypothesised, including infectious agents, toxic substances and genetic transmission (Bayles and Kaszniak, 1987). The finding that Down's Syndrome patients who live long enough develop Alzheimer type neuropathological changes has lent some support to the genetic theory (Jarvik and Matsuyama, 1986, cited by Scheibel and Wechsler, 1986), and abnormalities of chromosomes 1, 14 and 21 have been linked to early-onset AD. The late-onset familial form of AD has been linked with a gene on chromosome 10 (Bayles, 2001). Selkoe (2001) sums up the current thinking by saying that "... this multicellular dysfunction (in AD) appears to represent a common cytopathological response to several distinct genetic defects and perhaps also to certain environmental precipitants that remain poorly understood" (p75).

While drugs such as Tacrin, and more recently, Aricept are widely used to attempt to slow down the rate of memory loss (Gauthier, 1999), and numerous other drug and surgical interventions are being investigated, there is to date no cure for AD. It has been estimated that 10,3% of individuals over the age of 65, and 47,2% of individuals over the age of 85

will be affected by AD (Tomoeda and Bayles, 1990). People over 80 years of age now constitute the fastest growing sector of the population of developed countries such as the United States (Shuaib and Boyle, 1996) and it has been estimated that the cost of AD in the United States, including both direct costs such as medical care, and indirect costs such as loss of productivity of caregivers, amounts to U.S.\$100 billion annually (Goldberg, 1996). It is thus not surprising that AD was described by Newsweek magazine as "the disease of the (20th) century" (Benson, 1986).

Local statistics and epidemiological data are limited. Louw (1995) estimated that there were approximately 1,7 million South Africans over the age of 65, of whom approximately 1 million were rural black people whom Louw described as "... among the most marginalised and vulnerable sectors of our population" (p155). Results of the most recent census indicate that there are approximately 3 million people over the age of 60 (7,3% of the population), with 3,2% of the population being over the age of 70 (Statistics South Africa, 2003). As long ago as 1997, Kinsella and Ferreira described the growth rate of the over 60 year old group as exceeding the growth rate of the total population (Kinsella and Ferreira, 1997) and this trend is likely to continue in the foreseeable future. It is thus likely that the incidence of AD will continue to increase in this country, particularly with improved detection and prevention of other age-related diseases.

COMMUNICATION IN AD

Although language disturbances were reported by Alzheimer in his original description of his patient (Benson, 1986), it is only in the last three decades that the language of patients with AD has received systematic attention. The DSM IV criteria for dementia include language disturbance only as a possible consequence, but according to Henderson (1996) most authorities who have written on the subject of AD agree that patients with this syndrome will demonstrate some degree of language impairment during the course of the disease. As Miller (1989) states "the question of interest is therefore not whether language impairments exist,

since the evidence is overwhelmingly in favour of this assumption, but their nature or characteristics" (p75).

Phonology

Authors in the area of AD (eg. Appell, Kertesz and Fisman, 1982; Bayles and Boone, 1982; Bayles, 1985 and Kempler, 1995) agree that knowledge of phonological rules is well preserved in the early and middle stages of the disease process, and often even in severely demented individuals, with patients being able to correct phonological errors in an utterance even when they are unable to comprehend the utterance's meaning.

Morphology and Syntax

Most researchers agree that these aspects are relatively well preserved in AD (Bayles, 1985; Schwartz, Marin and Saffran, 1979; Murdoch, Chenery, Wilks and Boyle, 1987; Appell, Kertesz and Fisman, 1982; Kempler, 1995; Hopper, Bayles and Kim, 2001). However, Schwartz et al (1979) point out that the greater the effect that syntax has on meaning, the more likely it is to be impaired.

Bayles (1985) and Hopper et al (2001) have hypothesised that the preservation of the phonological, morphological and syntactic systems is attributable to the fact that the rules of these systems are applied automatically. Furthermore, Schwartz et al (1979) argue that these systems are more localised to a particular area of the left hemisphere, and can thus become "functionally isolated from cognition" (p301), in contrast to the semantic system, which is dependent on cognition, and thus more vulnerable to diffuse neuronal damage. However, it is generally agreed that syntactic comprehension is impaired in AD, and this dissociation between receptive and expressive syntax makes evaluation of syntactic competence more difficult. The underlying mechanism for the syntactic comprehension deficit is controversial, and this is discussed in more detail in chapter three.

Semantics

It is widely agreed that it is the semantic system which is most vulnerable to dementing conditions. This is borne out by the frequent reports of impairments in confrontation naming, verbal fluency and sentence disambiguation tasks, and the "emptiness" of discourse (Bayles, 1982; Bayles, 1985; Schwartz et al, 1979; Appell et al, 1982; Murdoch et al, 1987; Hopper et al, 2001). According to Miller (1989) and Hart and Semple (1990) there is some dispute in the literature concerning the underlying cause of the naming deficit in dementia, with some authors hypothesising a perceptual deficit. Bayles and Tomoeda's (1983) findings contradict this claim, however, finding that more errors were semantically related to the targets than visually. Likewise, the anomia in spontaneous speech which is the earliest language symptom of AD (Kempler, 1995) cannot be accounted for by visual perceptual difficulties. This view is further supported by the findings of Grossman, Mickanin, Robinson and D'Esposito (1996) and Nebes and Halligan (1996) among others. However, since visual perceptual disorders are documented to occur in AD (Hart and Semple, 1990) it seems likely that perceptual difficulties contribute to impaired picture naming. However, there is an abundance of literature which suggests that the primary problem lies in the semantic system itself.

More current research has been directed towards addressing the issue of whether the central deficit involves impaired lexical access or deterioration of the lexical representations themselves. To date this has not been resolved, with findings in support of both arguments (eg. Bayles and Tomoeda, 1983; Kempler, 1988; Nebes, 1985; Chertkow, Bub and Seidenberg, 1989; Margolin, Pate and Friedrich, 1996; Nebes and Halligan, 1996). Kempler (1995) concludes that "no single explanation can account for the naming performance of any group of DAT patients. Visual perception, attention, lexical access and deterioration of lexical representations all play a role in anomia of DAT" (p102).

Discourse and Pragmatics

Fromm and Holland (1989) and Kempler (1995) state that pragmatics is the area of language which has received least attention in the AD population, with much of what is thought being

based on anecdotal evidence. These early anecdotal reports (eg. Bayles, 1984) suggested that AD patients presented with marked impairment in topic maintenance and turn-taking, demonstrated insensitivity to the communicative needs and experience of their interlocutors, and were unable to repair communication breakdowns. The discourse of AD patients was thus described as verbose, tangential, incoherent and empty. However, in addition to the anecdotal nature of this work, Orange and Purves (1996) point out that much of the earlier research into AD was based on subject selection criteria that were not sufficiently rigorous.

In more recent years, some aspects of discourse and pragmatics have been investigated in more detail. Hopper, Bayles and Kim (2001) suggest that “individuals in the middle stages of AD remain able to contribute meaningfully to a conversation” (p268) despite difficulty with topic maintenance, decreasing relevance of utterances and decreasing content. Likewise, Cannito, Hayashi and Ulatowska (1988) found discourse superstructure to be essentially preserved in patients with AD. Discourse was, however, characterised by increased irrelevancy, inaccuracy and overelaboration, at least part of which they attributed to difficulty with reference. Likewise Ripich and Terrell (1988) suggest that conversation may be perceived as being "incoherent" because AD subjects omit crucial pieces of discourse linking related ideas.

In a longitudinal study of discourse production in AD, consisting of indepth case studies of 3 subjects over a five year period, Tomoeda and Bayles (1993) found a progressive decrease in the amount of information provided. They also noted an initial increase in the number of words used, followed by a decrease, which they use to account for the differences in findings of various researchers (eg. Nicholas, Obler, Albert and Helm-Estabrooks, 1985; Hier, Hagenlocker and Schindler, 1985) with regard to number of words. They concluded that verbosity and reduced output are dependent on the severity of the disease. Although fluency in their subjects remained relatively intact, the number of information units used over time was found to be a very efficient measure of the rate of the subjects' deterioration.

Ripich, Vertes, Whitehouse, Fulton and Ekelman (1991) summarised their research findings as follows: AD subjects (and their conversational partners) showed differences in word use, turn taking, nonverbal response, intelligibility and the use of speech acts. However, the basic structure of the conversational discourse was maintained. Orange and Purves (1996) and Kempler (1995) concur with them that some topic maintenance, turn-taking, making and understanding of propositions and greeting and providing their own names are relatively preserved, even in the later stages of the disease.

According to Kempler (1995) the underlying causes of the impaired discourse (and the dissociation of relatively preserved areas) in AD remain unclear. One possibility is that they are secondary to attention and memory problems, with Orange and Purves (1996) pointing out that much recent research is based on the assumption that the patient's cognitive status is the key feature underlying conversational discourse both at micro- and macro-structural levels. Others argue that AD selectively affects specific aspects of discourse knowledge. For example, Grafman, Thompson, Weingartner, Martinez, Lawlor and Sunderland (1991) hypothesise that AD patients have impaired script access, where a script is defined as a set of events that occur in a typical sequence. According to their model, AD patients may behave inappropriately or appear disoriented in certain situations because they have failed to retrieve the appropriate script. In other situations, however, they are able to perform adequately because their knowledge of the script enables them to compensate for their other linguistic and cognitive deficits. They suggest that impaired script access may imply relatively more pathological involvement of the prefrontal cortex, but their model does not account for differential script-accessing ability.

Kempler (1995) concludes that some aspects such as topic maintenance would appear to be more dependent on recent memory. Others may be more dependent on morphosyntactic abilities, and are thus better retained. Aspects such as the preservation of appropriate forms of politeness (as described, for example, in Hopper et al, 2001) are, however, not readily explained by either of these.

Contrary to Bayles' (1984) report that AD subjects are unable to repair communication breakdown, Ripich et al's (1991) results suggested that their AD subjects seemed to recognise confusion and requested clarification and additional information. Orange and Purves (1996) in their review of research into discourse and pragmatics also suggest that AD patients do request clarification and attempt to use conversational repair strategies. Ripich et al (1991) concluded that "...early to mid stages of (S)DAT patients use requests to help them process information.... The now classic neuropsychological position that a given variance often represents a strategy in response to a deficit rather than a deficit per se appears supported by this data" (p340).

Such a view is clearly consistent with compensation models of intervention and is a central tenet of this study. It is interesting that, despite the widespread shift in attitude in Speech-Language Pathology away from deficit-orientation (as exemplified by the Life Participation Approach to Aphasia (Chapey, Duchan, Elman, Garcia, Kagan, Lyon and Simmons-Mackie, 2001), or Worrall and Fratalli's (2000) book), until very recently, descriptions of communication in dementia have remained almost entirely deficit-based. The title of Hopper et al's 2001 review article "Retained Neuropsychological Abilities of Individuals with Alzheimer's Disease" represents a major shift in attitude, consistent with a more modern view of AD as a treatable condition.

INTERVENTION IN AD

"Dementia is not just a source of interesting academic problems that are difficult to resolve. Those who suffer and those who care for them.... are faced with considerable difficulties that demand a response. The fact that communication between carer and sufferer becomes difficult, and eventually can be almost impossible, can be one of the greatest sources of distress. It is therefore important that one significant thrust in the study of language impairment in dementia should be directed towards the question of doing something to resolve communication difficulties"

(Miller, 1989, p84)

The array of literature in the area of dementia that has proliferated in the last three decades has concentrated on the identification of language impairments and the rationalisation of the role of the speech-language pathologist in the dementia management team, and it is only in the last decade that intervention has received significant attention. According to Hopper and Bayles (2001), “Since 1991... interest in treating the communication problems of individuals with dementia has increased and results of studies to date suggest that dementia patients can improve function and maintain abilities longer when engaged in behavioural treatment” (p843).

Speech-language interventions in dementia can be grouped broadly into two categories: direct (where the patient herself/himself participates in therapy) and, more commonly, indirect, where the focus of the intervention is on the environment or the caregiver (Mahendra, 2001; Hopper, 2001). According to Ripich and Zioli (1998), in caregiver surveys of stress and burden of care, communication breakdown is consistently described as one of the major stressors. Caregivers of people with AD are more likely to be depressed, take medications or require medical care than others of the same sex and age (Katon, Kleinman and Rosen, 1982). Furthermore, as Hopper (2001) points out, caregivers do not always recognise spared cognitive functions in AD and are thus not able to capitalise on these to enhance communication.

Rau (1993) provides detailed guidelines to caregivers on how to cope with communication changes at each stage of AD. Specifically to enhancing comprehension, she suggests strategies such as structuring conversations, using simple, direct language, adjusting vocabulary, increasing redundancy and providing help with topic changes. Lubinski (1995) introduced the notion of the ‘communicatively impaired environment’, characterised by features including sensory-confusing and depriving environments, lack of sensitivity to the value of communication; limited interlocutors and limited reasons to talk as a result of a restrictive environment. On the basis of extensive observation and research, she provides a wide range of environmental interventions, targeting the physical environment, the sensory

environment, the cognitive environment and the social environment, as well as a detailed in-service training programme for caregivers. However, she points out that there remains a great need to evaluate empirically how the positive effects of environmental manipulation can be measured, what stages of dementia are most amenable to these manipulations and how an improved communicative environment can improve the cost effectiveness of service delivery (Lubinski, 1995).

Investigating the efficacy of treatment in the dementias is complicated by the fact the treatment is unlikely to result in improvement because of the progressive nature of the disorder. Traditional group studies comparing a "therapy" group and a "non-therapy" group are thus not a valid means of investigation. Howard and Hatfield's (1987) approach to investigating efficacy by using within-subject comparisons thus appears to be more relevant with the dementia patient. Such procedures would seek to demonstrate that the manipulation of environmental or linguistic variables results in improvement in the patient's performance at that given time. Although most caregiver intervention programmes (eg. Hopper, 2001) recommend manipulation of such variables (eg. use of short sentences; use of redundancy; conversation about concrete topics; minimising external distractions), little empirical data about the efficacy of these strategies has been gathered to date. Although several formal caregiver communication programmes have been devised, only the FOCUSED Program for Caregivers (Ripich, 1996, cited by Ripich and Horner, 2004) has published data on its outcomes. Tomoeda and Bayles (1990) report on an education and counselling programme for caregivers. This programme was evaluated by the participants and judged to be effective. However, while such findings validate the worth of educational programmes in general, it does not answer the question of the efficacy of specific techniques for specific problems. As Howard and Hatfield (1987) point out, showing that a general intervention procedure is beneficial for a group of patients is only a preliminary step. In order for such research to have validity, it must be replicable, and must thus have clearly delineated procedures. Basso (1993) stated that therapy cannot wait for theory "since patients have a right to

rehabilitation" (p22). However, rigorous evaluation of procedures remains obligatory for the accountable clinician.

While carefully controlled studies of some direct therapy approaches (eg. Arkin, 1998 ; Bourgeois, 1990; Palm and Purves, 1996; Quayhagen et al, 1995) have yielded promising results, in a developing country such as South Africa, with its very limited resources, direct therapy procedures are likely to remain a luxury restricted to very few people. Institutional and respite care facilities are very scarce, and most dementing patients are therefore cared for at home. There is thus a clear need for the development of intervention strategies which will be time and cost effective, which will assist caregivers to maintain functional behaviour in the demented patient for as long as possible, and which can be implemented largely without professional supervision.

CHAPTER THREE

MEMORY AND COMPREHENSION IN ALZHEIMER'S DISEASE

Memory impairment is the hallmark of AD. It is thus necessary to consider the properties of normal memory and its functional relationship to language, particularly comprehension, and to examine the memory deficits in AD in more detail.

MODELS OF NORMAL MEMORY

Baddeley (1992) states that the past 20 years of research have confirmed that "memory" is not a single, unitary system, but a complex interrelationship of subsystems which he categorises broadly into sensory memory, primary memory (working memory) and long term memory. Although widely used in psychology, this model is not universally accepted (Searlemann and Herrmann, 1994) but it is considered to be a useful means of conceptualising memory processes.

Sensory memory

This refers to the very brief period that sensory systems (eg. vision, audition and olfaction) are thought to be able to store sensory information. For example, the auditory system is able to store sensory information for long enough to allow the perception of speech sounds - echoic memory. To date, only iconic memory (the visual sensory store) has received detailed investigation (Baddeley, 1992). Hart and Semple (1990) point out that memory deficits at this sensory level are likely to manifest as difficulties with perception, rather than with memory.

Primary memory

According to Baddeley (1992), primary memory (also referred to as short term memory, immediate memory and working memory) is usually conceptualised as a short term store of between a few seconds and a few minutes, which temporarily holds information while thinking, reasoning, reading or learning. However, he argues that research evidence mitigates against the idea of a unitary primary memory system, and instead, proposes the concept of working memory. In this conceptualisation of working memory, a central executive coordinates the function of two subsidiary systems and determines the distribution of processing

resources in an individual. These subsidiary systems are referred to as the visuospatial scratch pad and the phonological loop. Baddeley, Vallar and Wilson (1987) suggest that this phonological storage component of the articulatory loop, in addition to speech perception, holds sequences of incoming discourse, allowing for it to be processed and analysed. Thus patients with deficits in this system find new phonological learning very difficult, and may have problems in comprehending complex sentences.

Baddeley (1992) points out that a deficit in any one of the subsidiary systems may not have a very profound impact on a person's functioning, since working memory is able to use a range of subsidiary systems. However, a failure in the central executive is likely to have a severe effect on everyday living.

Searleman and Herrmann (1994), in their review of Baddeley's working memory model, conclude that although some data are not consistent with it, in general there is good empirical evidence in support of the model.

Secondary memory

Secondary (long term) memory, involves recall of information stored from between a few minutes to very long periods (Hart and Semple, 1990), and it is deficits in this area of memory that are usually considered by lay people to be "memory problems". As with the primary memory store, secondary memory does not constitute a single unitary system. One division that was proposed by Tulving (cited by Hart and Semple, 1990) was that of semantic and episodic memory. Episodic memory refers to autobiographical information (eg. something that happened in the past), while semantic memory is memory for knowledge (eg. knowing the name of the President) (Baddeley, 1992). Although most research into semantic memory has tended to consider linguistic information, Hart and Semple (1990) point out that the term semantic memory is concerned with all factual knowledge, and not only linguistic. According to Baddeley (1992), most "memories" comprise aspects from both semantic and episodic memory. However, breakdown can occur in one system with relative preservation of the other.

A third type of memory has also been postulated, namely, procedural or implicit memory. This refers to memory for particular skills or procedures (eg. motor activities), where the

person may not recall the process of learning, but still retains the actual skill. (Hart and Semple, 1990; Baddeley, 1992; Searleman and Herrmann, 1994).

Tulving (cited by Desgranges, Eustache, Rioux, de La Sayette and Lechevalier, 1996) conceptualised these three subsystems of secondary memory as being hierarchically organised, with episodic memory being the most developed, and procedural the least. According to this model, then, in order for normal memory function, inferior systems would be required to be intact. As will be discussed later, the performance of AD subjects on memory tasks lends some empirical support to this view. A more current variation on this model views secondary memory as comprising two subsystems, namely declarative (memory for facts – semantic and episodic) and non-declarative (procedural) (Bayles, 2001).

Alternate models of memory

Craik and Lockhart (1972), although acknowledging the existence of separate primary and secondary memory stores, argued that consideration of **how** information is processed is more meaningful than **where** it is processed. According to their model, which has come to be referred to as "levels of processing", the deeper the level of processing, the more likely it is that information will be remembered (Searleman and Herrmann, 1994).

Memory processing comprises three functions: input, storage and retrieval, which, although described separately, interact constantly (Baddeley, 1992). Input refers to the learning or acquisition of material to be remembered, and attention to the material, and organisation, categorisation and integration with existing material are crucial processes. Fundamental to the levels of processing approach is the assumption that all incoming stimuli can be processed on different levels (for example, remembering the colour of a book as opposed to its contents). Craik and Lockhart (1972) hypothesised that the deeper the processing of information being encoded, the more successful the learning and the better the retention. Once material has been encoded, it must then be stored until it is required again. However, "forgetting" may occur as a result of difficulty in retrieval, and not only because of a loss of information from the store. The success of retrieval is closely related to the efficiency of the original encoding or input, and material which has been learned in a disorganised way is often more difficult to retrieve. (Baddeley, 1992; Hart and Semple, 1990).

Although there is much empirical and intuitive evidence to support this approach, it has been criticised because of its "circularity" - that is, the depth of processing and the success of

retention cannot be measured independently of each other. However, this model does appear to have clinical utility for the AD population where documented attention difficulties (eg. Foldi, Lobosco and Schaefer, 2002), for example, may reduce the efficiency of encoding. It also has the potential to take into account the effects of the environment and the context - encoding and storage cannot be efficient when the person is confused or has failed to understand the information fully and the negative cycle of memory failure thus continues. Clearly, this has great relevance to the present study.

MEMORY IN AD

According to Hart and Semple (1990), little attention has been devoted to sensory memory in AD to date, and echoic memory in particular has been largely neglected. However, there is an increasing awareness of perceptual deficits in the dementias, which may be accounted for by problems at the level of sensory memory. The few studies of iconic memory (the visual sensory store) in AD (cited by Hart and Semple, 1990), also suggest that there may be deficits at this very early stage of information processing in AD.

Controversy abounds as to the most effective ways of measuring primary/working memory performance in both normals and in subjects with memory impairments. However, the findings of most studies have revealed deficits at this level in AD, both for linguistic and non-linguistic information, although the underlying reason for these deficits is not yet clear. (Bayles and Kaszniak, 1987; Hart and Semple, 1990; Murray, Ramage and Hopper, 2001). Morris (1986) and Baddeley et al (1986) (cited by Baddeley, 1992) have hypothesised that the primary memory deficits of patients with AD result from an impairment in the functioning of the central executive itself rather than in the various subsidiary systems. Likewise, Desgranges et al (1996) interpret the performance of AD subjects on tasks based on the Brown-Peterson paradigm as suggesting greater involvement of the central executive.

According to Hart and Semple (1990), Desgranges et al (1996) and Murray et al (2001), most authors agree that procedural memory is relatively preserved in AD. This is likely to be due to the fact that the structures involved in non-declarative memory (corpus striatum, motor cortex and cerebellum) are not usually affected by the disease process (Bayles, 2001).

In contrast, the neuroanatomical structures involved in declarative memory (hippocampus, medial temporal lobes, prefrontal cortex, and association cortices) tend to be affected early in the disease process, hence the marked early effects on secondary, declarative memory in AD (Bayles, 2001). There is a large body of literature documenting this impairment in secondary memory, particularly in terms of episodic memory. In summary, AD patients present with impairments at all three levels of secondary memory, namely, input, storage and retrieval, which have been related to inadequate encoding and superficial processing of information, an abnormal rate of "forgetting", or loss of stored information (although there are some contradictory studies here) and reduced accessibility to stored information (again, controversy abounds, particularly with reference to semantic cueing) (Bayles and Kaszniak, 1987; Hart and Semple, 1990).

It is in the area of semantic memory in AD that there is most controversy in the literature, with some authors arguing that it is relatively preserved, and others that it is the central deficit. According to Chertkow, Bub and Seidenberg (1989) the bulk of research evidence thus far suggests that semantic memory is disturbed in AD. Schwartz, Marin and Saffran (1979) describe the subject of their single case study as having a specific semantic memory deficit characterised by a systematic, progressive "loss of the semantic features which define reference terms" (p285). Similarly, Martin and Fedio (1983) argue that AD leads to "a specific disruption in semantic knowledge characterised by a difficulty in differentiating between items within the same semantic category concurrent with the relative preservation of broader categorical information" (p124). Abeysinghe, Bayles and Trosset (1990) also suggest that the semantic memory impairment is due in part to deterioration in associative relationships between concepts.

Nebes (1985) and Nebes and Halligan (1996), on the other hand, believe that semantic memory itself is not disrupted, but rather that difficulties with semantic tasks result from an impairment in access. That is, individuals with AD have difficulty in actively searching their semantic memory in order to make decisions about semantic information. Hart and Semple (1990) also believe that the contents of semantic memory are relatively preserved although accessing of this information may be impaired. The relative intactness of the semantic system appeared to be borne out in Nebes' (1985) study by the subjects' responses to semantic priming tasks *inter alia*. In a similar semantic priming task, however, Chertkow, Bub and Seidenberg (1989) found "pathologically" increased semantic priming effects in subjects with

AD as opposed to normal elderly subjects, which they propose reflects degradation of the semantic memory. Given the different subject selection criteria used in these studies, as well as the different tasks, however, it is difficult to compare or interpret many of these conflicting accounts. It is noteworthy that Tulving's more recent models of the memory system (cited by Desgranges et al, 1996) postulate the existence of a separate "perceptual representation system" which underlies priming effects - if this is so, then any apparent dissociation between intact priming effects and impaired semantic memory may be explained. Shallice (1987) suggests that the deterioration of specific knowledge in the face of relatively preserved general knowledge (eg. retrieval of categories where category members cannot be retrieved) lends more support to the notion of semantic memory loss.

Bayles and Kaszniak (1987) take the semantic memory argument a step further by suggesting that the deficit in episodic memory in AD is accounted for, at least in part, by poor encoding as a result of semantic memory impairment. This view would appear to be consistent with Tulving's hypothesis of episodic memory being dependent on the integrity of "lower" subsystems - supported by the dissociations in memory subsystems demonstrated by Desgranges et al (1996) in AD subjects.

To some extent the apparently conflicting results of different studies probably reflect the different methodologies used, as well as a lack of agreement as to what constitutes evidence for either argument. Clearly, too, as the features of the various subtypes of AD are delineated, it may become evident that different studies are describing different disorders, as well as different stages of severity. The view taken for this study is that both arguments are true: namely that there is a characteristic impairment in semantic access together with a gradual degradation in the integrity of the semantic system itself as the disease progresses. This would seem to account for the preservation of residual areas of strength, while acknowledging that these may be temporary, depending on the stage of the disease.

Whatever the standpoint adopted, it is clear that impaired semantic functioning is a core feature of AD. A study by Grossman et al (1996) attempting to identify the neural basis for semantic memory based on evidence from AD patients also lends physiological support to the notion, discussed earlier, that AD patients are able to compensate (or at least attempt to do so) for some of their difficulties: this study examined areas of brain activation on PET scan in

response to semantic tasks and found that the AD subjects showed significant activation in regions not recruited in normal controls, which they suggest may be compensatory in nature.

MODELS OF NORMAL LANGUAGE COMPREHENSION

Carrow-Woolfolk (1988) defines comprehension as "the behaviour by which we attach meaning to coded symbols and signs" and she perceives 'decoding', 'understanding' and 'comprehension' as separate, hierarchical processes. For example, if a message is not decoded correctly (ie. errors in analysis of phonemes, words or grammatical elements) understanding and comprehension may be adversely affected. Similarly, it is possible to decode a foreign language, but not to understand it. Finally, even when decoding **and** understanding take place, it is possible that comprehension may be impaired if the listener does not have prior knowledge about that information (eg. one may decode and understand a cricket commentary, but unless one is familiar with the rules of the game, one will not be able to comprehend it).

Comprehension consists of three aspects, and comprehension breakdown may occur in any or all of these: knowing the rules of the code - combinations of phonemes, morphemes and syntax and the meanings these have when used in particular ways; the clarity and accuracy of the transmission of language through the auditory system - precision of auditory perceptual processing in discriminating and categorising phonemes, segments, units of language, etc; and the utilisation of messages and understanding the intention of the speaker (Carrow-Woolfolk, 1988).

Various models of language comprehension have been proposed, many of which are deficient in that they propose a rigid, unidirectional flow of information, inconsistent with what is known of the rich complexity of human language. Most also fail to take into account the context in which comprehension occurs, and the effects of other factors, such as long and short term memory. Clearly these factors will play a critical role in comprehension for the AD subject.

Marcus (1982) for example, hypothesised that the first stage in processing occurs at the *syntax* parser. This analyses the input into a tree structure, which serves as the input for the

semantic processor. Meaning obtained in this way is then processed by *world knowledge*. The *syntax* step may be bypassed if there is insufficient or fragmented information.

In contrast to this hierarchical model of processing, Tyler (1987) proposes that there is simultaneous integration of lexical, syntactic, semantic and pragmatic analyses. She describes these as "core" processes, which take place automatically. She outlines three important properties of the core processes in normal comprehension: Firstly, they are optimally efficient - that is, a word is recognised from the first moment that it is distinguishable from other words in the language; Secondly, the core processes operate **bottom-up**. For example, for single word recognition, the set of possible words for analysis is first defined by the phonological characteristics of the sensory input; Thirdly, the core processes are obligatory.

Tyler (1987) suggests that the effect of these three properties is that speech input is rapidly moved onto higher levels of representation. Mapping onto the internal lexicon and syntactic and semantic interpretation can begin after only about half a word has been heard. Contextual information also assists in providing missing information. That is, there is interaction between bottom-up and top-down processing. The advantage of this interaction is that the listener is able to integrate information from the utterance with his/her specific world knowledge and the specific discourse context. Studies in the aphasic population have contributed greatly to the understanding of the importance of context in discourse comprehension. It is widely agreed that aphasic individuals can have relatively intact ability to understand discourse even when they have severely impaired sentence comprehension (Stachowiak, Huber, Poeck and Kerschensteiner, 1977; Caplan and Evans, 1990). This is attributed to their ability to use context to compensate for sentence level difficulties.

Similarly, Kintsch (1977) also views comprehension as an interaction between top-down and bottom-up processes. In his model, processing of macrostructure (global themes of a discourse) does not occur as the final stage in a hierarchy, but rather, information is processed simultaneously on all levels in an interactive manner to result in eventual comprehension. That is, as new microstructures (individual propositions) are analysed, they are fed into the global macrostructure. For example, Kwong-See and Ryan (1996) point out that identifying the antecedents and referents to pronouns are essential for them to be understood within the context of a discourse macrostructure. Importantly, since a text could contain a very large

number of propositions, the immediacy of processing as well as the constant integration of new information, reduces some of the demands of short term/working memory. Just and Carpenter (1992) also suggest that lower levels (eg. syntactic structure) may be de-activated once higher level processing has occurred. (For example, little may be recalled about the syntactic structures of a text even when the macrostructure is well recalled).

Kahn and Goulet (1996) comment that crucial factors frequently omitted from cognitive models of language processing are the listener's attitudes, motivations and goals (possibly because of the difficulty inherent in quantifying and operationalising them). These factors must, however, be taken into consideration in any investigation into comprehension, and are particularly important in this study.

THE RELATIONSHIP BETWEEN MEMORY AND COMPREHENSION

Carrow-Woolfolk (1988) highlights the importance of long term (secondary) memory for comprehension - memory banks containing information about syntax, semantics and pragmatics, as well as knowledge about the world, are essential for decoding and comprehension, because it is against this stored information that new information is compared. As she points out, comprehension is not **getting** meaning from what is said, but **bringing** meaning to it.

Primary memory also plays a critical role in storing the intermediate products of the comprehension analysis and, according to Just and Carpenter (1992), can be viewed as the "pool of operational resources that perform the symbolic computations and thereby generate the intermediate and final products" (p.123). They hypothesise that comprehension is constrained by the capacity of the individual's working memory, and propose a "trading" relationship between storage and processing according to which processing will be scaled down when the storage capacity is exceeded. Thus, the speed and content of language processing depend on the capacity of the working memory, and when insufficient resources are available for the demands of a particular task, then there is degradation of both storage and computation.

Another role of the working memory in discourse processing is to act as what Kwong-See and Ryan (1996) refer to as the control system. This serves to activate relevant knowledge

and inhibit irrelevant information, acting as a filter for the incoming information. This filtering process, and particularly the inhibition of information as it becomes less relevant is being viewed as an increasingly important aspect of discourse processing (Faust, Balota, Duchek, Gernsbacher and Smith, 1996).

In the individual with AD, where there appears to be impairment in all three subsystems of memory the effect on language comprehension is likely to be profound. It is important to consider, however, that the relationship between memory and comprehension is reciprocal, since impaired comprehension in turn will result in poor acquisition and hence in poor memory. As Ska and Joanne (1996) point out "... it is not possible to study discourse comprehension without considering memory processing" (p101). This symbiotic relationship is summarised in figure 2, also incorporating the role of attitudes, goals and motivations highlighted by Kahn and Goulet (1996).

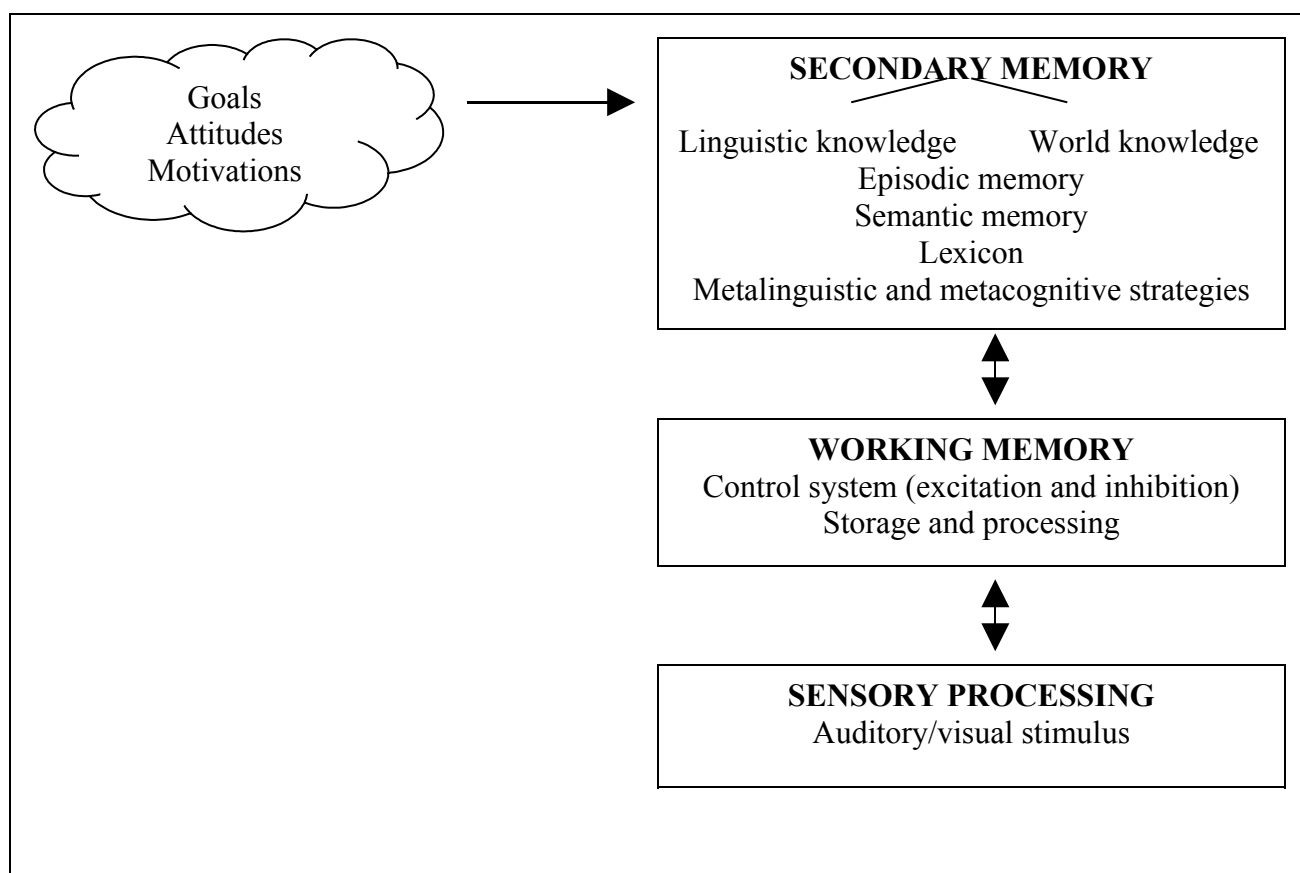


Figure 2: Model of normal discourse comprehension

(adapted from Kwong-See and Ryan, 1996).

MEMORY AND COMPREHENSION IN NORMAL AGING

According to Shadden (1988), "perhaps no area of gerontological research and theory is more controversial than the exploration of cognitive changes associated with aging" (p79), and Kausler (1988) provides a review of some of the methodological flaws which may account for the controversies (including the practice of group studies, and the ecological validity of laboratory studies). Nevertheless, it is widely agreed that there are some changes in cognitive processes associated with aging, including changes in working memory (Kwong See and Ryan, 1996).

Kausler (1988) summarises the two main schools of thought accounting for this as being a decrease in processing resources (either because of a decrease in storage capacity or because of a decrease in processing capacity, or both), or a decrease in the speed of processing. Kwong See and Ryan (1996) view both decreased resources and decreased speed as influencing each other. In addition, they point out that age-related changes in sensory abilities (eg. hearing) contribute to stressing the processing resources further. Hasher and Zacks (1988, cited by Kwong See and Ryan, 1996) contribute a third possible explanation for age-related changes in comprehension: aging appears to be associated with a decreased ability to prevent irrelevant information from entering the working memory, thus diminishing the efficiency of the working memory.

Early studies of normal aging (eg. Cohen, 1979; Ulatowska, Cannito, Hayashi and Fleming, 1985) suggested some marked age-related changes in comprehension ability. For example, Cohen's subjects demonstrated poorer ability to understand inferences and detect verbal anomalies, while Ulatowska et al's subjects demonstrated poorer comprehension of discourse. However, current researchers have criticised much of the earlier research for failing to take into account the documented changes *inter alia* in working memory.

To date, the results of studies of comprehension in normal aging are inconclusive. Some studies show that the performance of older adults is poorer than younger, while others show better performance by older subjects. (Kwong See and Ryan, 1996). One important finding, however, which is relevant to this study, has been that older adults appear to make more use of world knowledge than adolescents in processing texts (Kwong See and Ryan, 1996).

COMPREHENSION IN AD

In view of Bayles and Tomoeda's (1991) finding that inability to comprehend instructions was the fourth most prevalent linguistic symptom reported by caregivers of AD patients, it is surprising how little systematic attention has been paid to comprehension in these patients. Early studies of language in AD likened it to transcortical sensory aphasia and thus acknowledged that there is a primary receptive deficit associated with the disease (Miller, 1989) and, indeed, most studies have concluded that receptive language is impaired in AD (Appell et al, 1982; Murdoch et al, 1987; Bayles, 1982). Findings of various studies are presented in this section, but it should be borne in mind that many of these should be interpreted with caution.

One of the inherent difficulties in the study of comprehension lies in the fact that comprehension can only be inferred, not measured itself. That is, inferences are made about the person's comprehension on the basis of some sort of outcome, be it a verbal or a behavioural response. This makes "measurement" difficult, and probably accounts both for the paucity of studies of receptive language, and for the often conflicting findings. This difficulty is a key feature of the present study: subjects behaved in a particular way in response to presented stimuli. If that behaviour was different under a different condition one can conclude only that different linguistic conditions elicited different **responses**, not different levels or ways of comprehension. Since fluctuating behaviours are part of the condition in AD, and AD subjects are known to be vulnerable to the effects of limited attention, inference about comprehension is even more difficult in this population. This is felt to be a strong motivation for the use of qualitative, descriptive research techniques.

Likewise, it is a motivation for single-case studies rather than group designs, since even the most carefully selected, homogeneous group cannot be matched for the external factors (such as fatigue, affect, motivation) which may influence behaviour or responses. Such variables are difficult to manipulate even when, as in this study, subjects act as their own controls, although this is felt to be a more appropriate method. As discussed previously, large group studies are problematic in AD because of the difficulty in ensuring a sufficiently homogeneous sample. This is particularly true in South Africa where the medical differential diagnosis is often poor and is certainly unlikely to include an attempt to differentiate between different subtypes of AD. The converse of this is, unfortunately, also true: generalisation

from single-case studies is limited when the specifics of the underlying pathology of the subject are not known.

Many studies (particularly the older ones) have tended to approach dementia from the perspective of aphasia, attempts to classify the type of "aphasia" in dementia (eg. as cited by Miller, 1989) being typical of this. While attempts to "compare" the language of AD to aphasia or right hemisphere language disorder¹ have contributed greatly to our understanding of AD language, and many studies (including the present one) borrow heavily from what is known about other neurogenic communication disorders, it is crucial to view AD from its own, unique theoretical perspective.

A final note of caution relates to the difficulty in generalising "laboratory" findings to real-life performance. Many studies described in the literature rely heavily on tasks such as single word recognition, grammaticality judgements or sentence disambiguation. Performance on these tasks obviously cannot be equated to discourse comprehension.

Schulte and Brandt (1987) list various factors which can affect auditory comprehension: linguistic factors, including length of message and syntactic complexity, timing factors including rate and pauses, attentional factors, context, performance factors and presentation variables. Any discussion of comprehension must include an evaluation of these factors.

According to Kempler (1995) and Hopper et al (2001), comprehension of simple concrete material seems to be relatively intact in the early stages of the disease process. By the moderate stage, comprehension for complex material is usually impaired (Appell et al, 1982), and by the late stage comprehension is severely impaired in all modalities, even at the single word level (Kempler, 1982; Hopper et al, 2001).

Syntactic comprehension

The comprehension of syntax has been found by a number of authors to be consistently less intact than expression. Tomoeda, Bayles, Boone, Kaszniak and Slauson (1990) found that the level of syntactic complexity significantly affected comprehension, despite the relative preservation of expressive syntax. Similarly, Schwartz et al (1979) reported poorer

¹ For example, Reiff Cherney (1990)

comprehension of syntactic structures that affected meaning (eg. reversible SVO sentences). Waters, Caplan and Rochon (1991) confirm syntactic comprehension impairments, and suggest that this deficit may be due to a reduction in processing resources. Similarly, Kempler (1995) suggests that the dissociation between receptive and expressive syntax can be explained by the hypothesis that the memory and processing demands of reception are greater than those for expression. However, he acknowledges that the findings of studies in which subjects can repeat complex sentences even when they cannot understand them do indicate that there may be deterioration in the ability to process complex sentences over and above the memory demands (Kempler, 1995).

In contrast to these findings, Rochon, Waters and Caplan (1994) examined 23 subjects on a range of sentence-picture matching tasks of differing complexity, and found that comprehension was not poorer for sentences that were more syntactically complex, but for those that contained more than a single proposition. This suggests that it may have been the memory load, rather than the syntactic complexity that contributed to the subjects' difficulty.

Anderson, Kempler and Small (1991) found that their AD subjects scored significantly more poorly than normal controls on tests of grammatic comprehension, although, interestingly, they performed well on a "heteronym" task, in which comprehension of the preceding sentence was required in order to know how to pronounce the stimulus, suggesting preservation of some levels of automatic processing. Waters et al (1991) compared AD subjects' comprehension of syntactically "simple" and "complex" sentences, and hypothesised that the greater difficulty experienced with increasing complexity was attributable to the need for greater processing resources for more complex sentences. Tomoeda et al's 1990 study examined the effect of increasing syntactic complexity on comprehension (using the Revised Token Test), and concluded that increased complexity significantly affected comprehension both in AD patients, and in their normal elderly controls. They concluded that "individuals communicating with AD patients can improve patients' ability to comprehend by speaking in short and syntactically simple sentences" (p159). However, they acknowledge the limitations of the Revised Token Test which have been discussed, for example by Stachowiak, et al (1977) and Wegner et al (1984), who have found poor correlations between Token Test performance and functional comprehension ability.

Comprehension of non-literal language

Syntax remains the area of comprehension that has been most investigated in the literature. However, other aspects have also received attention. Bayles (1984) comments that AD patients have difficulty in detecting and understanding humour and sarcasm, and this is borne out by the findings of Fromm and Holland (1989) that their subjects had particular difficulty with nonliteral and abstract utterances, as well as with sarcasm and humour. These findings, coupled with those such as Reiff-Cherney's (1990) suggest that this will be a fruitful area for future research.

Pronoun comprehension

Another area of potential involves the understanding of pronouns. According to Ulatowska, Hayashi, Cannito and Fleming (1986), there appears to be a "lifespan continuum of referential decline within the normal population ... (with) the referential problems of dementing illness perhaps represent(ing) an extreme extension of such a continuum" (p34). Pronouns in particular have been found to present difficulty both expressively and receptively in the aphasic (Berko-Gleason, Goodglass, Obler, Green, Hyde and Weintraub, 1980 and Ulatowska, North and Macaluso-Haynes, 1981) and normal elderly (Ulatowska et al, 1986; Cohen, 1979) populations.

Cannito et al (1988) found that in the discourse production of their subjects with AD there were marked difficulties in the use of pronouns, manifesting in a significantly higher proportion of pronouns and more referential errors than in their normal subjects. Since pronouns play an important role in reference as "special markers within a text that point to lexical items, which in turn refer to semantic participants" (Ulatowska et al, 1986, p27) closer examination of the ability of AD patients to comprehend them seems warranted.

Discourse comprehension

Faust et al (1997) examined comprehension from a different perspective, namely explaining, rather than describing symptoms, and concluded that one of the core cognitive deficits underlying receptive breakdown in AD is a failure in the inhibitory mechanism of the working memory's control system. Their findings suggested that while excitatory processes remained essentially intact, the ability to disinhibit irrelevant material was impaired from very early in the disease process. This appears to have far-reaching implications, particularly at the discourse level.

To date, there has been little research into comprehension beyond the word and sentence level. Although this data undoubtedly adds to the theoretical knowledge of the nature of the linguistic deficit in AD, it has contributed little to the understanding of the functional effect on the individual. The “soft” features of discourse comprehension described in figure 2 (goals, attitudes and motivation) and the context in which it takes place have undergone very limited investigation. Furthermore, although the literature suggests particular aspects of comprehension which are most vulnerable, with the exception of Tomoeda et al (1990), there have been few attempts to discover whether manipulating these aspects will enhance comprehension and thus facilitate improved communication. Of particular interest is that many of the studies described allude to material as being “simple” or “complex”, but these terms are not defined. Presumably what is simple or complex for one person is not necessarily so for another, depending on prior experience or context.

CHAPTER FOUR

METHODOLOGY

The preceding chapters have described the nature of the problem in comprehension in AD and have highlighted some of the important methodological considerations for its investigation. This chapter outlines the methodology used in the study and attempts to identify flaws or possible sources of error or misinterpretation in the results.

In order to attempt to overcome some of the pitfalls of group or single-case designs, this study employed what is in essence a compromise between both: a multiple single-case design. This was felt to represent the most effective means of investigation since it would allow the performance of individual subjects to be analysed and described, while also allowing for the discussion of group trends. Nine participants were thus selected in order for the group to be sufficiently large for group trends to be statistically valid.

AIMS OF THE STUDY

1. To identify linguistic variables which facilitate improved comprehension at the sentence level.
2. To determine whether the manipulation of these variables can result in improved comprehension within a functional discourse context.
3. To determine if the systematic manipulation of these variables is a viable method of intervention for patients with AD.
4. To describe the pattern of comprehension strengths and deficits shown by the AD subjects.
5. To attempt to develop an explanatory model for the pattern of comprehension breakdown in AD.

PARTICIPANT SELECTION

Participants were selected according to the following criteria:

1. Medical diagnosis of probable AD according to the diagnostic criteria specified by the NINCDS-ADRDA task force (McKhann et al, 1984; Gauthier, 1999).
2. All participants to be first language English speakers.
3. Participants to have had a minimum of 8 years of formal education in order to meet the linguistic demands of the test procedure.
4. No past history of neurological disease, psychiatric illness or substance abuse.
5. Corrected vision and hearing within normal limits.
6. Participants to be in the mild to moderate stages of the disease as measured by the Global Deterioration Scale (GDS) (Reisberg, Ferris and Crook, 1982), that is, with ratings of 3 or 4 for mild patients and 5 or 6 for moderate patients (Bayles, Boone, Tomoeda, Slauson and Kaszniak, 1989)¹

Ethical clearance to undertake the study was granted by the University Committee for Research using Human Subjects. Lists of potential participants were acquired through nursing homes specialising in the care of frail elderly patients. After obtaining consent from their next-of-kin a preliminary interview was held with the participant and his or her nursing caregivers to determine if the selection criteria were met. In the case of two of the participants who had no next-of-kin, consent was granted by the Nursing Services Manager of the nursing home, acting in her capacity as their curator. All participants and their next-of-kin were assured that they could withdraw from the study at any time if they wished to, and feedback was given to family members by the researcher when this was requested.

¹ According to Reisberg et al (1982) a score of 3 on the GDS is considered to represent mild cognitive decline, a score of 4 moderate, a score of 5 moderately severe, and a score of 6 severe cognitive decline. However, the categories of Bayles et al (1989) have been used since scores on the Arizona Battery for Communication Disorders of Dementia (ABCD) (Bayles and Tomoeda, 1993) are interpreted in this way.

PARTICIPANT DESCRIPTION

Nine participants who met the selection criteria were selected, and demographic information is summarised in Table 1 on page 46.

Subjects ranged in age from 62 to 90 years, with a mean age of 79,2 years. All of the subjects selected were female.

It was noteworthy that of the approximately 50 names provided to the researcher as potential subjects, only 2 were male, one of whom suffered a head injury shortly before being interviewed, and the second who was found to be suffering from Parkinson's Disease. This is not consistent with the gender distribution of AD described in the literature, but seemed to reflect the normal distribution in nursing homes.

Furthermore, all of the subjects were institutionalised. This has important implications for the research findings in view of the reported possible effects of institutionalisation on communication (Lubinski and Welland, 1997), but also reflects the trend for white middle class elderly people to be institutionalised in South Africa.² Given the lack of facilities and different attitudes to aging, this is likely to be different in other cultural groups.

In view of the insidious nature of the disease process, it was not possible to determine the length of time since onset. This was exacerbated by the delay in reaching a diagnosis. In only two of the subjects selected (AG and RC) was the diagnosis of AD confirmed by a neurologist. However, this appeared to reflect the norm in frail-care facilities, with the overwhelming majority of patients having their diagnosis suggested by a general practitioner. The opinion expressed by many of the nursing staff was that consultation with a neurologist or gerontologist is "not necessary". Clearly, this has very far-reaching implications for research conducted in this setting. A similar problem with possibly inaccurate diagnosis exists in much of the literature on AD, particularly in the older studies, with the result that findings must be interpreted with caution.

²The matron of one of the nursing homes attributed this in part to the high rate of emigration, with the result that many institutionalised elderly people do not have children resident in South Africa.

Table 1. Participant Description

No.	Initials	Sex	Age	Residence	Education	GDS	Other
1	AG	F	70	Nursing Home	Degree	6	
2	DI	F	83	Frail Care	Std 8	5	moderate hearing loss due to basal skull fracture -1965
3	RC	F	62	Frail Care	Degree	6	
4	GA	F	90	Alzheimer Unit	Matric	6	
5	DD	F	80	Alzheimer Unit	Degree	5	Bi-lingual Eng/Afr
6	MW	F	86	Alzheimer Unit	10 years UK	6	
7	ER	F	89	Frail Care	12 years Australia	4	hard of hearing
8	SG	F	83	Frail Care	Matric	4	
9	BW	F	70	Frail Care	Std 8	5	

KEY:

Nursing Home: Provides an intermediate level of care. Nursing support is available where necessary, but a range of healthy and ill elderly persons reside there.

Frail Care: Special frail care unit of Nursing Home in which all patients require some level of physical care. Higher ratio of nurses to patients.

Alzheimer Unit: Locked section of Frail Care unit, specifically for the care of dementing patients. Patients are unable to leave unsupervised.

PROCEDURE

1. The Global Deterioration Scale (GDS) (Reisberg et al, 1982) was administered to the caregivers of all AD subjects to establish the stage of the disease process. This measure was selected as it is considered to reflect the progression of the disorder accurately, takes into consideration cultural, educational and socio-economic biases (Reisberg et al, 1982) and is considered to be easy for speech pathologists to administer (Bayles et al, 1989). The GDS consists of a 6 point rating scale which characterises the severity of cognitive decline and may be administered by family members or nursing caregivers.

2. The Arizona Battery for Communication Disorders of Dementia (ABCD) (Bayles and Tomoeda, 1993) was administered to all subjects in order to obtain quantitative information on language performance. This test is a comprehensive measure of a wide range of linguistic tasks and some non-linguistic tasks known to be vulnerable to the dementing process (eg. visual perception). It also includes a range of episodic and semantic memory tasks. The ABCD has been shown to have high validity and test-retest reliability (Bayles and Tomoeda, 1993) and, in addition to the normative data gathered using American subjects, it has also been used successfully in the United Kingdom (Armstrong, Borthwick, Bayles and Tomoeda, 1996) and South Africa (Sonnenberg, 1995). Certain adaptations were made to the test in order to make it appropriate for South African use, and these are detailed in Appendix A.

3. The sentence comprehension tasks described below were administered. The tasks are presented in full in Appendix B.

4. The discourse comprehension tasks described below (presented in Appendix C) were administered and audiotaped responses analysed. A random sample of one third of the responses was analysed by a second speech-language therapist and inter-rater reliability was determined. A percentage agreement of 82% was reached, which, according to McReynolds and Kearns (1983) suggests that the agreement could not be attributed to chance.

All testing was conducted in the nursing homes, in a quiet, familiar, one-to one environment (usually the subject's room). Testing was conducted over a minimum of four to a maximum of six sessions (depending on the needs of the subject) at approximately the same time each day in order to compensate for subjects' fatigue and impaired concentration. Due to illness, a

period of ten days separated the third and fourth testing session for subject DI, but this had no noticeable effect on her performance.

SENTENCE COMPREHENSION TASK

Purpose of task

In order to identify linguistic variables which may facilitate improved comprehension, a sentence comprehension task was developed in which specific linguistic variables could be assessed individually. Bayles and Kaszniak (1987) suggest that manipulation of the following variables may affect comprehension:

syntactic complexity; use of reference; verbal cue strength; directness; literalness; input modality; abstractness of topic; propositionality; word frequency; rate of speech; word class; and imageability.

Four of these variables were selected for investigation in the present study, namely syntactic complexity, reference (specifically, pronouns), literalness and directness, and the rationale for the selection of each is discussed below. The particular four were selected on the basis both of previous research and on their pervasiveness in normal conversational speech and thus their amenability to manipulation by caregivers.

Rationale for selection of test items

1. Syntactic complexity

As has been discussed in chapter 3, syntax is the only one of the four variables selected that has received systematic attention in AD patients. In order to sample a variety of syntactic conditions, four syntactically complex sentence types were used in the final task, namely:

- semantically reversible passives (eg. the boy was kissed by the girl)
- centre-embedded relative clauses (eg. the man that the policeman chased had a gun)
- before-after constructions (eg. before doing the washing, she swept the floor)
- comparatives (eg. the boy is taller than the girl)

These four types were selected as all have been examined before, as discussed in chapter 3 and are known to be particularly problematic for individuals with neurogenic communication disorders. Possibly more importantly, however, it was felt to be desirable to select types of syntactic construction which are reflective of normal conversation, rather than very complex,

but more formal sentence types. Four sentence types were selected to tap a range of constructions, but this is felt to be a weakness, as the limited occurrence of each type precluded generalisation.

2. Pronouns

As highlighted in chapter 3, pronouns have been investigated mostly in relation to expressive language. Documented difficulty in the use of pronouns as well as their central role as referents in discourse led the researcher to hypothesise that the manipulation of pronouns would be an important variable. Accordingly, the third person singular and plural pronouns (he, she, it and they) were assessed in subject and object form in semantically reversible sentences, and comprehension of these sentences was compared to comprehension of analogous sentences containing nouns.

3. Directness

As use of indirect speech acts and non-literal language is characteristic of much conversational discourse, and in view of the findings that AD subjects have difficulties with many of the aspects of language associated with right hemisphere brain damage, the comprehension of directness and literality were seen as important variables.

Indirect speech acts have been defined by Searle (1975, cited by Wilcox, Davis and Leonard, 1978, p364) as "the speaker communicat(ing) to the hearer more than he actually says by way of relying on their mutually shared background information, both linguistic and non-linguistic, together with the general powers of rationality and inference on the part of the hearer". According to Davis and Wilcox (1985) controversy exists regarding the processing of indirect speech acts by normal speakers. One model proposes that there are three processing stages: making a literal interpretation of the utterance; determining whether the utterance is consistent with the context; and, if inconsistent with the context, inferring a nonliteral interpretation. Another model suggests that some forms of indirect speech may be understood automatically without the literal interpretation step.

Comprehension of indirect speech acts has been examined in aphasic (Wilcox et al, 1978; Hirst, Le Doux and Stein, 1984) and right hemisphere brain damaged (RHBD) (Hirst et al, 1984) subjects and their results support the notion of a single staged, contextually based model of processing. While RHBD subjects could understand direct questions, but not

indirect requests, aphasic subjects in Hirst et al's (1984) study were able to understand indirect requests even where they could not understand direct questions (because of syntactic comprehension problems). They attribute this to aphasic patients' successful use of contextual information. This raises interesting implications for patients with AD who may have more difficulty in using or understanding contextual information.

4. Literality

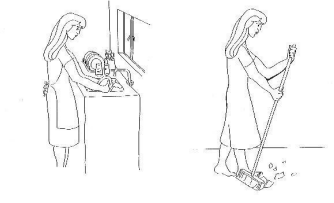
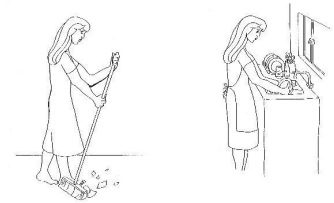
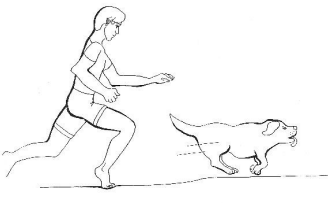
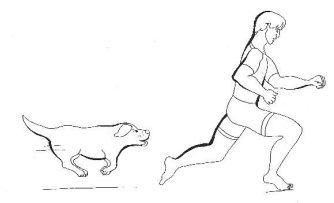
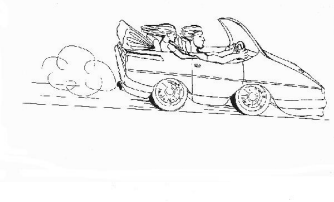
The comprehension of non-literal language depends on an integration of language and context. However, some metaphors are used so commonly that their non-literal meaning is immediately understood by normal listeners and comprehension is thus less dependent on context or shared knowledge. These are known as "dead" or "frozen" metaphors, often referred to as "idioms" and comprehension of their non-literal meaning appears to be easier than the literal meaning (Davis and Wilcox, 1985).

Since "natural communication is filled with idiom, metaphor and irony" (Davis and Wilcox, 1985, p20) and comprehension of non-literal utterances is known to be impaired in some neurologically involved populations (eg. RHBD), literality was selected as the final variable to be assessed. Ten commonly used idioms were selected and their comprehension compared to comprehension of literal utterances.

Test Construction and Administration

Four subtests were constructed, each targeting one of the selected variables. Examples of each are presented in Table 2 on the following page. Each subtest assessed comprehension of the same propositions under a "simple" and a "complex" condition depending on the manipulation of the relevant variable. Syntactic complexity was targeted in the first subtest, and stimuli in the simple condition depended on the nature of the complex stimulus (eg. active sentences for passives, two propositions for centre-embedded relative clauses). In the second subtest pronouns were targeted, with nouns being used in the simple condition and pronouns in the complex. In the third subtest (directness), the simple stimuli consisted of direct utterances and the complex of indirect. In the fourth subtest (literality), stimuli in the simple condition were literal and in the complex were non-literal, common idioms.

Table 2: Examples of stimuli from each subtest of the sentence comprehension task

Subtest	Stimulus example under simple condition	Stimulus example under complex condition	Picture stimuli
Syntax	First she swept the floor, then she washed the dishes	Before washing the dishes she swept the floor	 
Pronouns	The boy chased the dog	He chased it	 
Directness	Stop driving so fast	Are we being chased?	
Literality	He is very happy	He is over the moon	 

Each subtest consisted of ten utterances, each assessed under the simple (S) and complex (C) conditions – that is, two versions of the same ten utterances per subtest. The number of stimuli per subtest was restricted to ten in order to restrict the length of the complete test, and to facilitate concentration for the administration of one condition of a whole subtest. This was, however, seen as a major limitation of the study, since the restricted sample increased the likelihood of chance responses.

Stimulus pictures were drawn by a fine arts student. For subtests 1, 2 and 4, participants were required to point to the correct picture reflecting the given stimulus. The same pictures were used for both simple and complex conditions in the syntax, pronouns and directness subtests. Traditional sentence comprehension tasks which utilise the picture identification method comprise the correct picture and three distractors. Caramazza and Zurif (1976) discuss the importance of the distractor items, pointing out that a correct choice can be made on the basis of partial information and stressing the need for control of each proposition in a sentence. This was adhered to in stimuli which contained multiple propositions. For example in Syntactic Complexity, for the item "the man that the policeman chased had a gun", the distractor items were policeman with gun chases man, man with gun chases policeman, policeman chases man with stolen goods. However, in the Pronouns and Literality subtests, where comprehension of a single proposition only was targeted, only two pictures were presented. While the choice of only two pictures increases the probability of guessing, results of piloting indicated that AD subjects were less distracted, and less likely to point to more than one picture, or not respond at all, when presented with only two pictures. For the literality subtest, under the complex condition, the picture stimuli consisted of the target (eg. an angry looking person) and a literal interpretation (eg. someone literally "seeing red"). However, the literal interpretation picture stimulus was not felt to be logical for the simple condition, and the picture stimuli under this condition thus consisted of a target and a traditional distractor item (eg. for the item "he is happy", the picture stimuli were a happy person and an angry person). While it was felt to be desirable for each variable to be assessed in the same manner, the assessment of comprehension of indirect speech acts by pointing to a choice of picture stimuli is more difficult. Other researchers (eg. Hirst et al, 1984) investigating this area have presented videotaped vignettes, where subjects were required to indicate whether the actors' responses were appropriate or not. In the current research, a pictured context was presented (eg. a couple in a speeding car) together with the stimulus ("Are we being chased?"). The participants were then asked "What does she

mean?/What does she want him to do?". Subjects were thus required to provide an expressive response in this subtest, in contrast to the pointing responses of the other subtests, which has important implications both for scoring and for interpretation.

The presentation order of subtests and simple and complex conditions was randomised and no order effect was evident during piloting. Stimuli were repeated if there was no response, or if participants requested repetition (repetition was noted under qualitative comment). Participants' responses to subtest 3 were tape-recorded and orthographically transcribed. Responses to subtests 1, 2 and 4 were marked as correct or incorrect. In addition, qualitative comments were made on the scoresheet - these related to areas such as response latency, requests for clarification, and comments on the stimulus. If the participant changed her response (as occurred frequently), this was also indicated. When this happened, the researcher repeated the stimulus and recorded the final choice as the response.

Pilot study of sentence comprehension materials

A pilot study was conducted using five institutionalised AD participants. The aim of this study was to evaluate the test materials, to investigate the order of subtest presentation and to investigate methods of scoring. Following this, adaptations were made to the Syntactic Complexity subtest: initial items with relative clauses had been presented in the passive voice, thus targeting two aspects of complexity in each item. For the final task, relative clauses were presented in the active voice, and passives were assessed separately. As discussed previously, no order effect was noted. Clear differences between performance in the simple and complex conditions emerged for all variables. However, quantitative differences were small for some participants, although there were marked qualitative differences (these included slower processing, more repetition of the stimulus being required and spontaneous attempts to simplify the stimulus). This indicated the need for qualitative analysis of participants' responses.

DISCOURSE COMPREHENSION TASK

Rationale for discourse task

There is an abundance of literature which confirms that performance on sentence comprehension tasks is not necessarily a predictor of performance at the level of discourse

comprehension, or in real-life conversation (eg. Brookshire and Nicholas, 1984; Wegner et al, 1984; Stachowiak et al, 1977; Boller, Cole, Vrtunski, Patterson and Kim, 1979; Caplan and Evans, 1990; Cannito, Jarecki and Pierce, 1986). Brookshire and Nicholas (1984) and Stachowiak et al (1977) found that aphasic subjects comprehend discourse better than they do individual sentences, which they attribute to the greater availability of context and redundancy, as well as the theme of a discourse. De Beaugrande (1980, cited by Brookshire and Nicholas, 1984) asserts that pragmatic knowledge is important in discourse comprehension since it allows the listener to make interpretations relative to shared knowledge between speaker and listener. Furthermore, he states that factors such as memory, distractions and attention shifts are more important in discourse comprehension than in sentence comprehension. This clearly has important implications in the dementia population who have well documented impairments in memory and attention.

Since a major aim of this study was to evaluate the efficacy of the manipulation of linguistic variables in improving comprehension in conversation, it was felt to be important to do so under as functional conditions as possible. As Brookshire and Nicholas (1984, p35) comment "... predictions about ... listeners' comprehension of discourse in daily-life situations should be based upon samples of their performance on discourse, and not upon their performance on traditional tests of comprehension composed primarily of single-sentence stimuli".

Task Construction

Caplan and Evans (1990) evaluated the effect of manipulating syntactic complexity in aphasic patients by assessing comprehension in both sentences and discourse. In their study, each syntactic complexity variable was presented in a sentence and in a discourse. However, for the purpose of this study, a more "real-life" discourse task was required, without such rigid control of variables. Discourse materials were thus required which could simultaneously manipulate all of the variables under investigation.

Narrative discourse was selected as it is felt to be representative of the type of discourse in which an AD patient is likely to engage with a caregiver (eg. telling the patient about activities of a grandchild). Two types of discourse were then selected for the study: a fable task, and a "current affairs" narrative based on a newspaper article.

A fable was chosen as fables are a narrative genre which has undergone detailed research in the AD population and their stereotypical structure makes them amenable to manipulation. The "vineyard" fable specifically was selected as it is short and simple. Penn and Jones (1999) found it to be the simplest of three fables presented to a group of closed head injured subjects.

In order to approximate more closely a "real-life" narrative, the adapted newspaper article was also devised as discussion of a newspaper article is an appropriate adult narrative task. For this task, it was felt to be desirable to have a theme which was broadly familiar to the subjects and in which they would be interested. Political change in South Africa was an obvious topic. However, following informal experimentation with another group of neurologically involved patients (aphasic), it was rejected as the emotive content of most discourses tended to affect comprehension. That is, patients were more likely to make value judgements or comments than to answer probe questions accurately. The "Royal Scandal" topic was selected as it was a topic in which most South Africans of English-speaking descent were interested.³

Test administration and scoring

Discourse tasks were presented in random order. Distractor tasks were presented in between administrations. These normally took the form of conversation initiated by the researcher about something completely different from the preceding task (eg. Family photographs in the room). The purpose of this distractor task was to attempt to inhibit perseveration from one task to the next. Participants were presented with the narratives in written form, and either read the narrative themselves, or listened to the researcher reading it, according to their preference. In order to reduce the memory demands of the task, the story was left in front of subjects for them to refer to if necessary.

Questions relating to the content of the narrative were then asked, and responses were tape-recorded for subsequent orthographic transcription and analysis by both the researcher and the second rater in order to ensure inter-rater reliability. Responses were coded as correct or inappropriate and total number of correct responses were calculated for each condition. Of

³ Data collection coincided with this event.

greater importance, however, was qualitative description of the participants' responses. As Boller et al (1979) stated: in order to study comprehension "... one must pay attention to more than whether their response is correct. Other aspects of the patient's performance, such as a puzzled look or a burst of laughter or a performance which, although incorrect, is related to the question asked or the command given, may be just as important in determining how much has been understood" (p164).

Pilot study of discourse comprehension materials

The discourse comprehension tasks were administered to two of the participants used in the sentence comprehension pilot study. Although marked deterioration in the condition of both participants was noted since the sentence comprehension pilot study, both were able to complete the tasks, confirming that they are suitable even for patients in more advanced stages of AD. On the basis of the first participant's performance, the following adaptations were made to the task:

- a picture of the overall theme was presented with the narratives. Although Hough (1990) found that a picture presenting the central theme did not have a significant influence on the performance of brain-injured subjects, it was decided to include a picture in order to provide some additional contextual information and orientation to the topic.
- the first participant was required to retell the narratives for analysis in order to determine her comprehension, as proposed by Ulatowska et al (1981). However, she was unable to complete this task at all, perhaps because of the difficulty in conveying the instructions to her. Accordingly, probe questions were devised.
- the importance of qualitative analysis of responses was evident from the pilot study, as both participants produced a greater amount of irrelevant, tangential or confabulatory discourse in response to probe questions under the complex condition.

DATA ANALYSIS

Results of individual participants and of the group are presented in tabular form for each subtest. Mean scores under each condition are presented for the sake of completeness but in view of the heterogeneity of the sample, these have limited utility. The research question involved investigating whether manipulating the variables resulted in change, rather than the magnitude of that change, since it would clearly be inappropriate to consider numeric

changes in the group as a whole. For this reason, data for each subtest were analysed using the Sign test (Siegel, 1974). According to Siegel (1974), the sign test is appropriate when the researcher wishes to establish that two experimental conditions are different but where quantitative measures are inappropriate. It measures direction of change, rather than direction **and** magnitude and is particularly suitable when, as in this case, each subject acts as her own control.

In addition, qualitative differences in individuals' performance are discussed, and relevant examples provided.

CHAPTER FIVE

RESULTS AND DISCUSSION

Results of the GDS rating scale and participants' performance on the ABCD are presented in this chapter. Individuals' results are presented in both the sentence comprehension tasks and the discourse comprehension. Group performance is discussed both qualitatively and quantitatively, and group trends are highlighted. In addition, some observations made during the testing are described.

RESULTS OF GDS RATING SCALE AND ABCD

The results obtained on the ABCD and the GDS are summarised in table 3 below. As can be seen, there was no clear relationship between age of the participants and severity.

Table 3 : Age, GDS rating and performance on the ABCD

No.	Age	GDS	ABCD
1	70	6	14
2	83	5	12,7
3	62	6	7,6
4	90	6	10,1
5	80	5	16
6	86	6	8,2
7	89	4	13,7
8	83	4	17,9
9	70	5	15

Two of the participants (22%) were classified as moderately demented according to the GDS rating (GDS 4) (Reisberg et al, 1982), three (33%) as moderately severely demented (GDS 5) and four (44%) as severely demented (GDS 6). According to Bayles et al (1989) and Bayles and Tomoeda's (1993) interpretation of GDS scores, this corresponds to 22% of the participants falling into the mild category, and the remainder into the moderate. This has important implications for interpreting the results in the light of the literature, since most studies have examined milder subjects.

Total overall scores on the ABCD ranged from 7,6 to 17,9, with a mean score of 12,8. Three of the participants (participants 3, 4 and 6) obtained scores below the range obtained in the moderate category in the norms of the ABCD (Bayles and Tomoeda, 1993). However, it was noteworthy that two of these participants (participants 3 and 6) refused to complete parts of the test, and expressed their distaste for the formal test procedure, with the result that their performance was not felt to be an accurate reflection of their linguistic competence. Only one participant (participant 8) fell within the range of the mild category of the ABCD.

Bayles and Tomoeda (1991) summarise the ABCD scores according to five constructs, namely mental status, episodic memory, linguistic expression, linguistic comprehension and visuospatial construction. Using mean raw scores presented for a moderate American and a moderate British group of AD subjects by Armstrong et al (1996) (in which they concluded that the results of both groups were comparable), mean summary construct scores were calculated. These are presented together with the mean summary construct scores of the current study in table 4 below.

With the exception of the mental status summary score, the small discrepancies can be accounted for by the difference in subject samples, since the groups described in the Armstrong et al (1996) paper considered only subjects with GDS ratings of 5 or 6. It is thus difficult to account for the mental status score in the current study being **lower** than that of Armstrong et al, but this may

reflect the adaptations made for use with South African participants (for example political changes in South Africa may have contributed to participants' confusion about the name of the president and the capital city).

Table 4: Mean summary construct scores

construct	mean score	construct	USA mean construct score	UK mean construct score
mental status	1,875		2	2
episodic memory	2,45		3	2,2
linguistic expression	2,66		2,3	2
linguistic comprehension	2,52		2,2	1,8
visuospatial construction	2,81		3	2,5

In summary, the ABCD appeared to be a useful screening measure, appropriate for use with the South African population. Of some concern, however, was the strong deficit orientation of the test together with its assessment of completely decontextualised language. While this made it sensitive to the more subtle impairments of the milder participants (eg. participant 8), it made it difficult, and possibly inappropriate, to administer to the more severely impaired, and gave little or no insight into the participants' functional communicative ability. The repetition subtest, in particular, with meaningless stimuli (such as "tornadoes misjudged long egg booklets") seemed inappropriately confusing for participants who are already confused and disorientated. Consistent with the findings of Bayles, Tomoeda and Rein (1996), participants' repetition ability deteriorated with the decrease in meaningfulness of the stimuli. Bayles et al interpreted this finding as contra-indicating loss of the content of semantic memory. This appeared to be borne out qualitatively by the participants' awareness of the meaninglessness of the stimuli,

demonstrated for example by requests for clarification ("what?" - eg. Participant 7), or participant 6's comment "this is silly, darling".

Interestingly, even the participants with the lowest overall scores demonstrated a level of awareness both of their deficits and of the fact that they were being tested. For example, participant 3 was particularly resistant to doing tasks with high memory demands. Participant 6 asked "what's this for?" in response to several subtests and participant 4 said "oh gosh, I've forgotten all these things" in response to the mental status subtest, and commented "this is difficult, isn't it" on various other subtests.

RESULTS OF SENTENCE COMPREHENSION TASKS

Statistically different performance between simple and complex conditions was observed in three of the four subtests, namely syntax, literality and directness. Despite the numeric differences being small for some individuals, performance under the simple condition was always either better than or the same as performance under the complex condition, with equivalent scores being obtained in only 3 cases - for literality and pronouns in participant 8, where both were equally good, and pronouns in participant 4, where both were equally poor. The greatest qualitative differences between the two conditions were, however, observed in the pronouns subtest, for which the quantitative results were not statistically significant. This finding was consistent with the literature discussed earlier, which suggests that AD subjects are able to utilise compensatory strategies, and to do so successfully.

Based on the average difference in score between simple and complex conditions, presented in table 5 overleaf, literality and syntactic complexity emerged as the most important variables for the **group**.

Table 5: Average improvement in score from complex to simple for each subtest

Subtest	Average improvement
syntax	4,1
pronouns	2,3
directness	3,7
literality	4,2

However, even based on these restricted quantitative measures, individuals within the group had different results. This is discussed in more detail later.

Syntax

Table 6: Average improvement in score from complex to simple for syntax subtest

Average score under complex condition	4,33
Average score under simple condition	8,44
Average improvement from complex to simple	4,11

Consistent with the findings of other researchers (eg. Tomoeda et al 1990), there was a statistically significant improvement in performance from the complex to the simple condition. As can be seen in figure 3 on the following page, all participants improved. The probability of this occurring by chance is $p=0,02$ and the result is thus significant at the 5% level.

Participants 6 and 9 showed the largest quantitative differences, and participants 2 and 4 the smallest, with participant 6 also showing large qualitative differences. Interestingly, however, participant 4 also showed very marked qualitative differences between the two conditions. This took the form of repetition of the complex utterances and spontaneous attempts to simplify (eg.

"who had the hat, the boy or the girl?"), which seemed to be largely successful in facilitating comprehension. Participant 5 used this same strategy, but only for the before....after constructions (eg. " **before** doing the washing she swept, so she swept first").

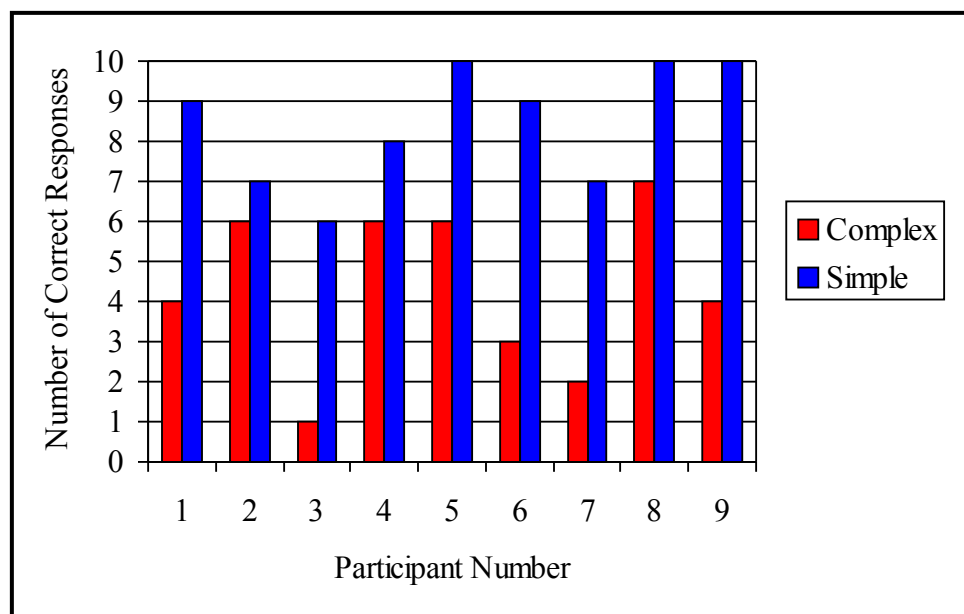


Figure 3: Results of syntax subtest

Participants 1 and 9 also showed substantial qualitative differences between the two conditions, but this was a negative feature of repeating the stimulus over and over or making comments (eg. "that's rather Irish" – participant 9; "obviously they weren't very hungry" - participant 1; also observed in participant 6) which seemed to increase rather than decrease confusion. Although this could obviously not be viewed as a compensatory strategy, it did serve to alert the interlocutor to comprehension breakdown (cf. performance on discourse tasks).

Although the small number of each type of syntactic construction used precludes the drawing of any conclusions, analysis of individual items of this subtest suggested that centre-embedded relative clauses were the most difficult syntactic form to understand, with 7 errors being made for both stimuli of this type. In view of the different number of items for each sentence type,

comparison is facilitated by converting the numbers of errors made to percentages of incorrect responses. These are presented in table 7.

Table 7: Percentage of incorrect responses for each sentence type in syntax subtest.

Sentence type	Percentage incorrect responses
centre embedded relative clause	77
before.....after	55
comparative	38
passive	40

It is felt that more rigorous investigation of the variable of syntactic complexity may suggest that it is of even greater significance than suggested by the preliminary results of this study. Other aspects of syntactic complexity need to be studied, and larger numbers of each sentence type. Also highly relevant would be to test in more detail Rochon et al's (1994) hypothesis that it is not syntactic complexity that makes comprehension more difficult, but the number of propositions.

Pronouns

Average scores for the group are presented in table 8 overleaf. The numeric differences between the two conditions were smallest for this subtest. These differences are presented in figure 4, but the results are not statistically significant at the 5% level , the probability of 7 out of 9 participants improving being $p=0,09$. However, as will be discussed, the largest number of qualitative differences was observed in this subtest.

Table 8: Average improvement in score from complex to simple for pronouns subtest

Average score under complex condition	6
Average score under simple condition	8,33
Average improvement from complex to simple	2,33

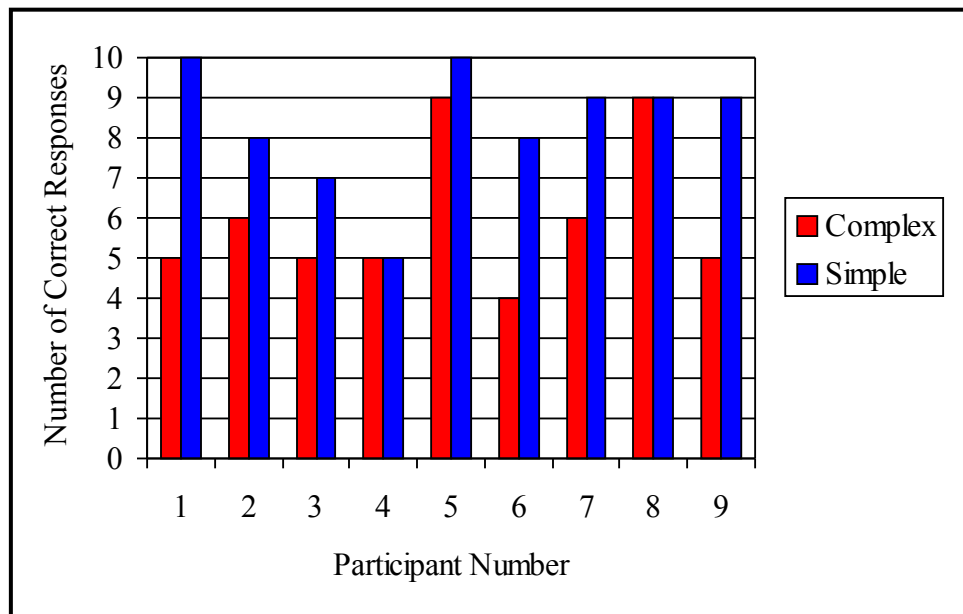


Figure 4: Results of pronouns subtest

Participant 8's quantitative performance under both conditions was the same, although, as discussed below, there were qualitative differences in her performance. Participant 4 performed poorly under both conditions. This seems to reflect her difficulty in comprehending semantically reversible sentences, irrespective of whether nouns or pronouns were used. This participant requested repetition of each stimulus under both conditions and appeared to be trying to mediate verbally for herself who had been the subject and who the object, repeating the stimulus to herself over and over, pointing first to one picture and then the other and becoming increasingly

confused. Although she thus appeared to have a useful strategy to decode the stimuli, it appeared that the impairment in the inhibition of irrelevant information described by Faust et al (1997) was in operation here.

Although the smallest quantitative differences between the simple and complex conditions were noted for this subtest, and the difference observed was not statistically significant, the largest number of qualitative differences was observed. Only participant 4 discussed above and participant 3, who, despite the severity of her language impairment performed relatively well under both conditions, showed no qualitative differences for this task. For the remaining participants, universal differences were noted:

- under the complex condition participants attempted to clarify the referent. For milder participants, this took the form of explaining (eg. "oh, 'it' must be the lion") and for the more severe participants, a question (eg. "what is 'it'?")
- participants repeated the complex stimuli to themselves, often substituting nouns for the pronouns (eg. "oh, so the boy followed the children").

This finding suggests that even severely dementing individuals (eg. participant 6) are able to compensate consciously when they have difficulty understanding ambiguous referents and, as borne out by the non-significant difference between the two conditions, that these strategies are largely successful. However, the need for compensatory strategies, and the resultant slower responses are consistent with the literature that the comprehension of pronominal reference is impaired in demented subjects.

Directness

Although the numeric differences between the two conditions were small for many of the subjects, as reflected in figure 5 (on p 60), all subjects showed an improvement from complex to

simple. This result by chance alone would have a probability of $p=0,02$ and is thus significant at the 5% level.

Table 9: Average improvement in score from complex to simple for directness subtest

Average score under complex condition	5,11
Average score under simple condition	8,88
Average improvement from complex to simple	3,77

Very few qualitative differences were observed between the two conditions, but this was felt to be a function of the fact that participants had to provide a verbal response, with the result that there was less opportunity for the questions, comments and revisions noted in the other subtests. The requirement for expressive language in this task is seen as a major weakness of the study, both because of its different response mode and because of its extra resource demands. At times, the researcher's clinical impression was that the subjects' responses were incorrect because they lacked the ability to explain rather than because they had failed to understand, although this was not borne out by the small, but consistent, differences in scores between the two conditions.

Gibbs (1982, cited by Davis and Wilcox, 1985) argued that some indirect speech acts have become "frozen" over time so that the implied meaning is more readily understood than the direct interpretation (eg. "can you...." is more readily understood as a request than as a question). Although McDonald (1992), rejects this notion of "frozen" speech acts and believes that rejection of the literal meaning is a prerequisite for understanding even very conventional indirect utterances, whether this occurs in a step-wise or in a more interactive manner, perhaps consistent with Gibbs' view, the majority of the participants had no difficulty explaining the more conventional and frequently occurring indirect stimuli: only one participant made an error

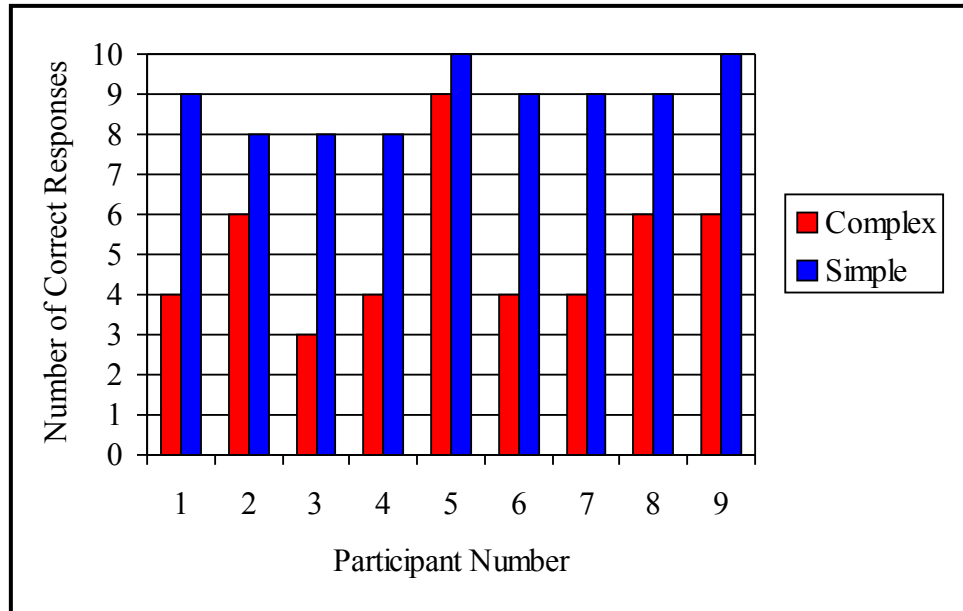


Figure 5: Results of directness subtest

with "I could do with a drink" and two with "I'm hungry" and "I'm thirsty". In contrast, however, the most errors (8) were made with what is intuitively an equally conventional utterance: "do you have the time?"

Literality

Eight of the nine participants improved from the complex to the simple condition. The probability of this result occurring by chance alone is $p=0,02$ and the result is thus significant at the 5 % level.

Table 10: Average improvement in score from complex to simple for the literality subtest

Average score under complex condition	4,88
Average score under simple condition	9,11
Average improvement from complex to simple	4,23

As reflected in figure 6, subject 8 performed equally well under both conditions.

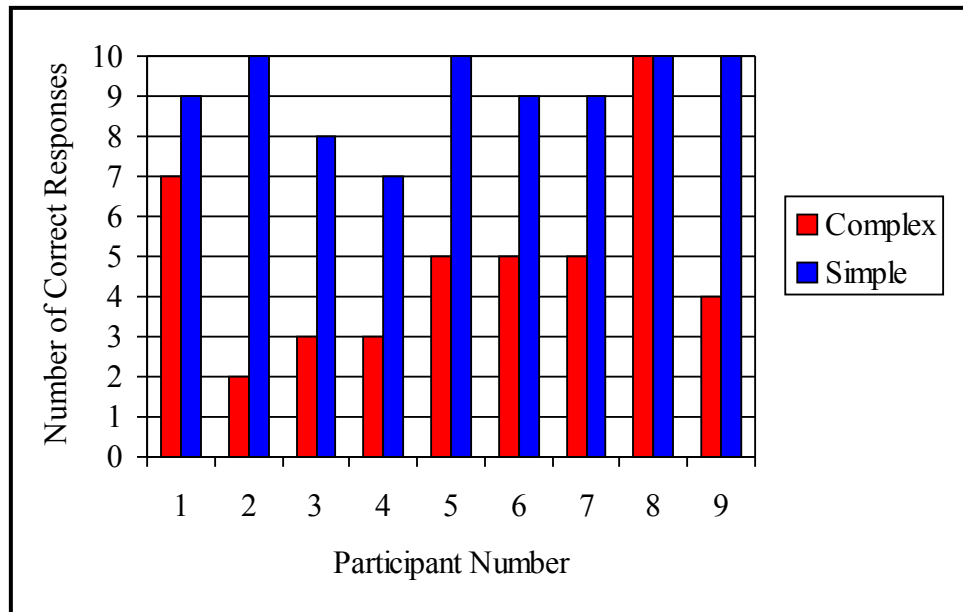


Figure 6: Results of literality subtest

Substantial qualitative differences were observed in only three participants. The same phenomena were, however, observed in all three under the complex condition, namely:

- delayed responses
- explanation (or querying) of the non-literal utterance (eg. he saw red - "so he must have been angry"). For participants 5 and 6 this strategy was successful, resulting in the correct response for every stimulus in which they used it (For example for "struggling to make ends meet", participant 6 said "well, in one respect this (pointing to literal picture), but this is what it means (indicating her choice of non-literal). Participant 1 also used the strategy, but appeared to be unable to suppress the literal interpretation, explaining or querying the meaning (eg. "does fist have anything to do with money?", but pointing to the literal picture, even when cued by the tester to point to the one "that shows what it **means**".

Davis and Wilcox (1985) suggest that the non-literal interpretation of very familiar or "stored" metaphors appears to be understood more readily than a literal interpretation, resulting in more rapid processing than the three stages proposed by Clark and Lucy (1975, cited by Davis and Wilcox, 1985):

1. The listener makes a literal interpretation
2. The listener determines whether or not the utterance is consistent with the context in which it exists
3. If the utterance is not consistent, the listener infers a non-literal meaning, based on the context.

The performance of these three participants seems to support this model, with participant 1 demonstrating a breakdown between the second and third levels, while participant 8's equivalent performance under both conditions is more compatible with a single stage approach.

No particular stimulus emerged as being either easier or more difficult than the others, with the highest number of incorrect responses (6) being for "over the moon" and "tight fisted" and the lowest (3) being for "warm heart" and "struggling to make ends meet".

Review of performance on sentence tasks

As mentioned previously, the group trend of syntax and literality showing the greatest quantitative improvement from complex to simple conditions does not accurately reflect the results of individuals within the group. The rank ordering of variables resulting in greatest improvement from complex to simple conditions for all the participants can be seen in figure 7 on the following page.

From the figure it is evident that there was great variability between individuals. For example, participants 1, 2 and 8 all showed different patterns of improvement. Most participants tended to

show a cluster of improvement in scores of around 4 or 5 points for 2 to 3 subtests. Of interest, however, is the fact that participant 8, the mildest participant, demonstrated the smallest quantitative responsiveness to simplification. This may suggest either that the tasks were too easy to tap into her difficulties, even at the complex level, or that the need for simplification becomes greater as the disease progresses.

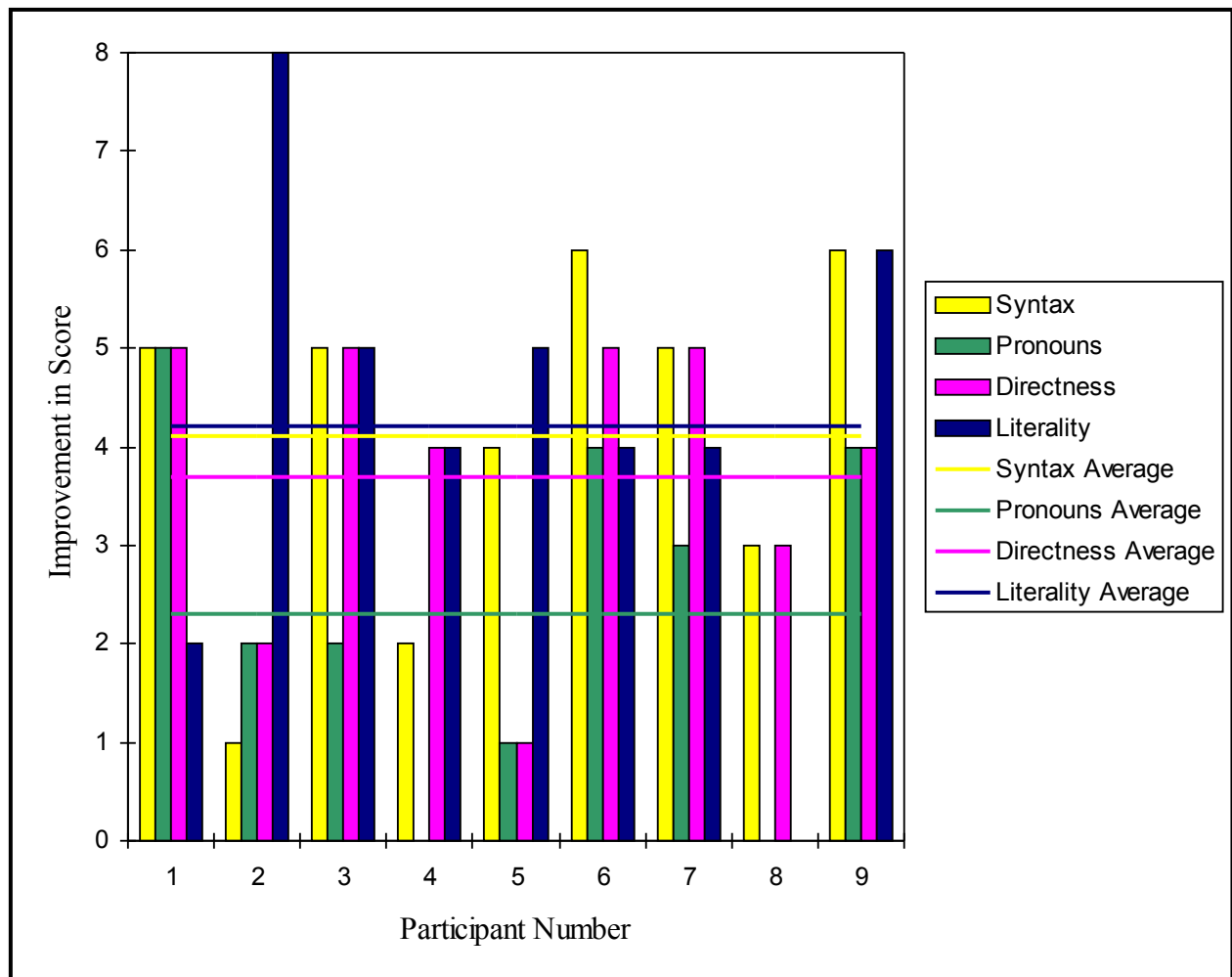


Figure 7: Improvement from complex to simple for all variables and all participants

These results highlight two important features:

1. The breakdown of language comprehension does not occur in a uniform way in individuals with AD, with some subjects appearing to be more vulnerable to difficulty with certain variables

than others. This probably relates both to premorbid language style and experience and to the loci of neurological damage.

2. If this is so, then there is a need for individual assessment of patients with AD in order to identify important variables for each individual. “Simplicity” or “complexity” of aspects of language differs from person to person.

With these important caveats in mind, the general trends which emerged from the sentence tasks can be summarised as follows:

- responses tended to be slower under the complex conditions;
- subjects demonstrated a level of awareness of what was difficult for them;
- subjects attempted to compensate for their difficulty. Some of these strategies were successful, and some not, but even the use of unsuccessful strategies can be viewed as positive insofar as they may alert the interlocutor to communication breakdown.

These have important implications for management, which are discussed in chapter 6.

RESULTS OF DISCOURSE COMPREHENSION TASKS

As in the sentence comprehension tasks, the performance of all participants improved from the complex to the simple conditions, but the quantitative differences were very small. These are summarized in table 11 below.

Table 11: Average improvement in score from complex to simple condition for each subtest

Subtest	Average improvement
Farmer and sons	4,44 (maximum possible score of 12)
Royal scandal	2,2 (maximum possible score of 8)

“Farmer and sons” subtest

The performance of the group on this subtest is summarised in table 12. A difference between simple and complex conditions was observed in all of the participants. The probability of this occurring by chance was $p=0,02$ and the result is thus significant at the 5% level.

Table 12: Average improvement from complex to simple for “Farmer and sons” subtest

Average score under complex condition	4,33
Average score under simple condition	8,77
Average improvement from complex to simple	4,44

As can be seen in figure 8, participants 3 and 4 performed very poorly under the simple condition, with the result that the small improvements noted may have been due to chance. The largest differences (greater than 50%) were seen in participants 1, 7 and 9.

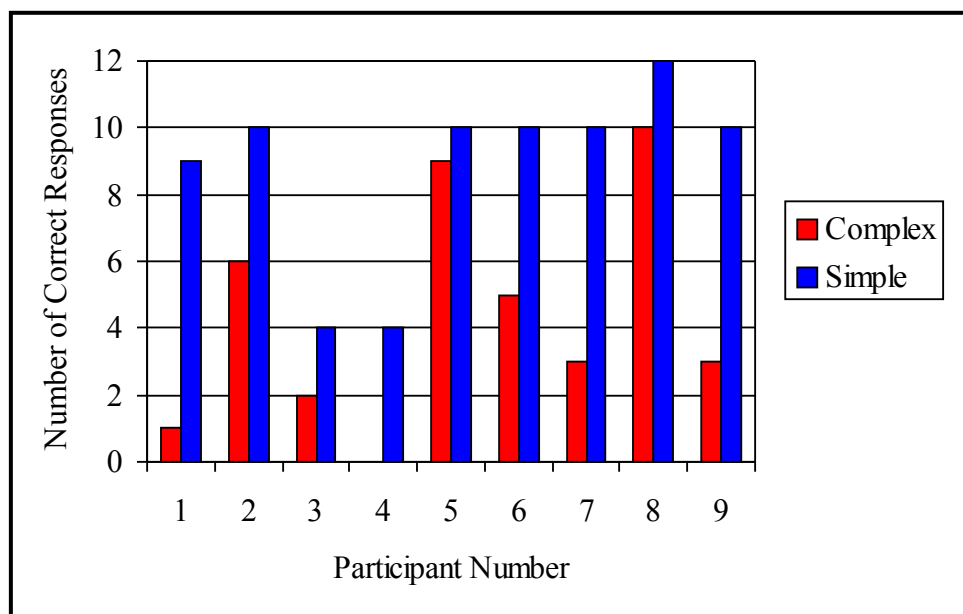


Figure 8: Results of "farmer and sons" subtest (maximum possible score of 12)

Only participant 8, the mildest participant obtained the maximum number of points possible under the simple condition. Given that some of the questions required higher level cognitive processing this was not unexpected. The poor performance of participants 3 and 4 was consistent with their severe cognitive and linguistic impairments reflected in the GDS and the ABCD (although participant 6, also severely impaired, performed relatively well). This is noteworthy from the point of view of possible manipulations, since both participants 3 and 4 performed relatively well in the sentence tasks, confirming that length and conceptual complexity as well as increased cognitive processing demands decrease the likelihood of successful communication as much as or more than linguistic complexity.

“Royal scandal” subtest

Average performance of the group on the “royal scandal” paragraph is summarised in table 13. Eight of the nine participants improved from the complex to the simple condition. The probability of observing this as a result of chance is $p=0,02$ and the result for the group is thus significant at the 5% level.

Table 13: Average improvement from complex to simple for the “Royal scandal” subtest

Average score under complex condition	1,88
Average score under simple condition	3,88
Average improvement from complex to simple	2,2

Performance of individual participants is shown in figure 9 on the following page. One participant (participant 6) improved from a score of 0 under the complex condition to a score of 1 under the complex. With scores as low as this, however, it is difficult to attribute the difference to anything other than chance. Similar difficulties with the interpretation of results

occur for participants 1 and 4 who also obtained scores well under 50% under the simple condition.

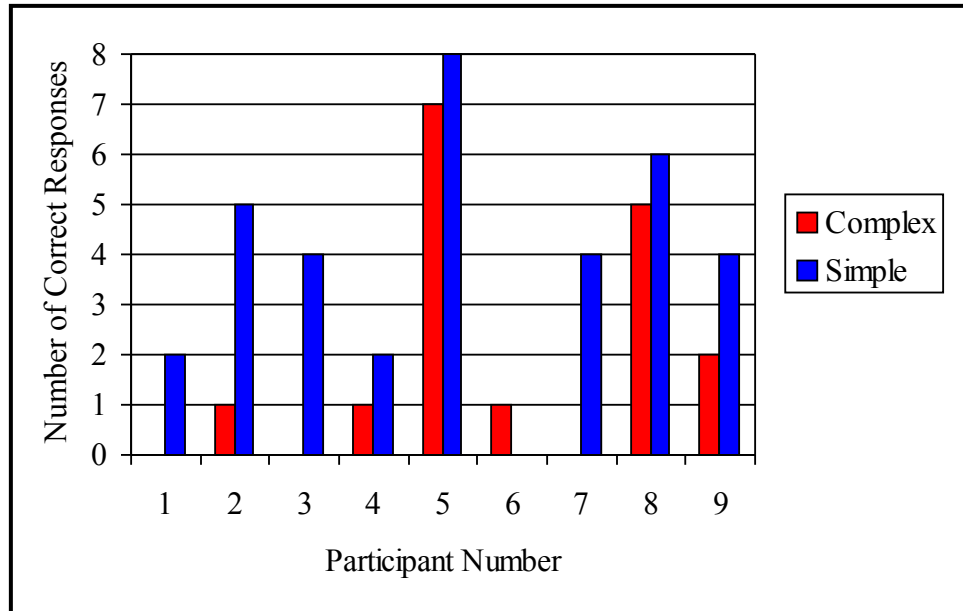


Figure 9: Results of "royal scandal" subtest

Only 3 participants obtained more than 50% under the simple condition, suggesting that this paragraph was more difficult for the participants to understand than the previous one. This was a surprising finding in view of the fact that the "royal scandal" was current and participants may have had more exposure to the content via the news media. It is, however, possible that this may have increased participants' confusion because their previous knowledge of the topic had not been correctly encoded. The fable task, on the other hand, taps into older stores of world knowledge and personal values, which may account for its greater accessibility to the participants.

Marked qualitative differences were observed in participants 1,3, 6 and 9 for both discourse tasks with the following features being noted in all four participants under the complex conditions:

- restating of the question;

- lengthy, incoherent responses;
- tangential or irrelevant responses.

Some responses are transcribed below to exemplify this.

Participant 1 in response to the question : what did the farmer want to teach his sons?

"To copy... to follow him.....to be like him".
(simple)

"I want to tell you this that nowadays everything is keeping up with the Jones' as you know. I only want to know I keep all right so that I can manage on my own. My kids can be all right on their own. I don't ask them to take me out. I don't ask them to take me to a show, which I would like very often. And the bank, and my"
(complex)

Subject 3 in response to the question: was Princess Diana happy or sad?

"I don't know."
(simple)

"Oh really, you know, that's a hard answer. I really don't know this royalty. Royalty is nothing to me. I've been to England, of course. I've seen a lot of places in England, but I'm quite happy here."
(complex)

Participant 6 in response to the question: what did the farmer want to teach his sons?

"He wanted them to be rich. They had to learn to work hard."
(simple)

"What did he want to teach them? Yes, he wanted to teach them. You find that quite often, don't you.?"
(researcher asks "what was it that the farmer wanted to teach them?") *Oh, that's what you want is it. Well I'm not quite sure what that means for it.* (rereads passage to herself) (unintelligible 6 syllables). *He wanted them to follow in his steps* (reading)".
(complex)

Participant 9 in response to the question : why are the British people upset with Charles and Diana?

"Well they're unimpressed with all the scandals."
(simple)

"Well I don't know about these British really. Some of my relatives go shopping there. I've never been to England. My uncle and auntie wanted to take me when I was 18 but my father said 'no, Bess will stay here', so I've never been to England you see....."
(complex)

It appeared that participants were less able to utilise compensatory strategies in the discourse tasks than they had been in individual sentences. However, the clear differences in response and coherence could again be seen as indications to the interlocutor of breakdown in comprehension and thus as compensatory in some sense. In general, the differences, both quantitative and qualitative, between the two conditions, were very small. Possible cognitive-linguistic reasons for this are discussed below. However, another explanation may lie in the nature of the tasks themselves. An unfortunate limitation of the discourse tasks in this study was the restricted incidence of each of the variables in the paragraph tasks. It is probable that a far greater shift from complex to simple would have been observed had each variable been examined in its own discourse context. As discussed in the methodology, however, this would have sacrificed "real-life" applicability of the tasks.

GENERAL DISCUSSION

All participants showed an improvement from complex to simple conditions, but in general there was a discrepancy between their performance on the sentence level tasks and the discourse level. In the aphasic population, there is abundant literature to suggest that subjects perform better on discourse tasks than on sentences as a result of the greater number of cues and the redundancy afforded by contextual information at the discourse level. The corollary of this may then be true of the AD population, namely, that people with AD are less able to make use of contextual information and discourse redundancy and hence comprehend better at sentence level. One possible explanation for this is the resource allocation model discussed in more detail later.

Alternatively, the discrepancy between sentence and discourse levels may be as a result of the **nature** of the context, in this case the discourse tasks. Some support for this hypothesis comes from the researcher's clinical impression that there was also a discrepancy between the participants' performance on the formal discourse tasks and their conversational discourse ability. Although anecdotal in nature, the following example highlights this.

As discussed previously, participant 3 performed very poorly in the discourse tasks, even under the simple conditions. This was in marked contrast to her largely successful discourse in a recorded spontaneous conversation where it appeared that her comprehension was largely accurate (transcribed in the text box).

(looking at photographs of her dogs)
 PARTICIPANT: *I love my doggies. That one's ... what's her name? And that's Nola.*
 RESEARCHER: *The pointer?*
 PARTICIPANT: *Yes, that's it. Pointer. She's lovely. But she's gone now you know. (starts to cry). Thirteen years old and lovely. We had to she.... we had to*
 RESEARCHER: *Did you have to have Nola put down?*
 PARTICIPANT: *It was the cancer. Oh dear, the doggies.*
 RESEARCHER: *That's the hard part of having pets, isn't it.*
 PARTICIPANT: *Have you got dogs?*
 RESEARCHER: *Yes, I've also got a labrador, a black labrador like this one in the photo, and then another one.*
 PARTICIPANT: *What kind?*
 RESEARCHER: *Oh, she's a bit of a mixture.*
 PARTICIPANT: *That's also good. Lovely to have dogs. Labradors. I love Labs. Bushy! That's my lab. Oh, she's so big and (non-specific gesture of size) and ... big. Big dogs, I like big dogs. Not the little ones - too snippy.*
 RESEARCHER: *Yes, small dogs can be a bit yappy.*
 PARTICIPANT: *Oh, it's nice to see you. Nice to talk to someone who loves them. My doggies and my garden. All its little hoekies and (unintelligible) hoekies. I'm always seeing.. what's here? What's new? I love it, my hoekies and my doggies.*

It thus appeared that personal salience of the topic played a major role in facilitating successful communication and comprehension in particular. This highlighted the difficulty, and perhaps the

inappropriateness, of attempting to evaluate comprehension under “laboratory” conditions in a population who are already confused and may be strongly reliant on environmental and personal world-knowledge cues. Again, it is possible that decontextualised tasks further deplete the resources that the dementing individual can allocate to language processing.

To test this hypothesis further, albeit not under rigorous conditions, the researcher presented this participant with a short written paragraph about her own dogs. This was presented using simple language, and the participant was asked a series of questions. In contrast to her best performance of 50% correct responses in the "Royal Scandal" passage, and 33% in the "Farmer and Sons" passage (both under the simple condition), in this personally salient passage, she achieved 60% correct responses. Furthermore, digressive responses were largely relevant to the topic.

Resource allocation in language comprehension

Just and Carpenter (1992) and Miyake, Carpenter and Just (1994) have proposed a model of "capacity constraints" in both normal and aphasic language processing according to which reduced capacity of the memory's central executive results in comprehension breakdown. Since, as discussed in the introductory section, there is hypothesised to be an impairment to the central executive in dementia, the model may have utility for the AD population as well. The theory suggests that "the working memory (Baddeley's central executive) capacity consists of a flexibly deployable pool of limited cognitive resources that supports the two functions of working memory, namely computation and storage" (Miyake et al, 1994). When the demand on the resources is high (as for example in syntactically complex sentences as proposed by Miyake et al (1994) or in discourse processing where the person must simultaneously process linguistic, world-knowledge and (already depleted) semantic and episodic memory information) then there will be competition between the two functions for these limited resources.

According to Miyake et al (1994) this "trading relationship" comes into play when the pool of resources is about to be exceeded, and it has two important consequences:

Firstly, there is a de-allocation of resources from the storage component of the working memory. This suggests in turn that the more complex the information to be analysed and stored, the more likely there is to be impaired storage, ie. the greater the computational demands, the less likely there is to be effective storage. Although the model accounts for **sentence** level processing deficits, it seems to suggest that this trading effect may be even greater at the discourse level where there is both a greater need for on-line storage **and** a depletion in access to memory for computation.

The second consequence of the trading relationship between computation and storage proposed by Miyake et al (1994) is a reduction in the speed of processing. As part of the cycle, however, if processing is much slower than the rate of the incoming information, then the subject is less likely to carry out all of the necessary computations, with the result that "a processing slowdown exerts a strong negative influence on comprehension by making inherently severe time constraints in auditory comprehension even more severe" (Miyake, et al, 1994, p684). This is consistent with the results of this study where slower processing or delayed response time occurred universally under the complex conditions.

One final feature lies, again, in the clinical observation of the participants by the researcher: all of the participants willingly entered into the testing situation and all attempted to engage on some level. This was often in contrast to the expectations of the nursing caregivers. Likewise, in discussion with participants' next-of-kin there was often a discrepancy between the perceptions of two relatives of the participant's ability to comprehend. This may suggest that the environment, and specifically the attitude and behaviour of the interlocutor, also play an important role in facilitating comprehension in the dementing individual.

Factors such as "attitude" may be difficult (or impossible) to measure empirically. As Lubinski (1995, p275) points out "the environment, in contrast to laboratory conditions, is not controllable". However, it appears that comprehension in individuals with AD may depend on an interaction between three aspects: linguistic complexity, memory resources and the communicative environment, and a holistic model of comprehension needs to take cognisance of all three.

CHAPTER SIX

CONCLUSIONS

LIMITATIONS OF THE STUDY

This study attempted to examine the effects of manipulating several variables both at sentence and at discourse level. Although the rationale for this was to try to gain a more “real-life” perspective on comprehension, it was a major limitation of the study, since it did not allow for sufficiently indepth examination of any of the variables. Future research of this nature would need to include more stimuli for each variable to allow for more reliable and systematic manipulation. The different response modes required for the different variables was also a major limitation. As discussed in chapter 5, it is felt that the expressive component of the Directness subtest greatly influenced the results obtained.

The small sample size precludes generalization, as does the unscientific method of reaching a diagnosis. However, the latter is likely to remain a reality in South Africa for as long as there is a generally nihilistic attitude to people with dementia, who are not seen as a priority in the caseload of the average neurologist or physician.

Evaluating comprehension in discourse tasks was an attempt to extend testing beyond the sentence level. However, it would have been desirable for this to have been further extended to conversational settings where the manipulations were carried out by the caregiver. This is an important direction for future research.

CONCLUSIONS

Although of necessity preliminary, results of this study suggest that manipulating the four variables can result in improved comprehension. That this effect is less marked in

discourse than at the sentence level suggests that other variables, in addition to the linguistic, contribute to the AD individual's ability to comprehend. These may include the context of the assessment, the personal salience of the topic and the attitude of the interlocutor. Such factors can only be measured in the "real-life" context of naturalistic conversation and there is clearly a need to conduct careful, ecologically valid, research into these areas.

Of note was the finding that manipulating individual variables had a differential effect across the subjects. This confirms the need for careful assessment prior to embarking on a caregiver training programme, so that caregivers can be taught to manipulate those specific variables which facilitate comprehension for that specific patient.

Some consistent features did, however, emerge. These included a reduced speed of processing under more complex conditions and attempts to compensate. Where these attempts were not successful, comprehension breakdown was evident in the increased output and the decreased coherence of the responses. These features should be incorporated into caregiver training programmes, although Hopper (2001) cautions that slowing rate of speech too much may also make comprehension more difficult because of the need to store information for longer periods of time..

Researchers into the area of comprehension in AD are presented with a challenge: namely, to investigate each individual variable in more detail, but also to put them together into some kind of meaningful, functional whole, since, as the results of this study indicate, comprehension is more (or, in some cases less) than the sum of all its parts. It would seem that the way forward lies in indepth individual case studies. Such studies should seek to identify significant variables, evaluate the subject's response to simplification of these variables, and then, most importantly, train the caregiver in this

simplification. The latter is crucial: if training the caregiver to modify his/her input does not result in improved conversation then the results of the current and any other study only give us interesting information about how dementing people process language and do not contribute to lessening the burden of care or lead to any improvement in the quality of life of the AD patient. This is what Camp (2001) refers to as the challenge of “diffusion” and he states further that “... interventions are not truly effective unless they are disseminated” (p496).

This poses a further challenge both to researchers and clinicians: we urgently require valid, reliable methods of evaluating the success of real conversational interactions.

Until we have such measures, we will struggle to overcome the dilemma that was experienced over and over again in this study: what AD patients do on tests often does not reflect their actual communicative competence. As professionals we know this and are addressing it constantly with other populations, but the issue becomes far more critical in working with a population who are confused, concrete and context-bound.

In working with more severely impaired individuals, one must question the validity of formal, deficit oriented tests. Obviously these have their place in the differential diagnosis of early stage dementia, but thereafter there is a need to move towards measures which will foster a more positive view of demented patients, identifying realistic goals for intervention and taking cognisance of patients' awareness of their deficits. The results of this preliminary study suggest that the area of dementia is indeed a potentially fruitful one to explore the "marriage" of traditional linguistic approaches with more contemporary functional or pragmatic ones to both diagnosis and treatment.

Lubinski (1995, p271) aptly sums up these challenges in her statement that "... dementia, the environment and communication considered individually or in combination are very

complex. Improving the communicative environment of demented persons requires that we challenge ourselves to original and productive thinking."

If the ability to comprehend is influenced as depicted in figure 10 below, then attempts to improve comprehension in AD must take cognisance of variables over and above linguistic complexity. There thus exists a very large area for potentially fruitful research.

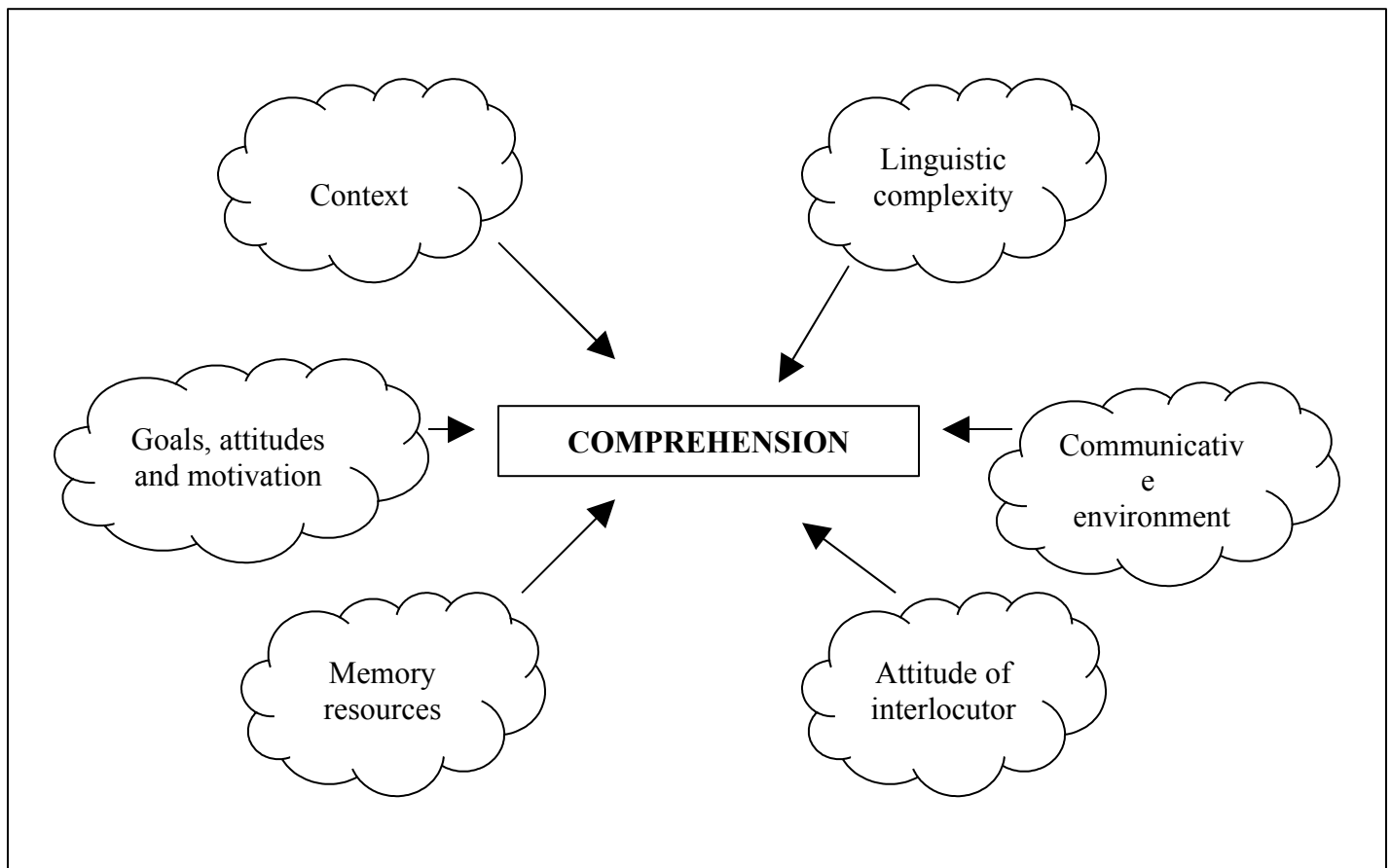


Figure 10: Proposed model for the factors affecting language comprehension

IMPLICATIONS FOR FURTHER RESEARCH

As stated previously, the results of this study highlight the need for further research into the area of linguistic complexity. This includes other types of syntactic structure as well as investigation into whether it is syntactic complexity which affects comprehension, or the number of propositions. The whole issue of complexity, in fact, is one which

warrants greater attention, both in normal language processing and in individuals with impaired language. What is it that makes one utterance more complex than another? How is this affected by prior experience, the context and the goals and motivations of the listener?

Researchers such as Lubinski (1995) have demonstrated the influence of the environment on communicative success. However, the relationship between the environment and comprehension specifically still requires further investigation. The goals, attitudes and motivation of the listener, probably influenced by the degree of personal relevance are also key areas for future research. These, together with the attitude of the interlocutor, are, of course, more difficult to measure under “laboratory” conditions, and will require creative solutions. This is aptly summed up by Camp (2001) in his statement that:

“ A final change in attitude must occur in researchers...It will require that researchers think of intervention as a large-scale enterprise. It will require that researchers be willing to let their interventions be applied by non-researchers in settings without good experimental controls. Without this final transition, researchers will have to accept the strong possibility that their interventions may have no meaningful impact...” (p513).

CLINICAL IMPLICATIONS

The findings of this study, although preliminary, do lend support to the idea that caregivers can relatively easily modify their own input to enhance the comprehension of demented people in their care. This strongly supports the role of the Speech-language therapist as a trainer-consultant within organizations and institutions devoted to the care of people with dementia. Naturally, this does not negate the importance of direct intervention, but it is likely that this will remain an option only for the very privileged few in South Africa for many years to come. The role of trainer-consultant, however, fits very well within the model of primary health care and, indeed, is consistent with the consultative approaches advocated in other areas of speech-language pathology (eg.school-aged children with language impairment). As discussed above, the challenge remains for South African clinicians to demonstrate the benefits of such indirect interventions in terms of reduced burden of care for the caregivers.

CONCLUDING REMARKS

The findings of this study are consistent with the more modern view of dementia as being a treatable disorder, with communication in AD, as with all other neurogenic communication disorders, having areas of strength and weakness (Hopper et al, 2001). As concluded by Ripich et al (1991) “ Results suggest that AD patients remain proactive communicators and compensatory shifts in discourse are occurring in the early and middle stages These compensatory shifts point to a retained flexibility in the communication system...” (p341). In addition to the potential for improved communication, interventions geared at caregiver training also have the potential to share this more optimistic attitude, and, hopefully, help to dispel some of the nihilism surrounding AD in care facilities in South Africa.

Although in recent years there has been a proliferation of literature focussed on intervention, by far the majority of studies remain diagnostic in approach. One must question the ethics of diagnosing and identifying where treatment is not attempted. Theoretical advances in understanding of language have been considerable because of dementia studies, but if there is not equivalent research in methods of intervention then, as a profession, we are guilty of exploitation. The challenge thus remains to continue to develop approaches to intervention and determine their efficacy.

"Dementia patients challenge us to learn more about human memory and the relation of memory to language. As professionals we are also challenged to provide education to caregivers who need the skills to create environments in which patients can retain their dignity, feel secure, and function at capacity"

Tomoeda and Bayles, 1990. p318

As professionals in South Africa, we are also called upon to find creative ways to provide services to all who require them, and to uphold our obligation to the elderly as enshrined in the Constitution:

“We, the people of South Africa
Recognise the injustices of our past,

Honour those who suffered for justice and freedom in our land,
Respect those who worked to build and develop our country...”

(Preamble to the Constitution of South Africa)

APPENDIX A

MODIFICATIONS TO ARIZONA BATTERY FOR COMMUNICATION DISORDERS OF DEMENTIA (ABCD)

MENTAL STATUS SUBTEST

5. 'What is the capital of South Africa?' (either accepted) in place of 'What is the capital of the United States?'
8. 'In what month do we celebrate Christmas?' in place of 'In what month do we celebrate Independence Day?'
9. 'Who is the President of South Africa?' in place of 'Who is the President of the United States?'

STORY RETELLING SUBTEST

'Purse' in place of 'wallet'

'Till' in place of 'check out counter'

COMPARATIVE QUESTIONS SUBTEST

5. 'Is a yard longer than a foot?' was retained, as many older South Africans are still more familiar with the Imperial system.

WORD LEARNING SUBTEST – RECOGNITION

'eagle' in place of 'cardinal'

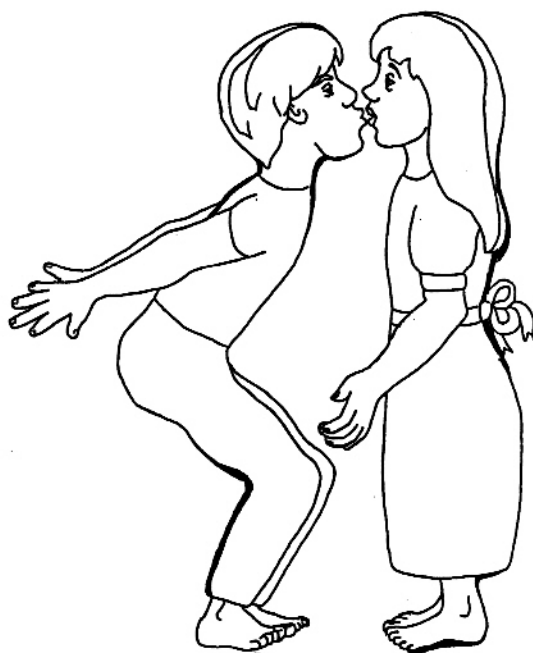
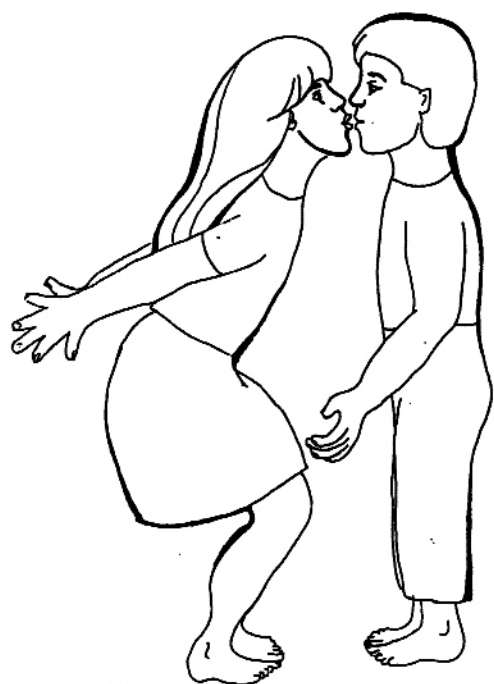
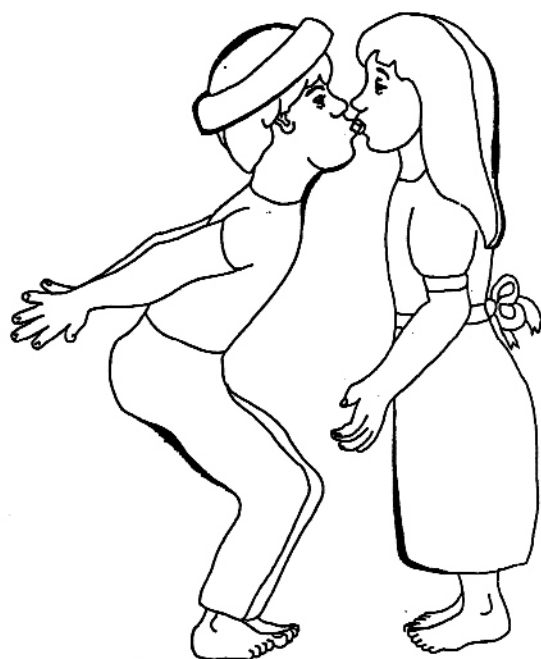
'mealie' in place of 'corn'.

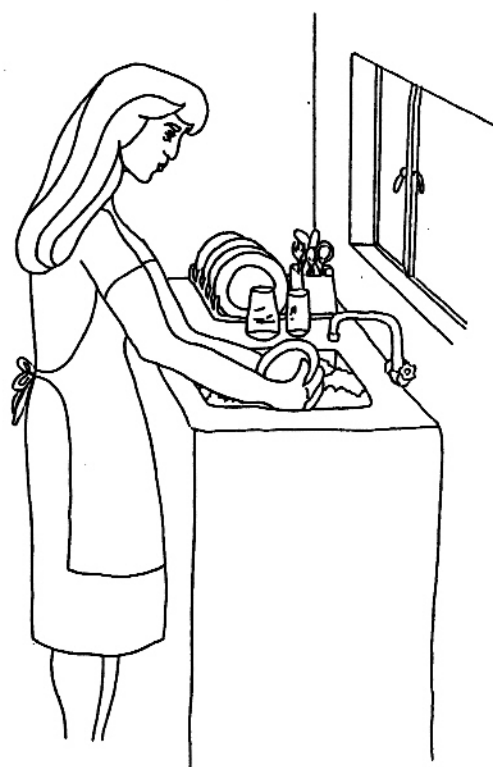
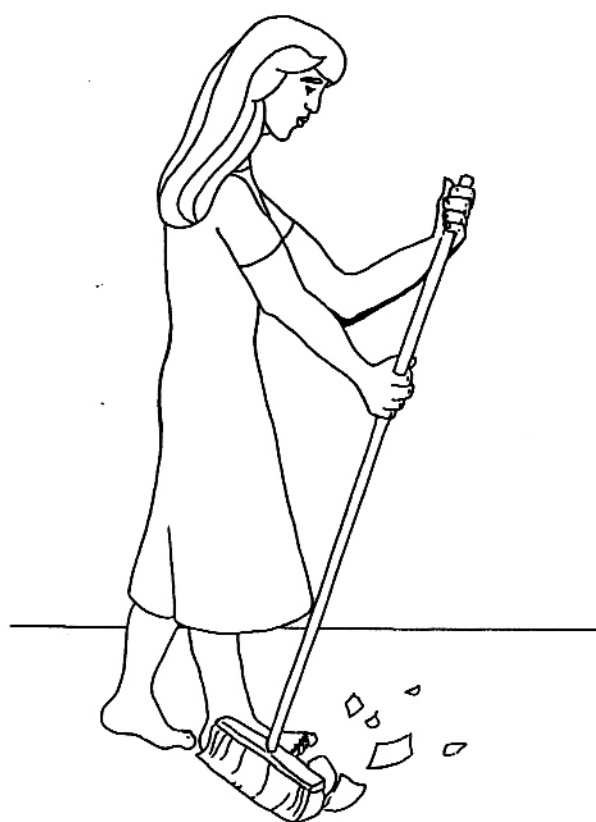
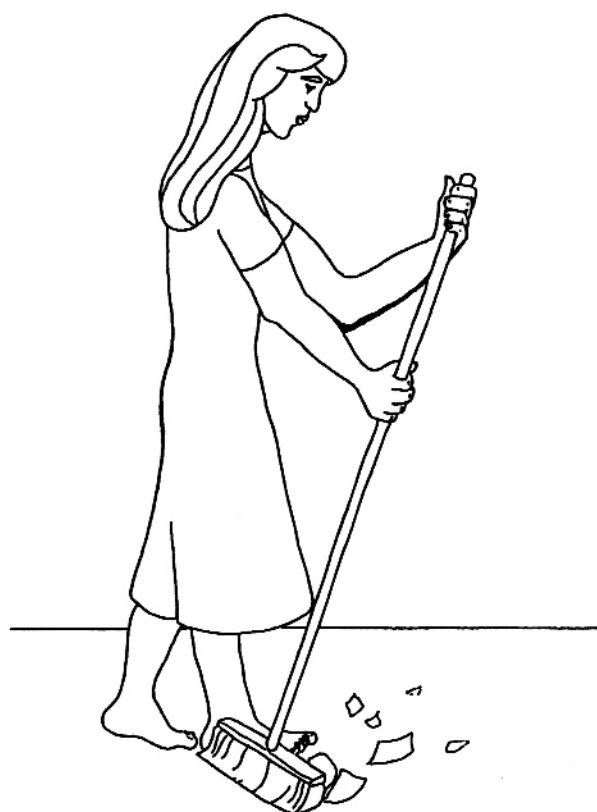
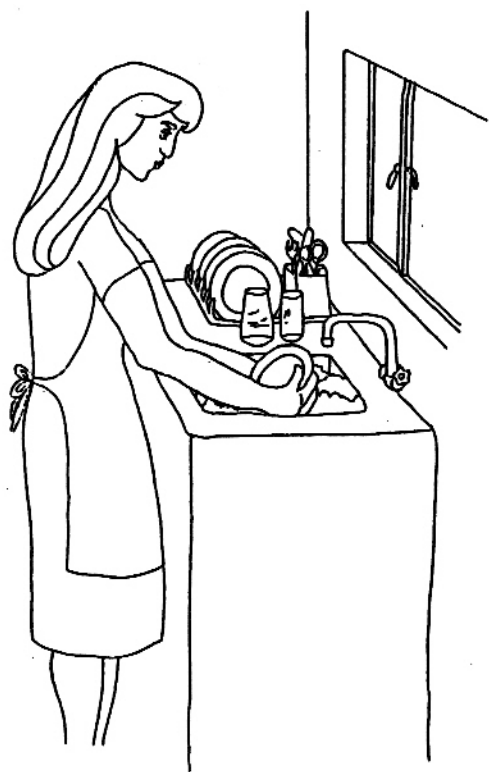
APPENDIX B**SENTENCE COMPREHENSION TASKS****SUBTEST 1: SYNTAX****Complex**

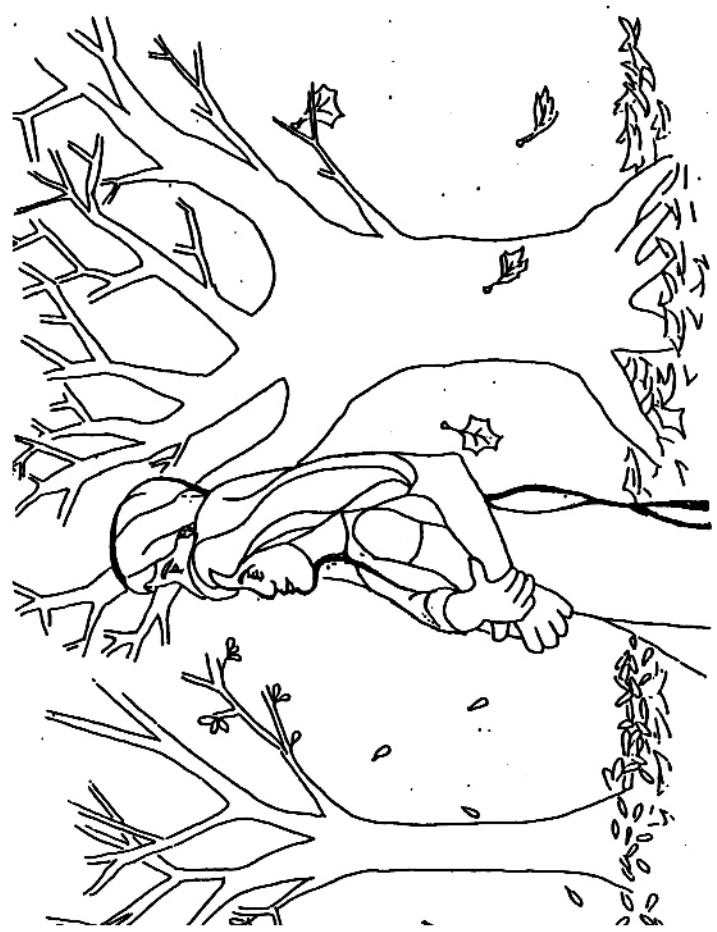
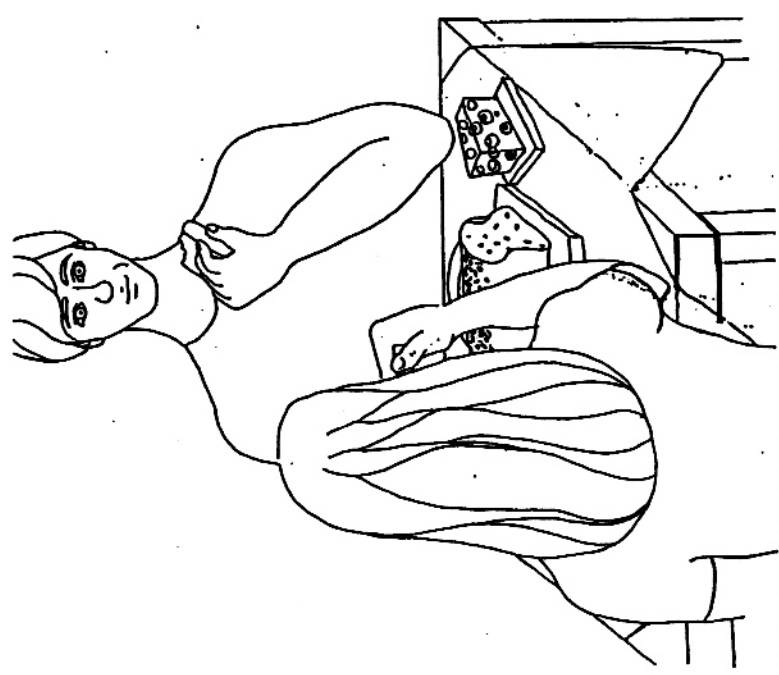
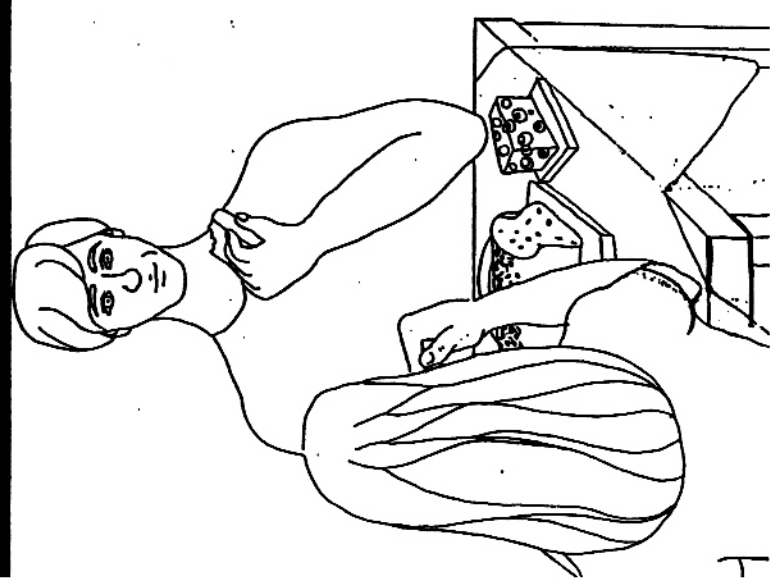
1. The girl that the boy kissed had a hat.
2. Before doing the washing, she swept the floor.
3. Before eating dinner, they went for a walk.
4. The man that the policeman chased had a gun.
5. The dog is bigger than the cat.
6. The boy is taller than the girl.
7. The children were followed by the boy.
8. The boy was chased by the dog.
9. Before sleeping, he had a bath.
10. The woman was hugged by the man.

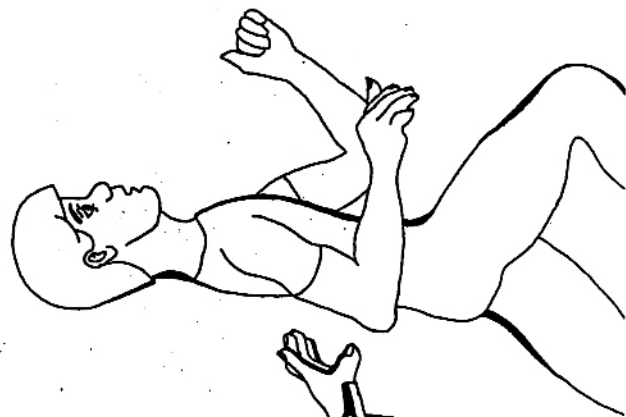
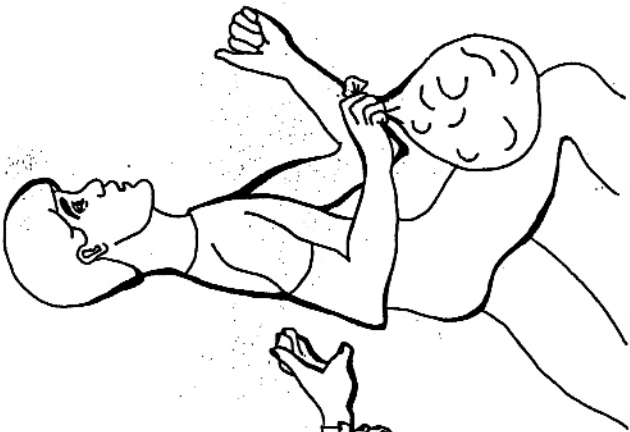
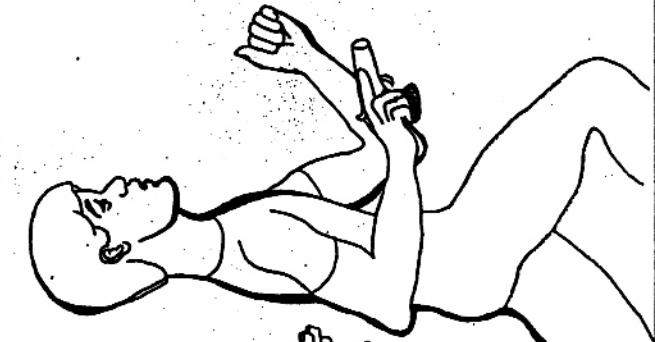
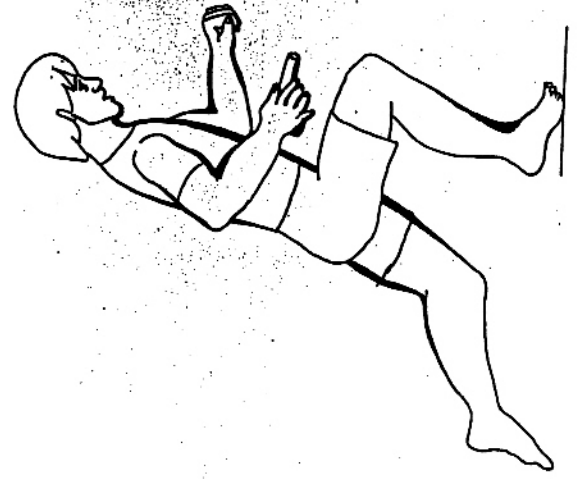
Simple

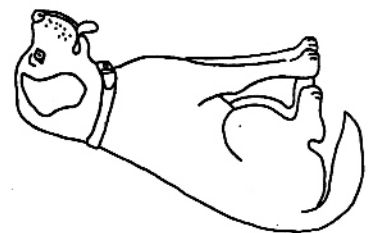
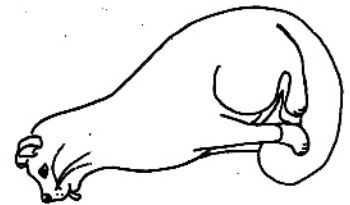
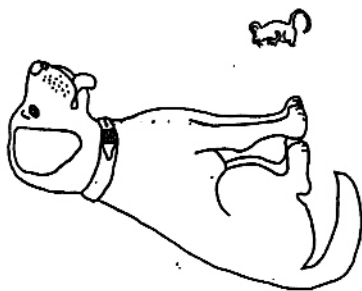
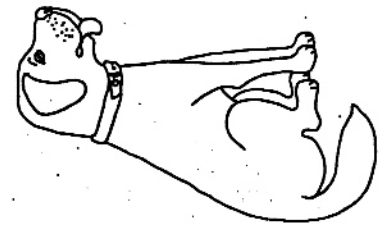
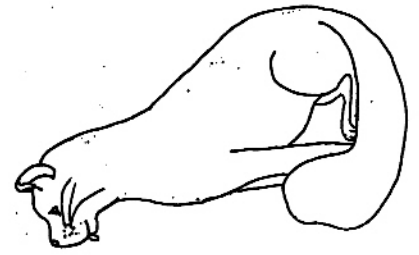
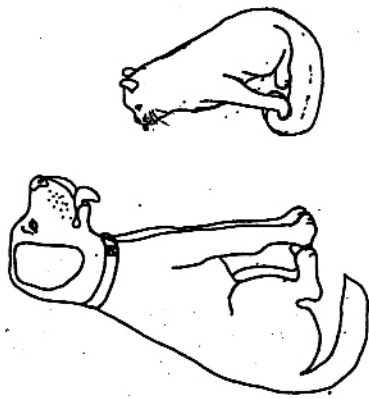
1. The boy kissed the girl. The girl was wearing a hat.
2. First she swept the floor. Then she did the washing.
3. First they went for a walk. Then they had dinner.
4. The policeman chased the man. The man had a gun.
5. The dog is big. The cat is not big.
6. The boy is tall. The girl is not tall.
7. The boy followed the children.
8. The dog chased the boy.
9. First he had a bath. Then he slept.
10. The man hugged the woman.

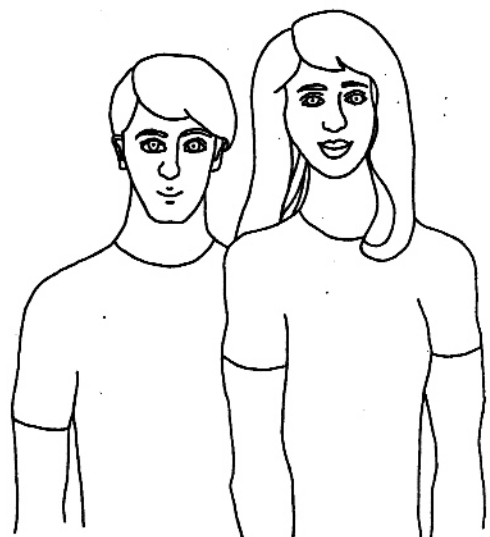
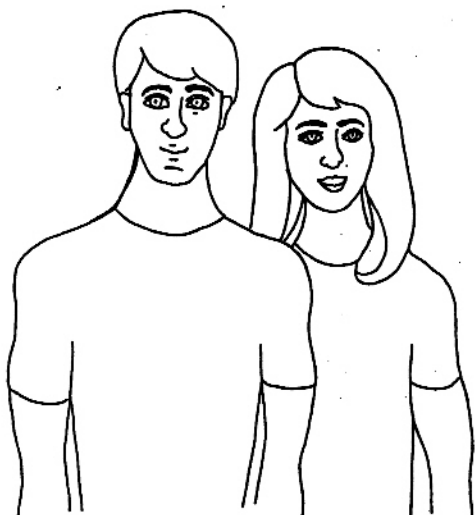
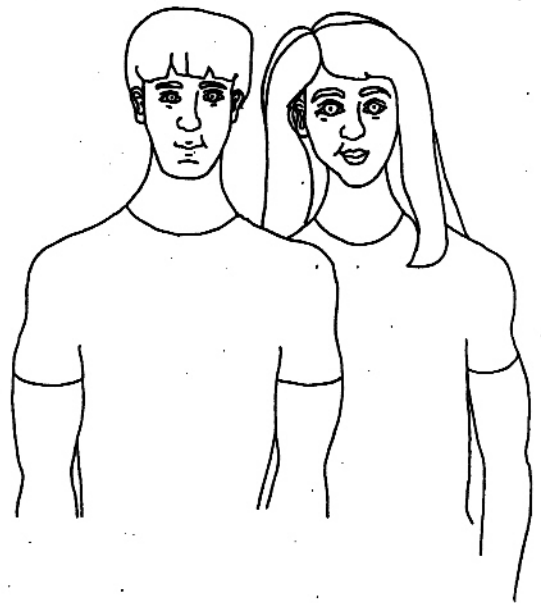
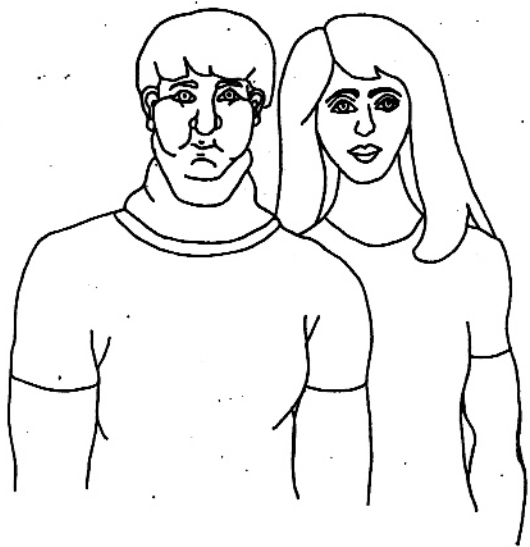


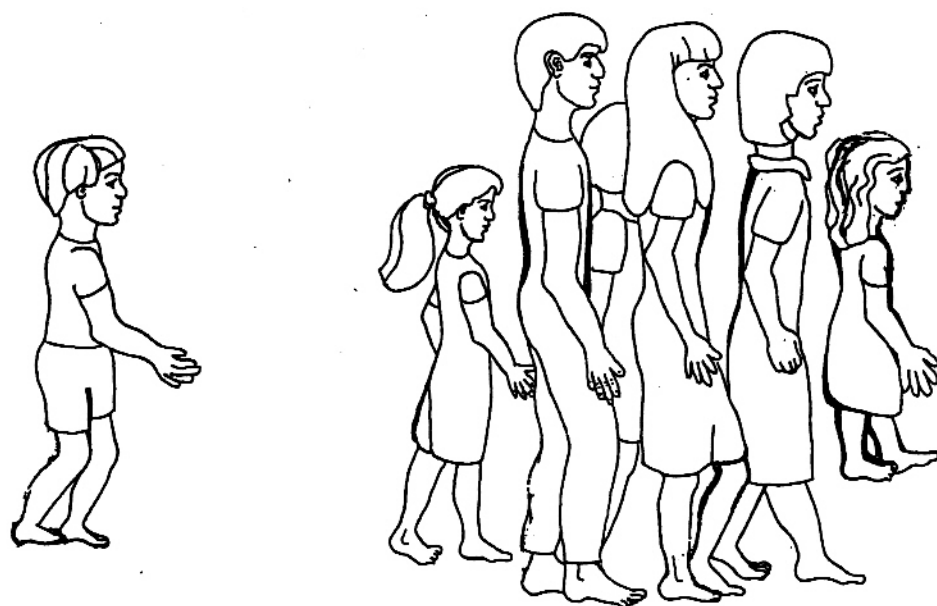
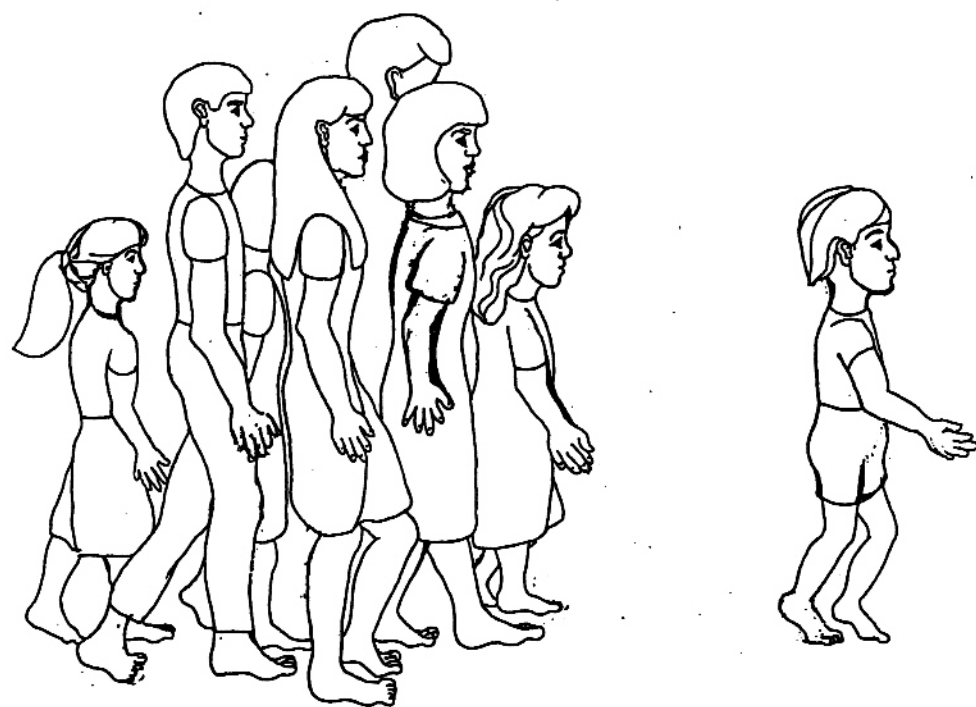


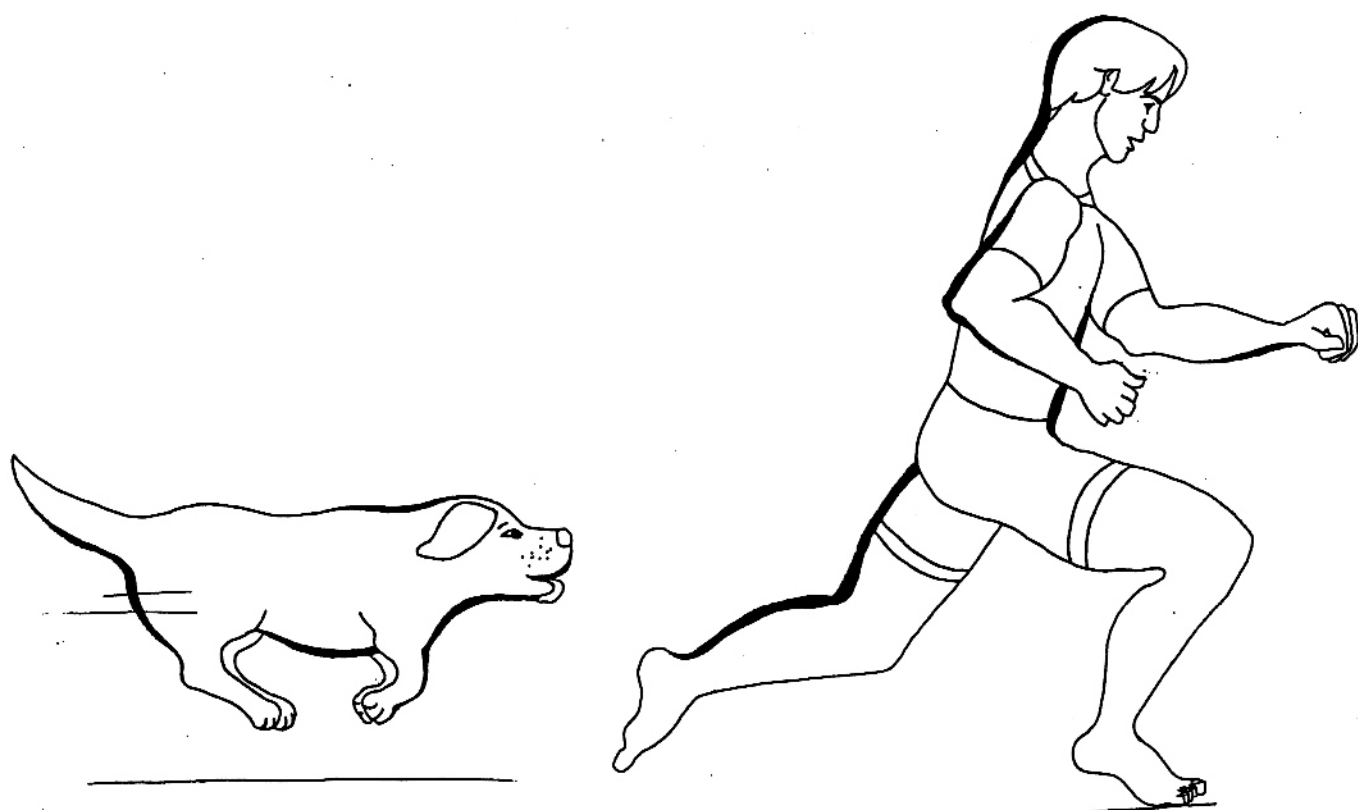
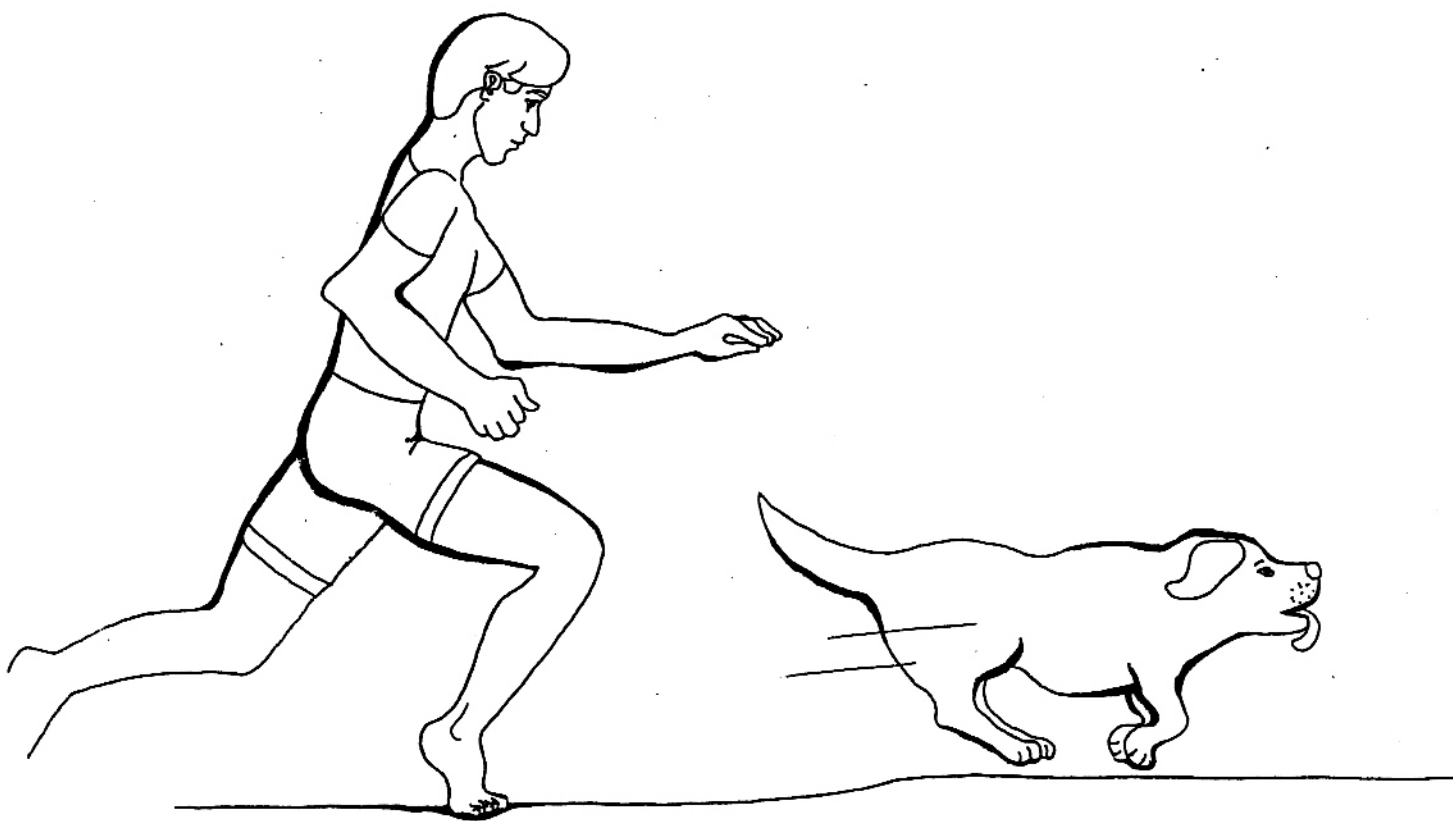




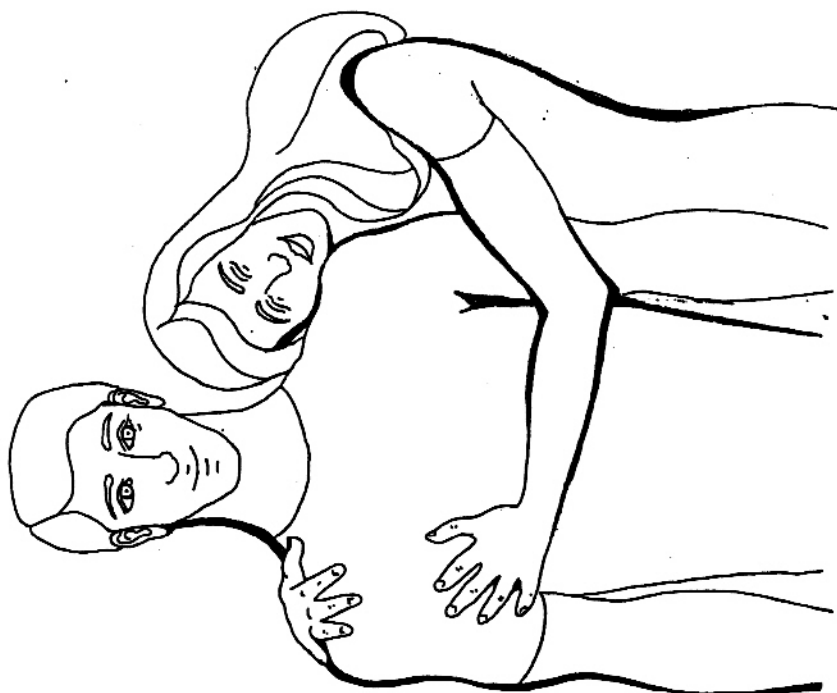
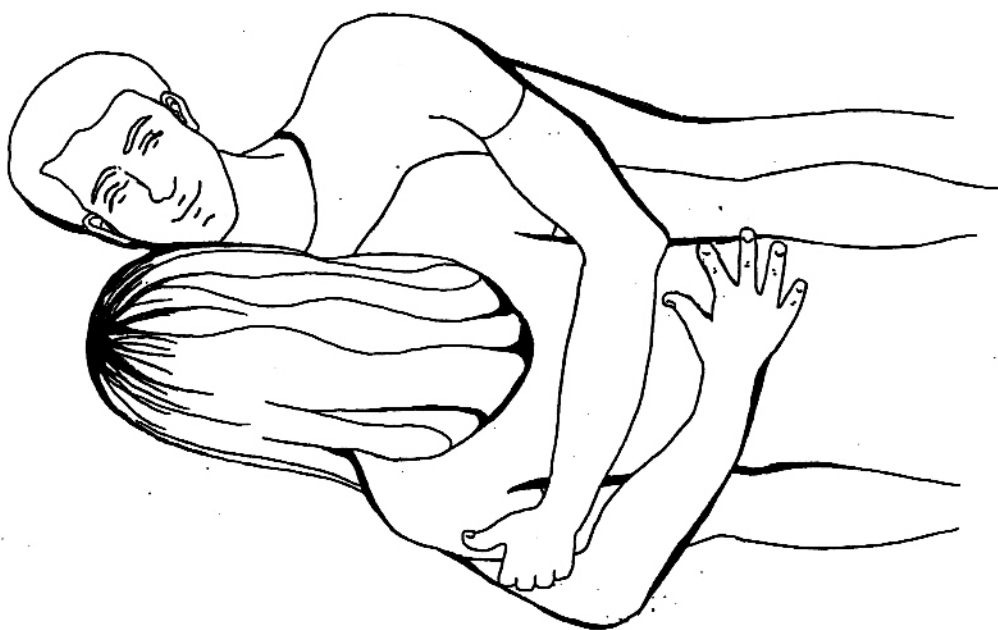










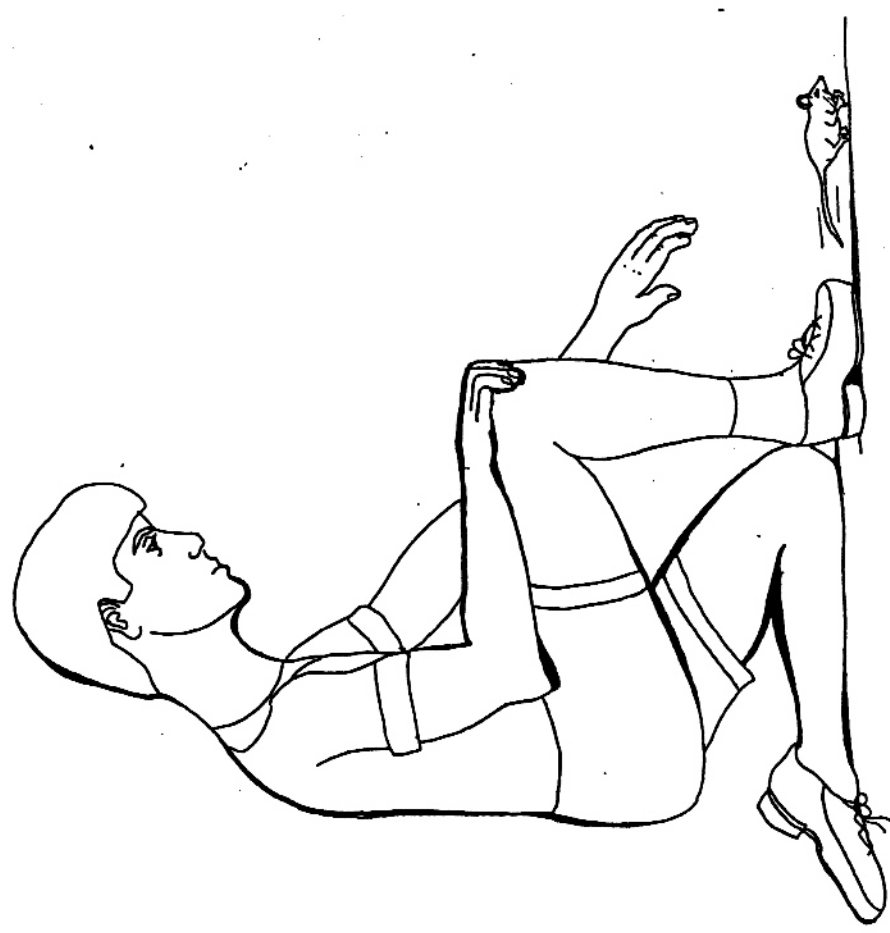
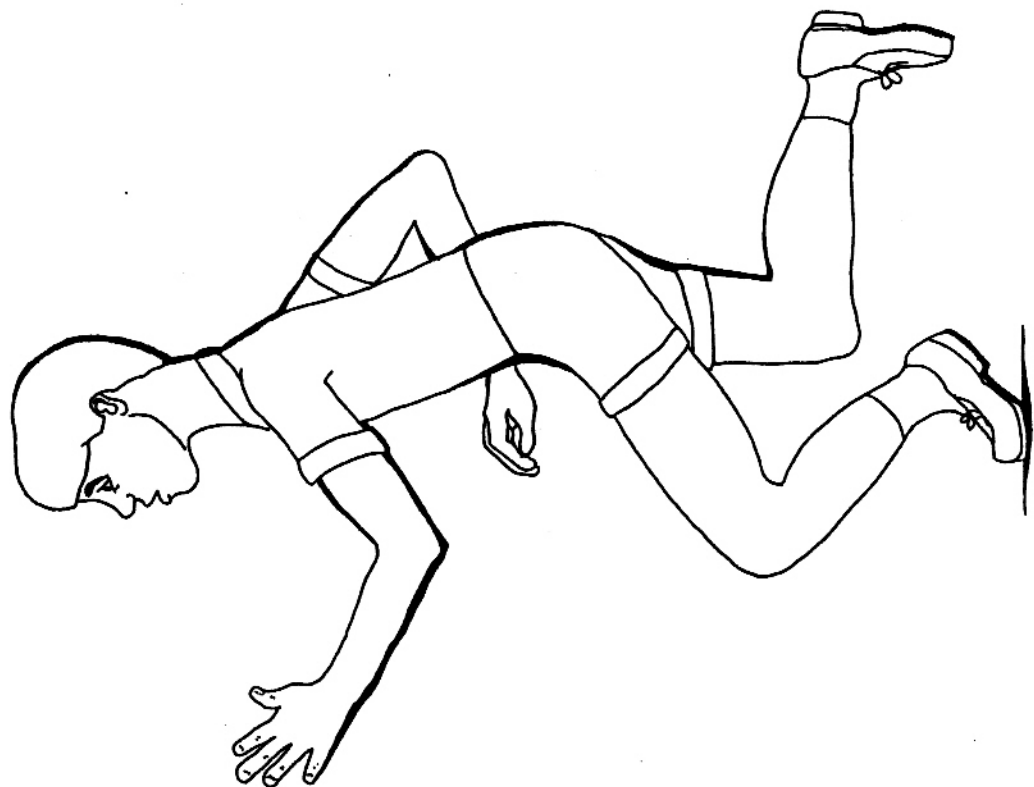


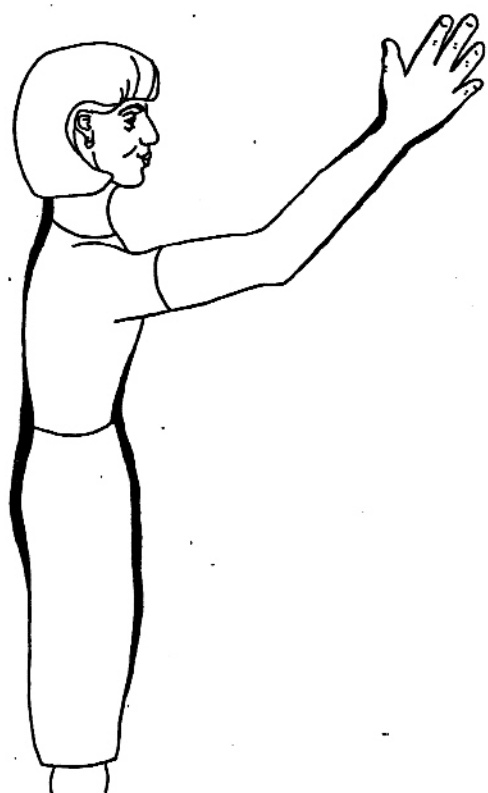
SUBTEST 2: PRONOUNS**Complex**

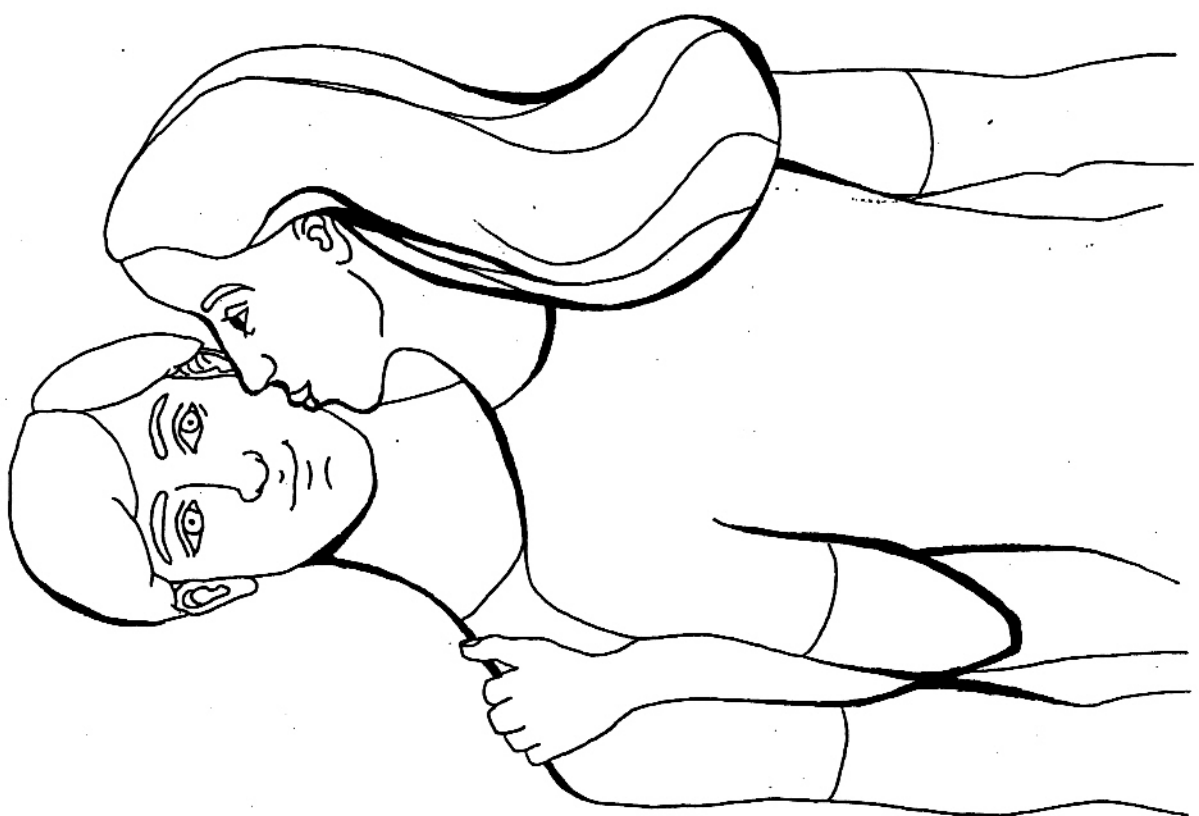
1. It frightened him.
2. She waved to them
3. He kissed her.
4. He chased it.
5. She hugged him.
6. She talked to them.
7. They followed him.
8. He watched it.
9. She hit him.
10. He knocked her over.

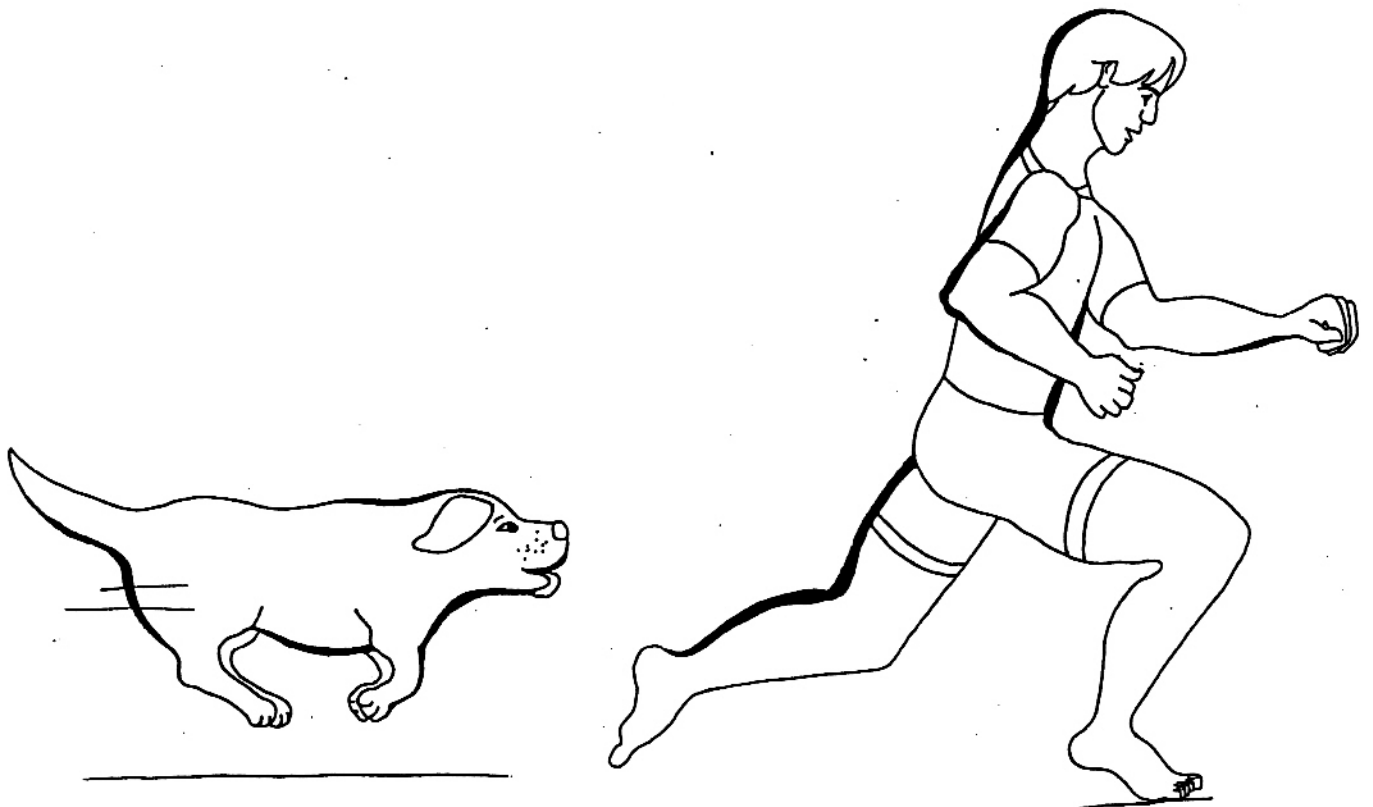
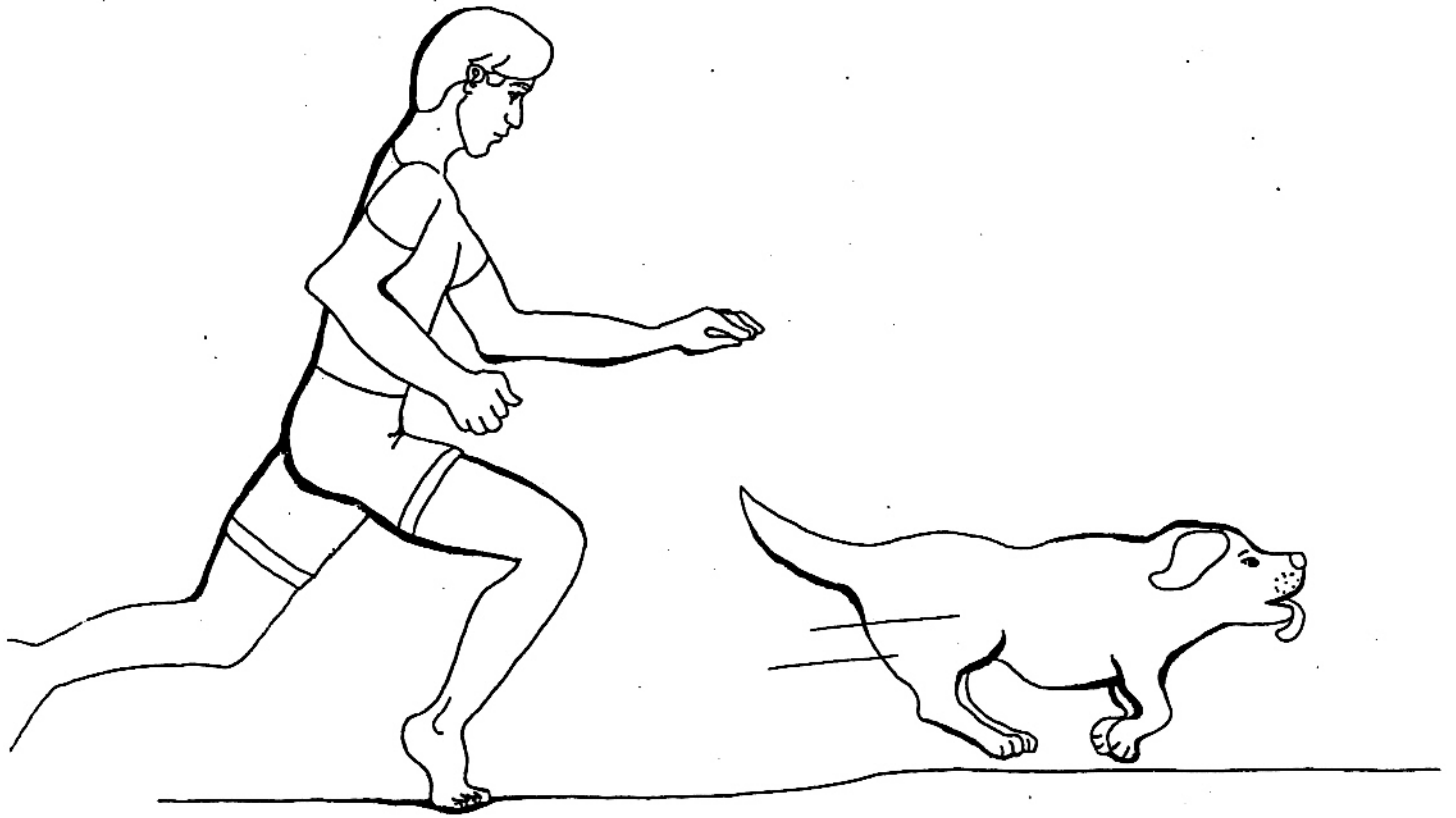
Simple

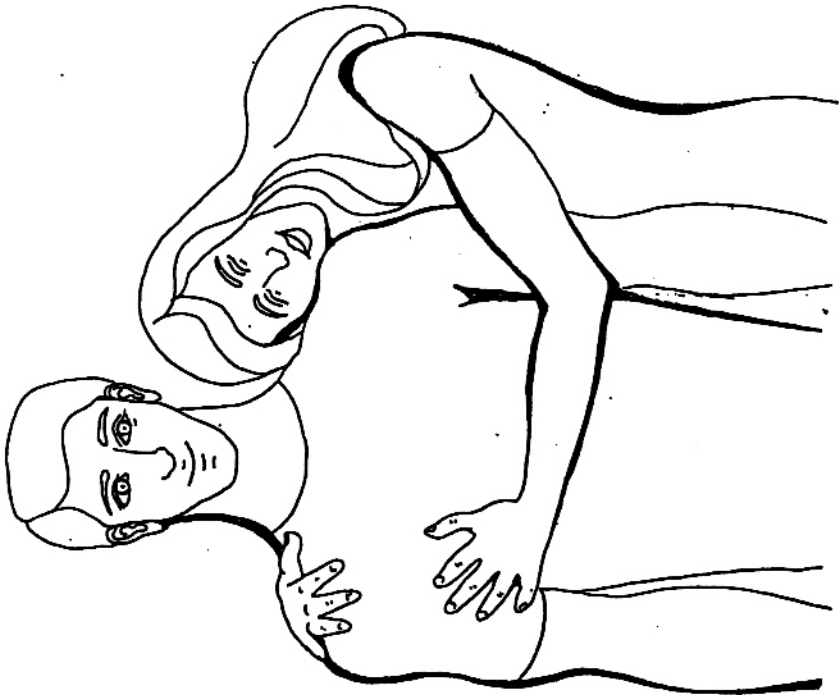
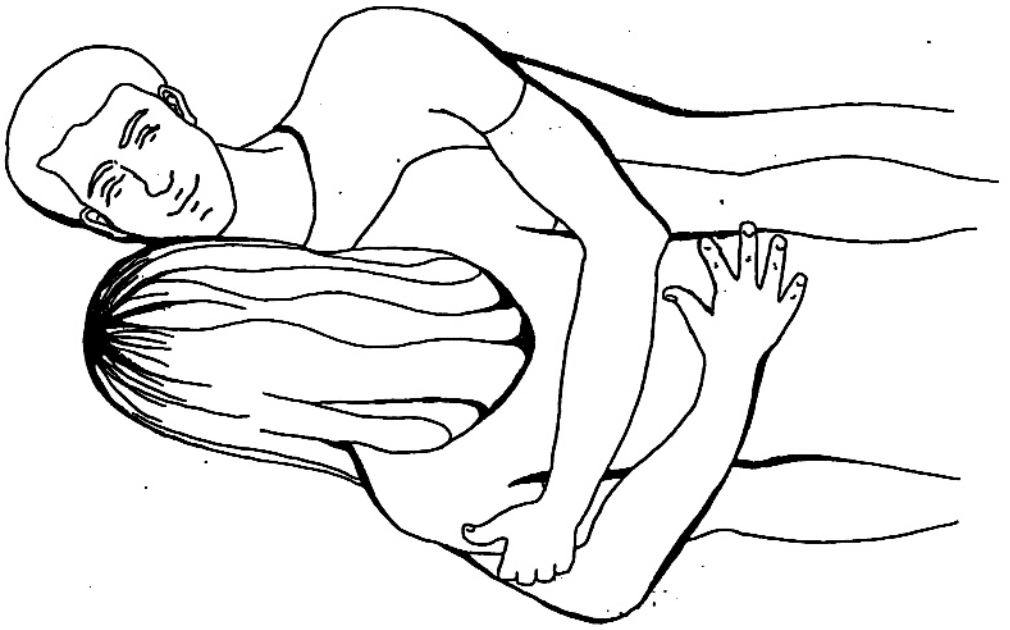
1. The boy frightened the mouse.
2. The children waved to the mother.
3. The woman kissed the man.
4. The dog chased the boy.
5. The man hugged the woman.
6. The children talked to teacher.
7. The boy followed the children.
8. The lion watched the man.
9. The boy hit the girl.
10. The girl knocked the boy over.

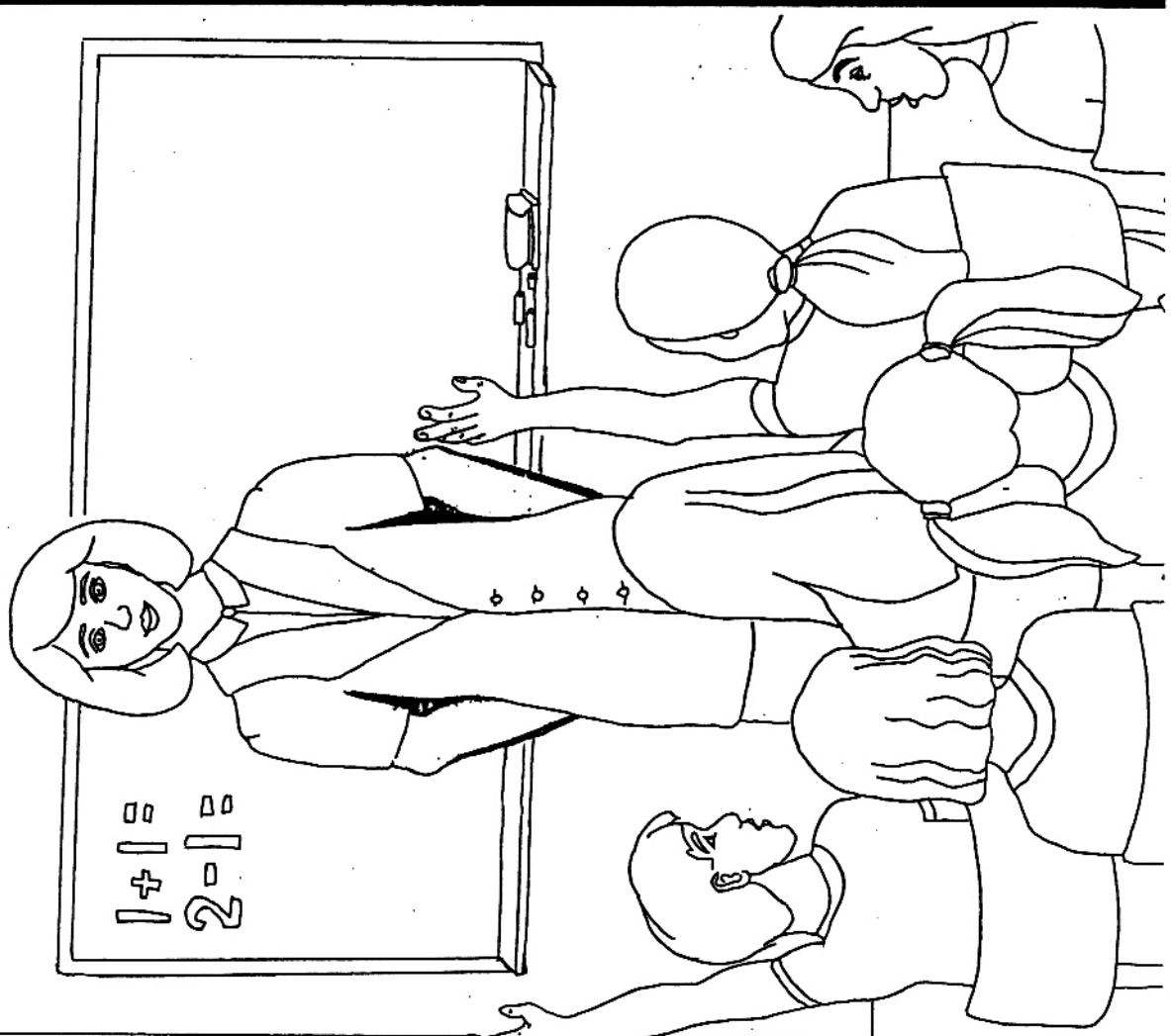
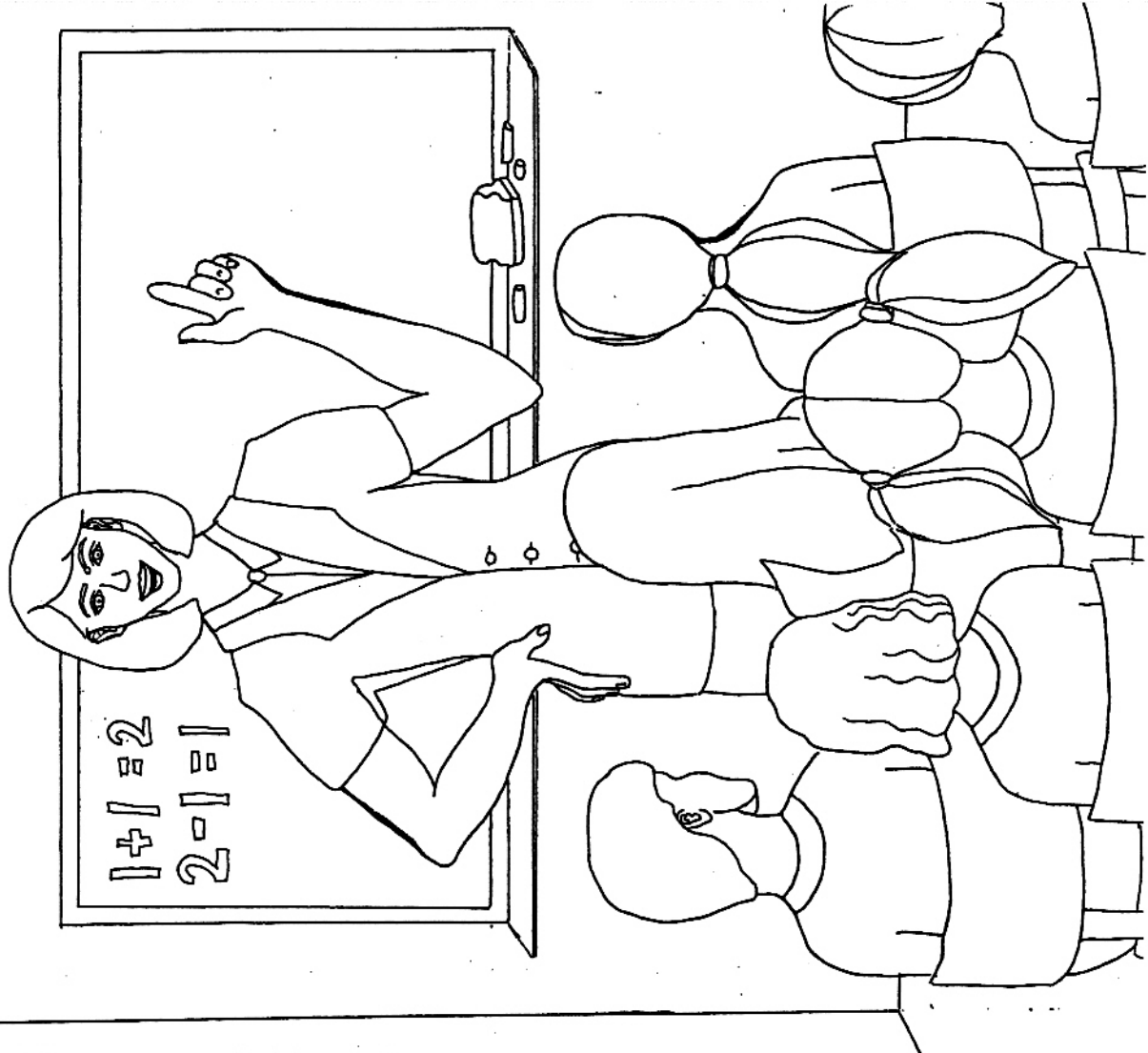


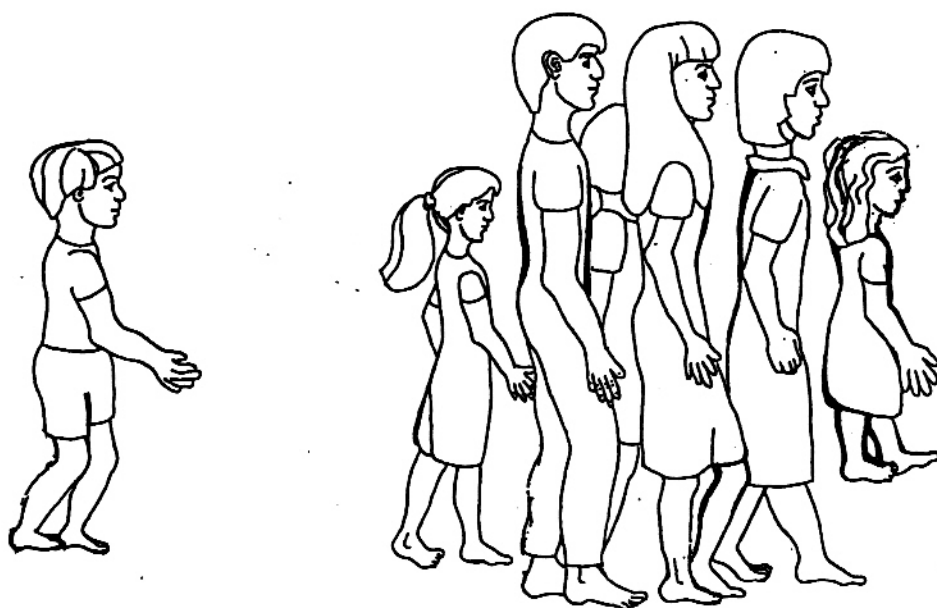
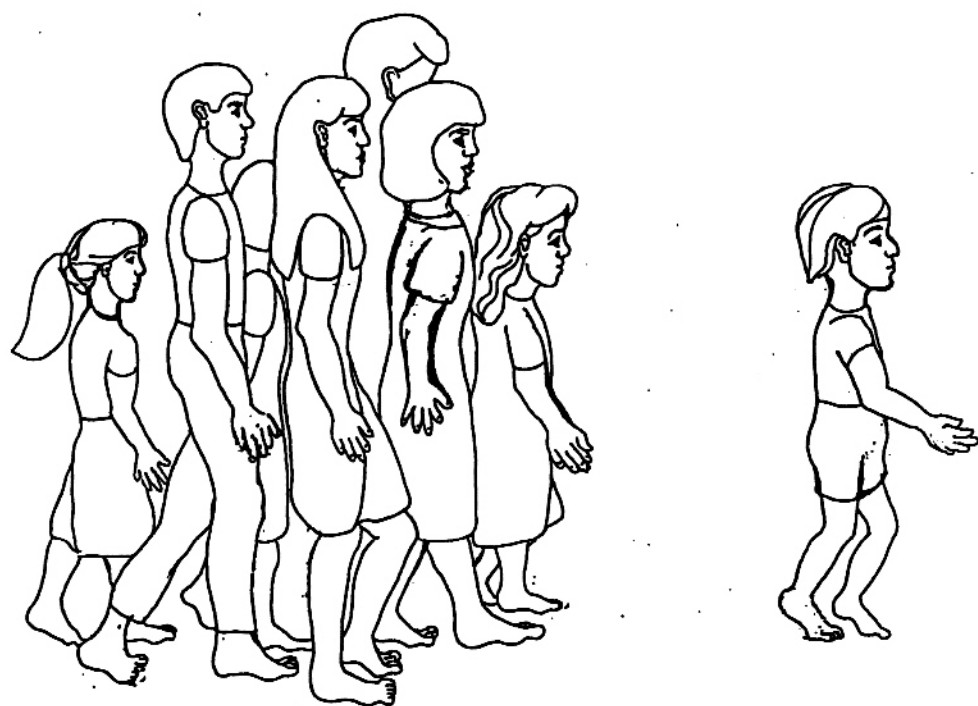


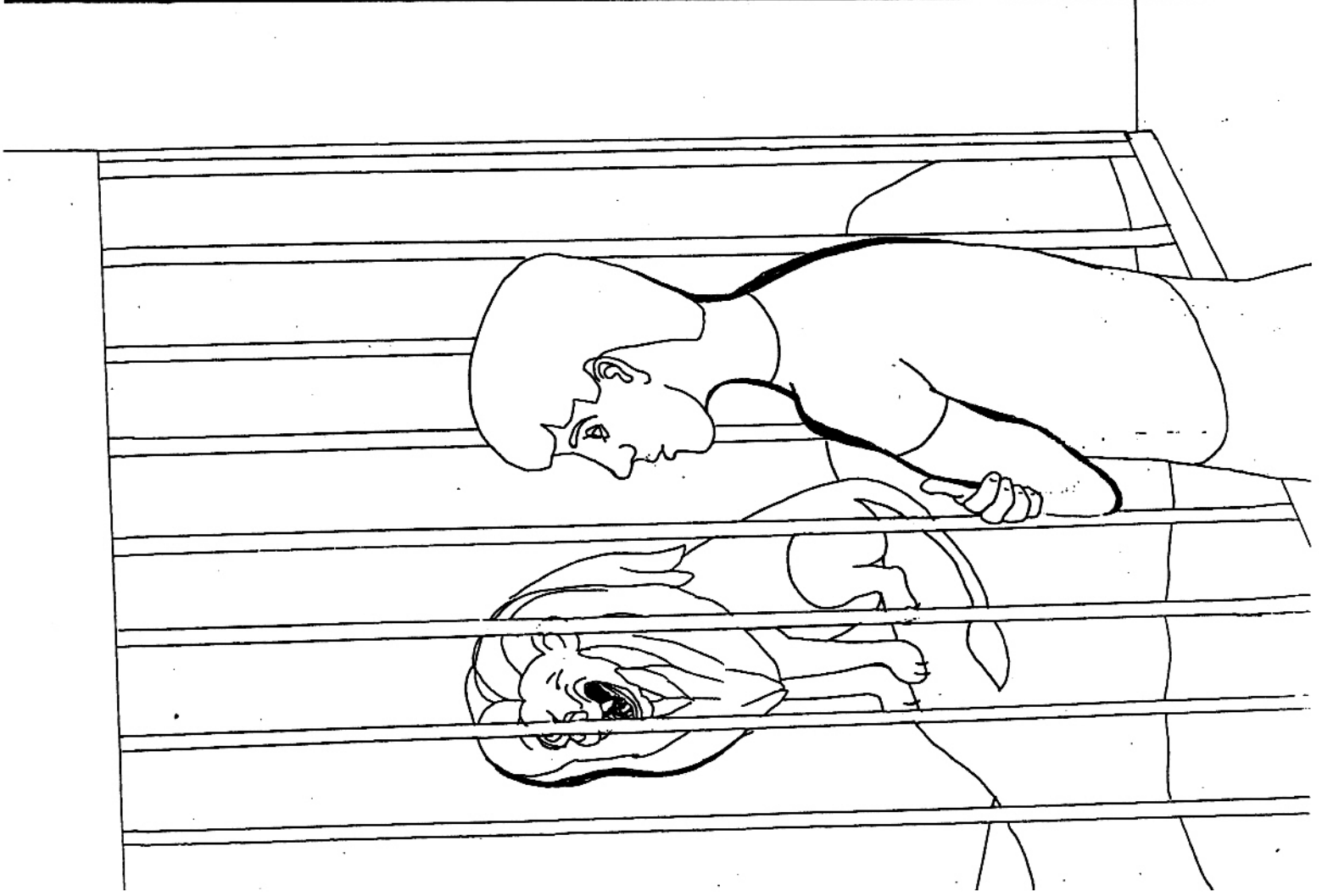


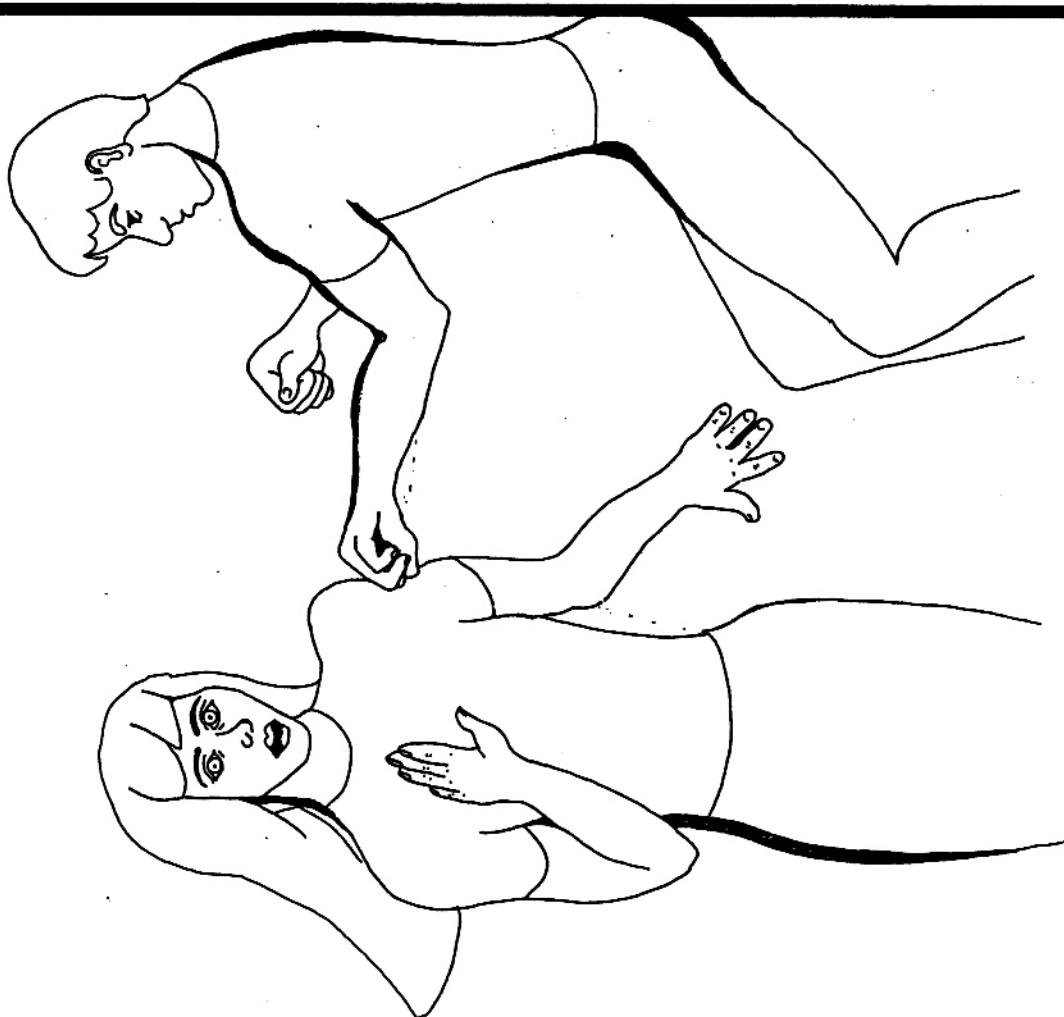
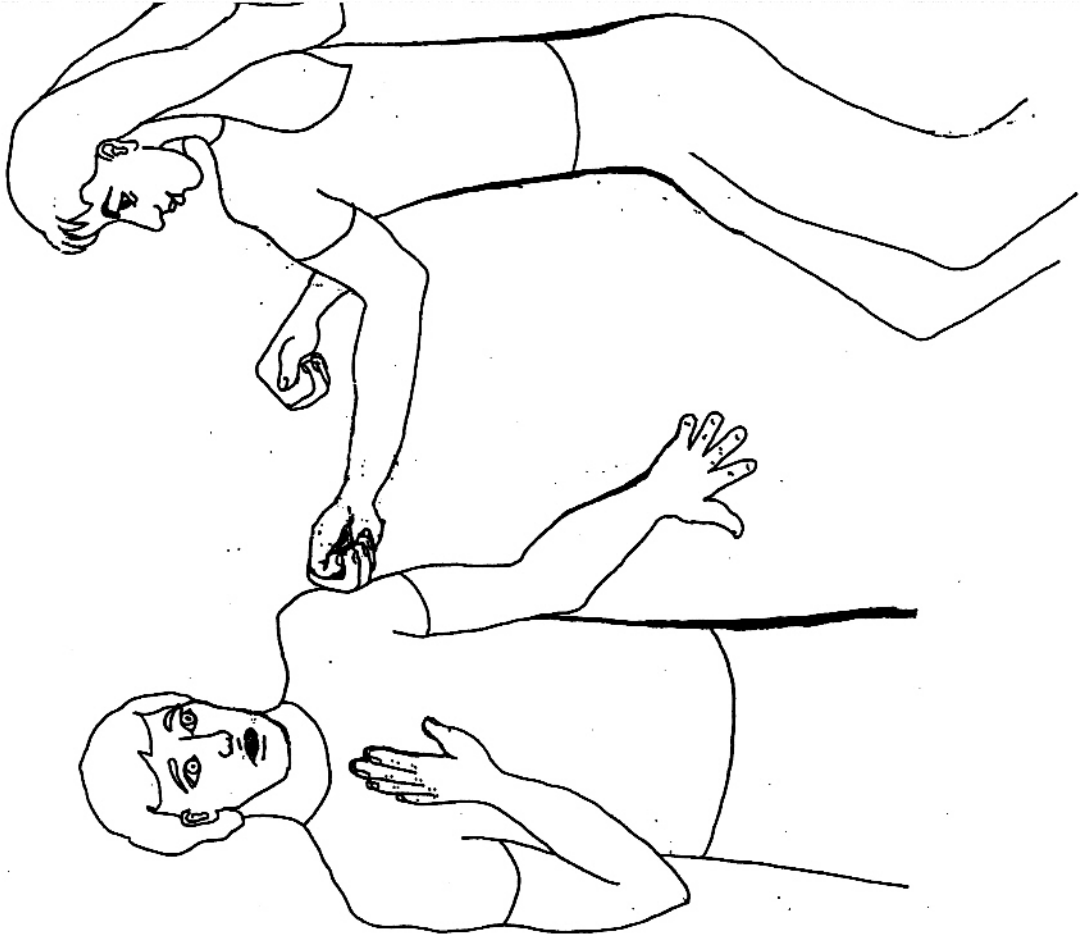


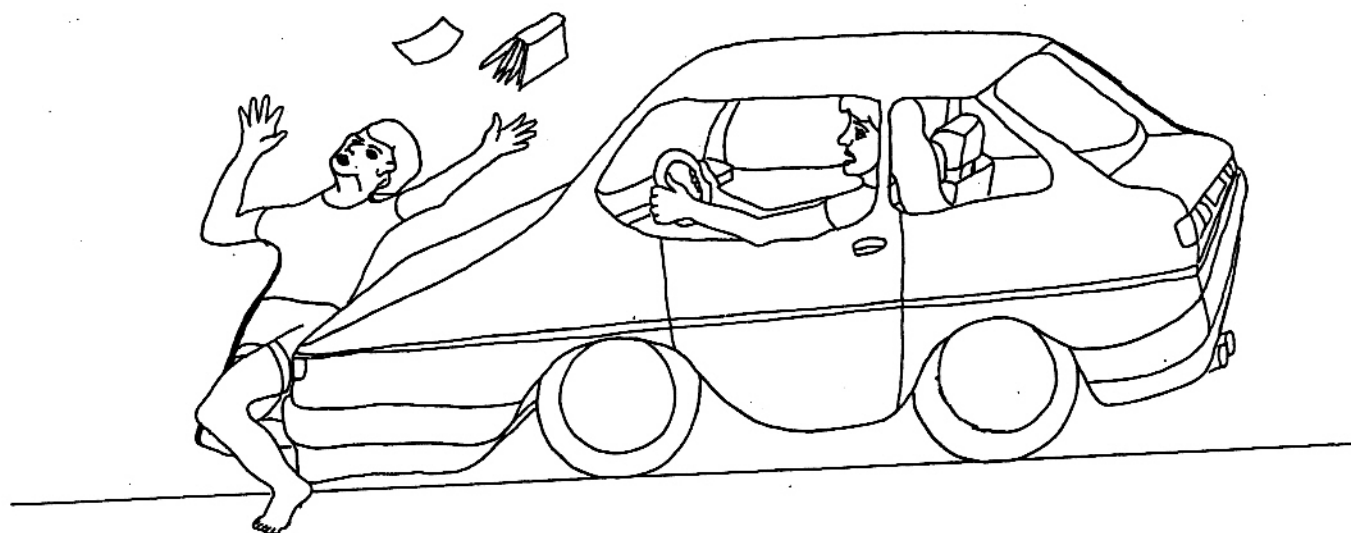
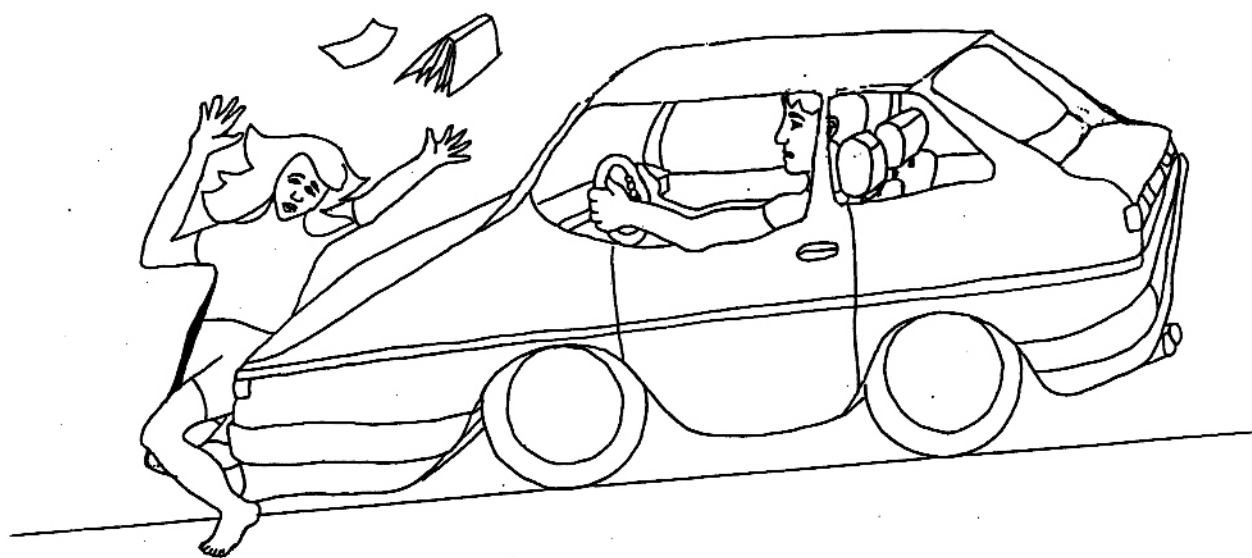










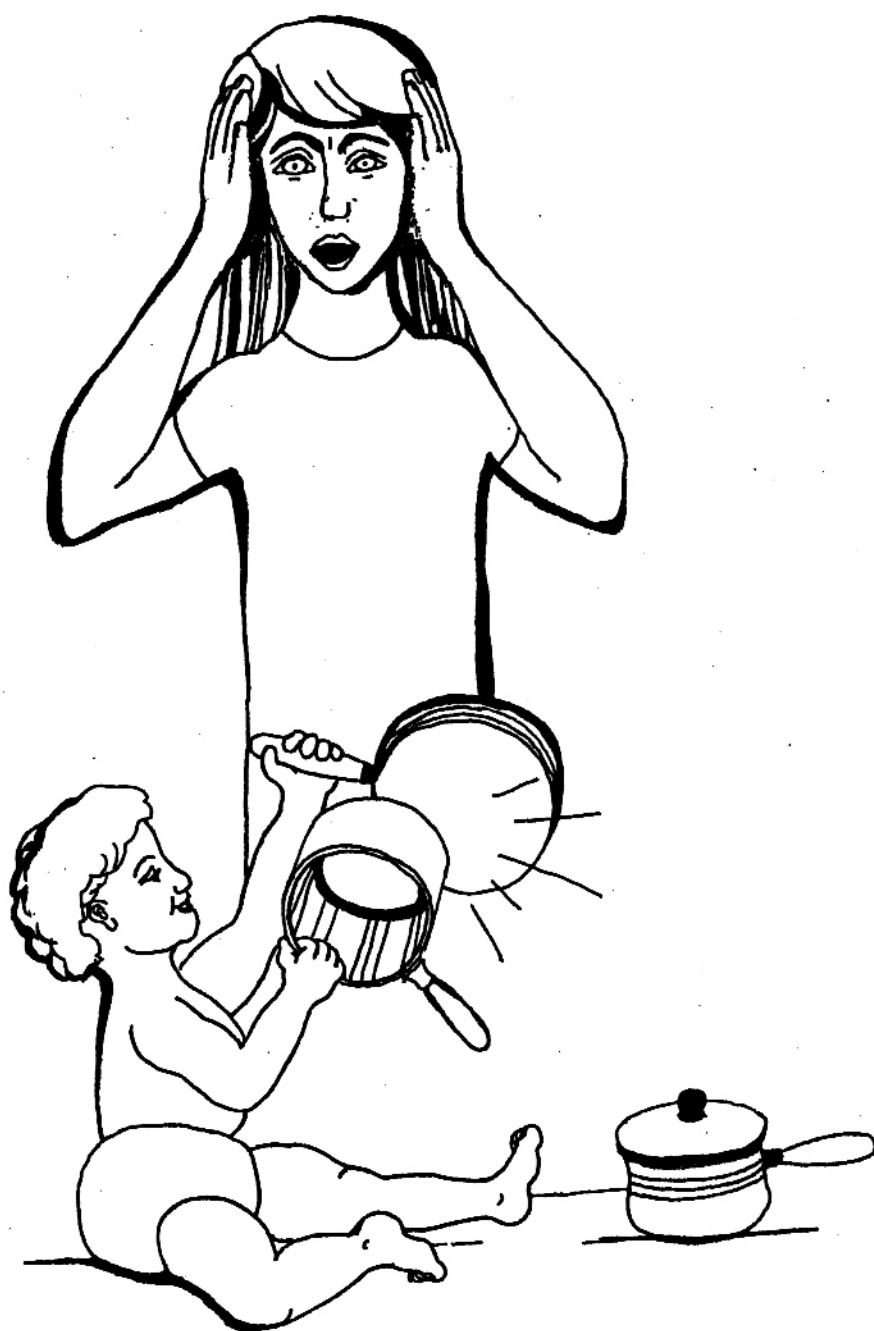


SUBTEST 3: DIRECTNESS**Complex**

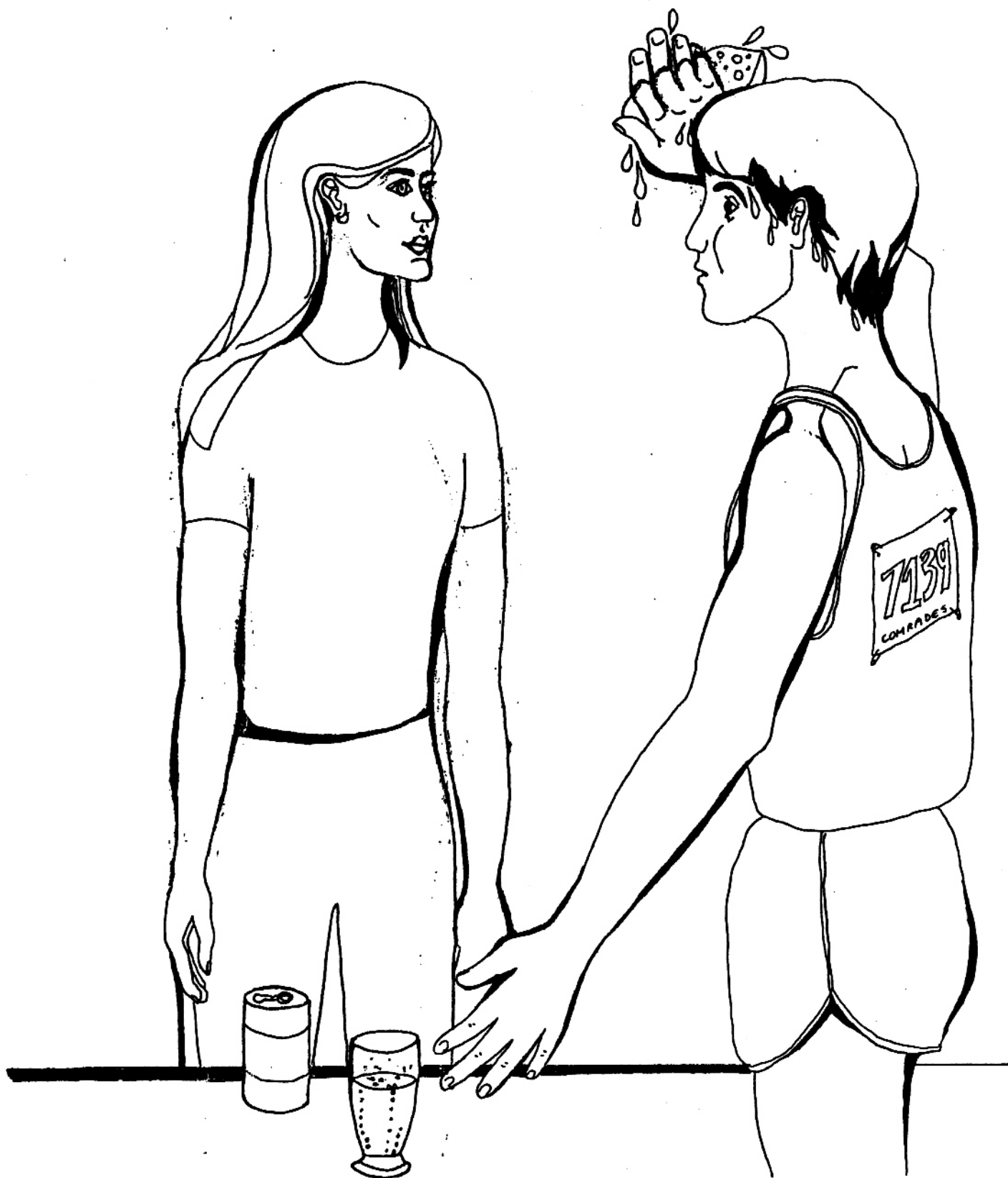
1. Must you do that?
2. It's very stuffy in here.
3. I'm thirsty.
4. Do you have the time?
5. Do you know the way to the station?
6. That cake looks delicious.
7. I'm hungry
8. Are we being chased?
9. Has Jim just started playing the piano?
10. I could do with a drink.

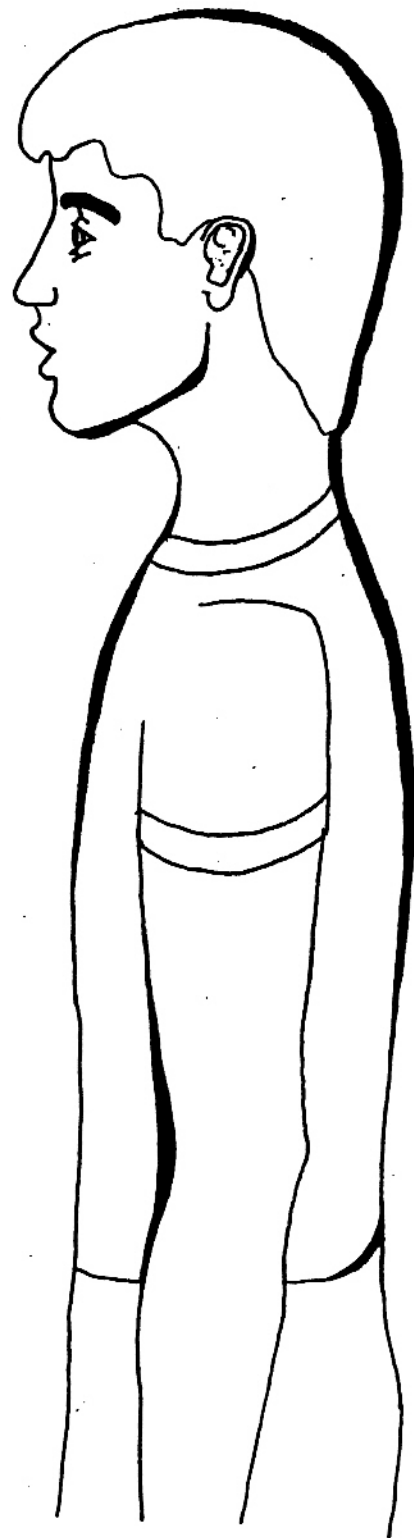
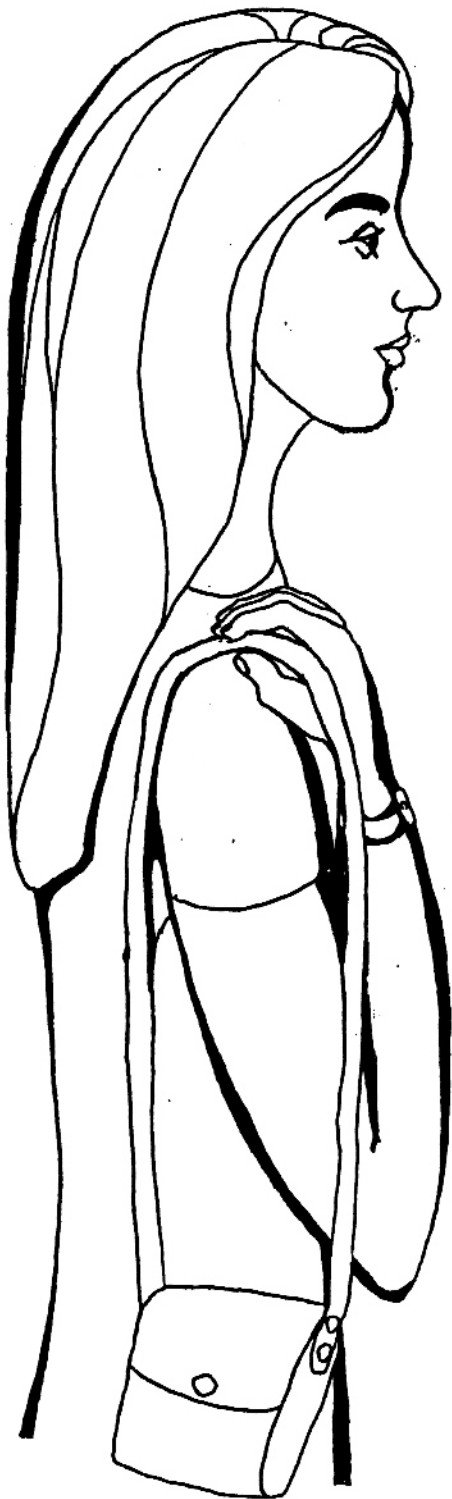
Simple

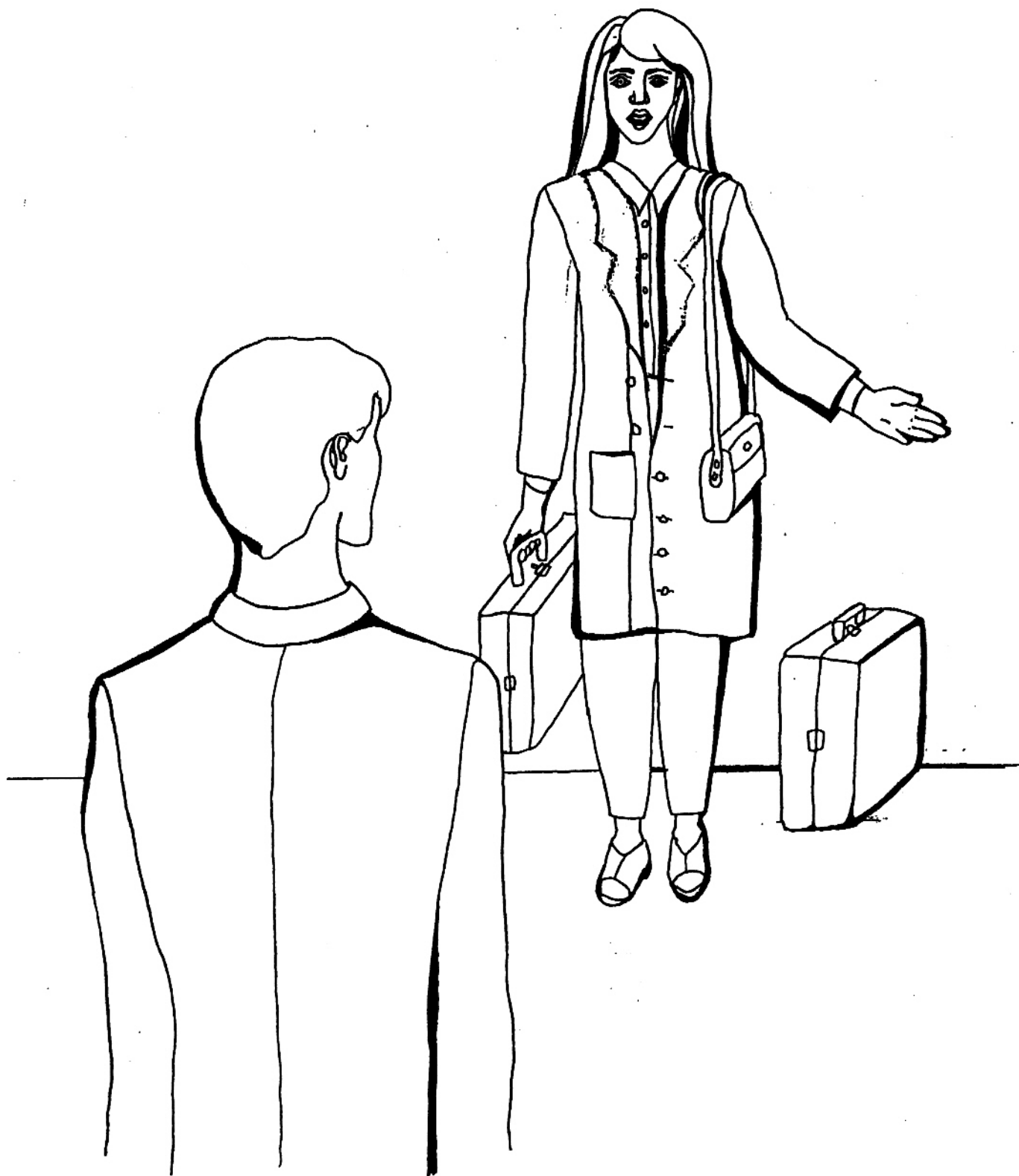
1. Stop doing that.
2. Please open the window.
3. Please give me a drink.
4. What is the time?
5. Where is the station?
6. Please give me some cake.
7. Give me some food.
8. Don't drive so fast.
9. Jim doesn't play very well.
10. Please pour me a drink.





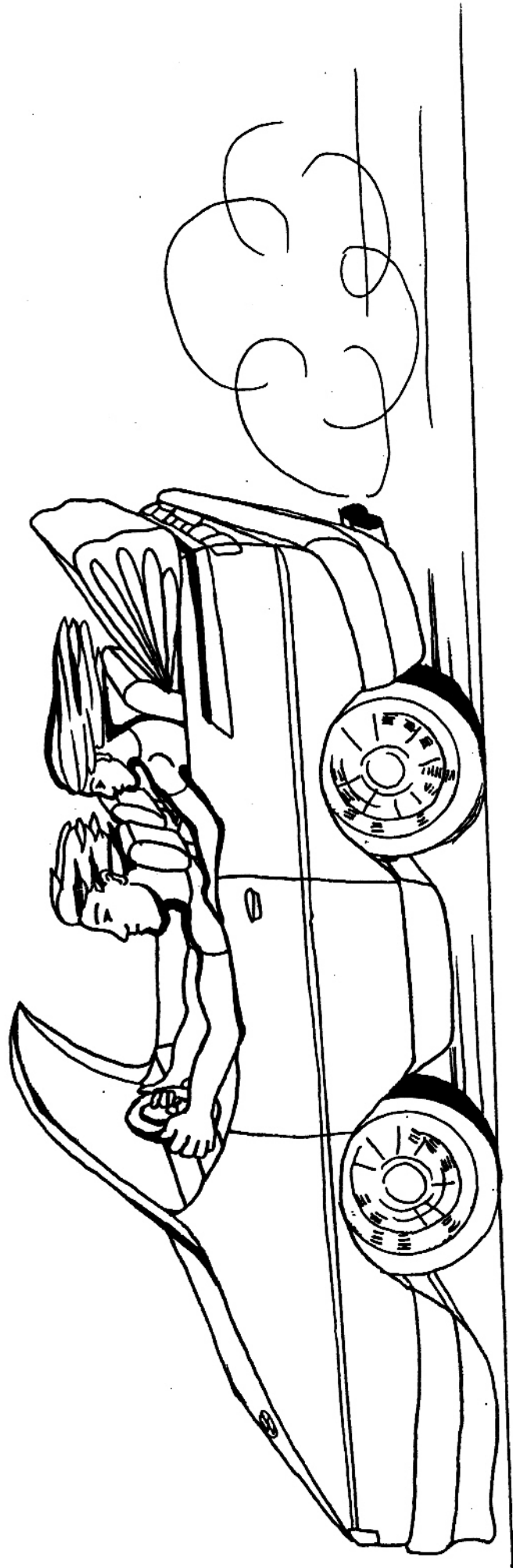


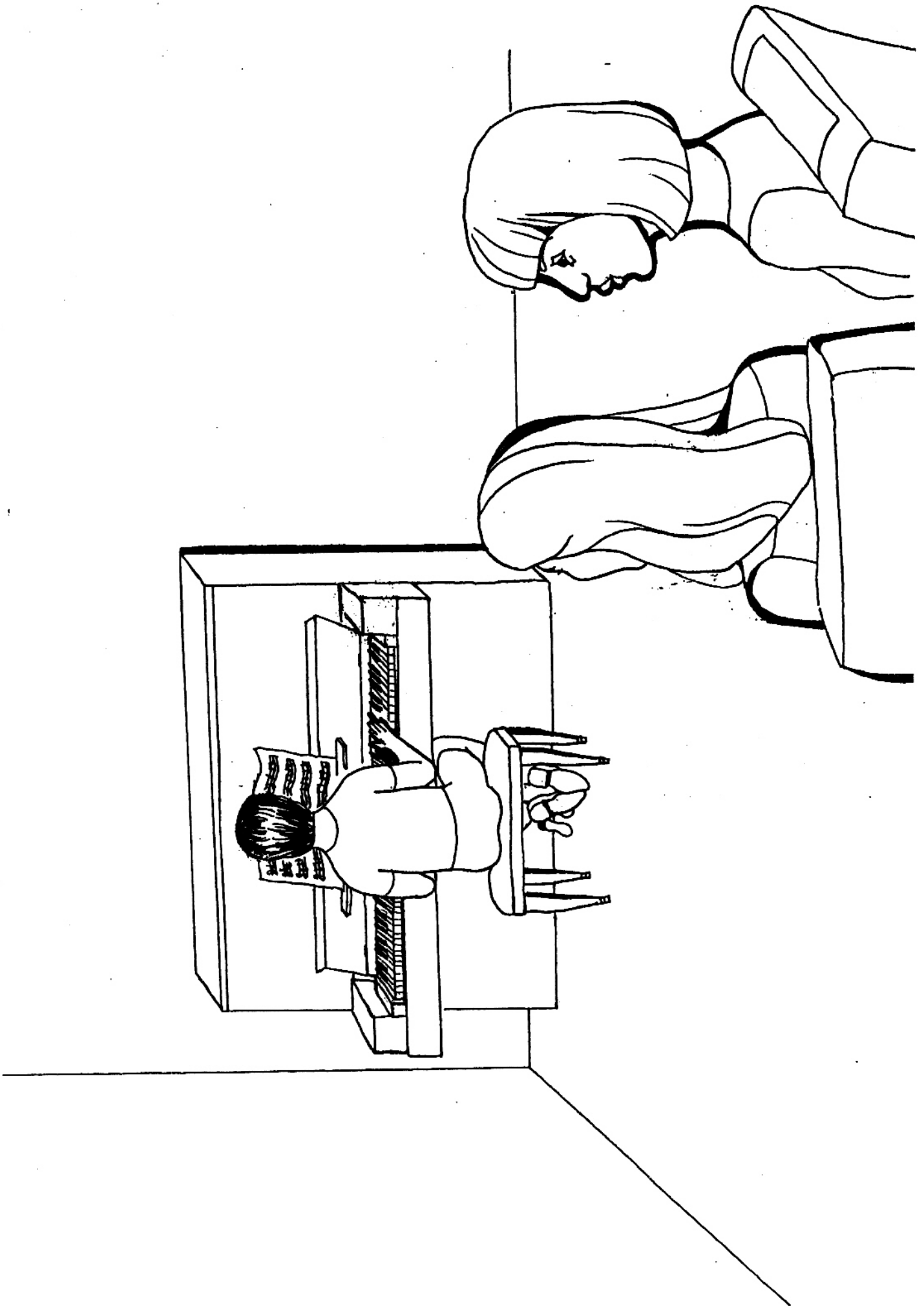


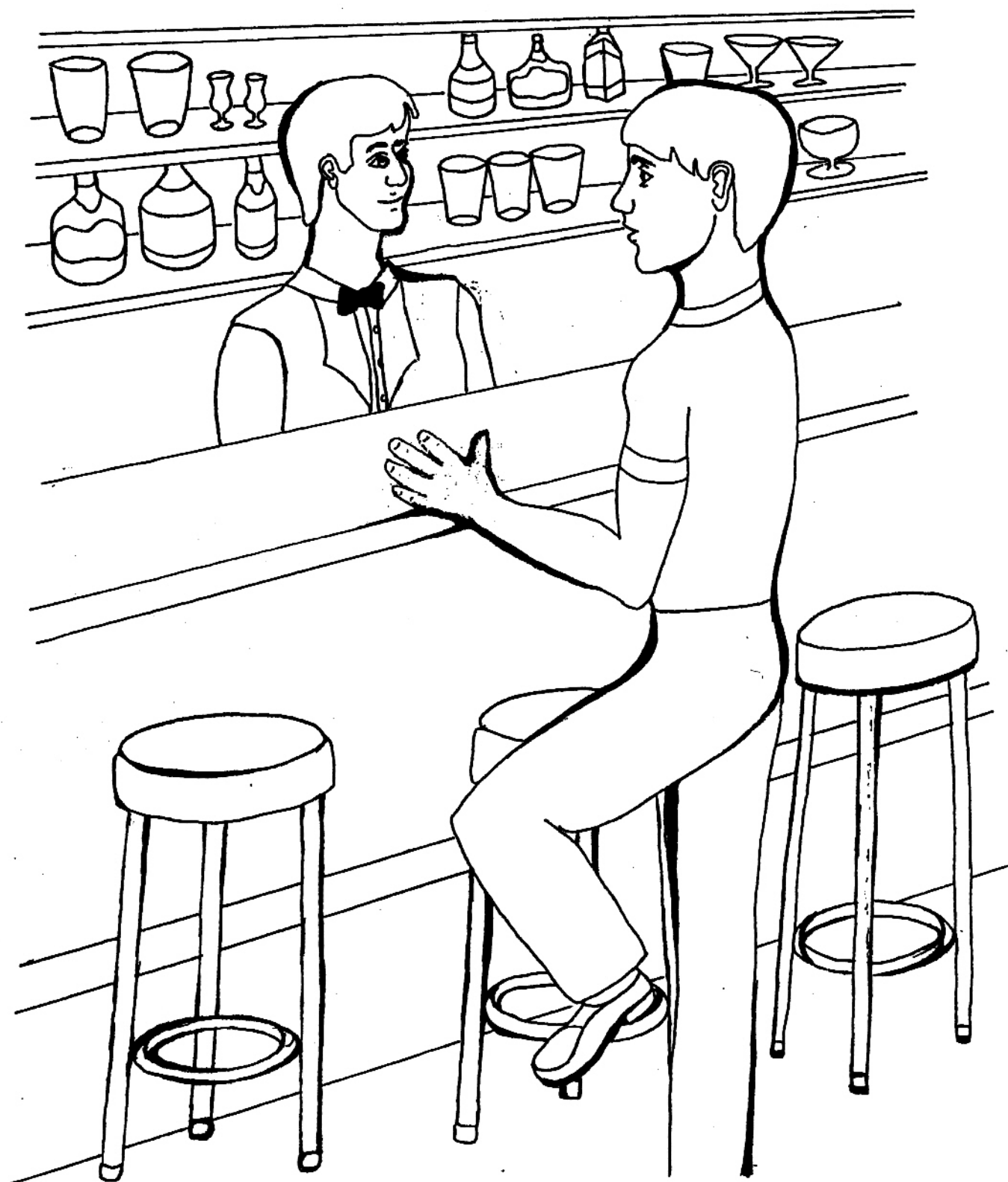










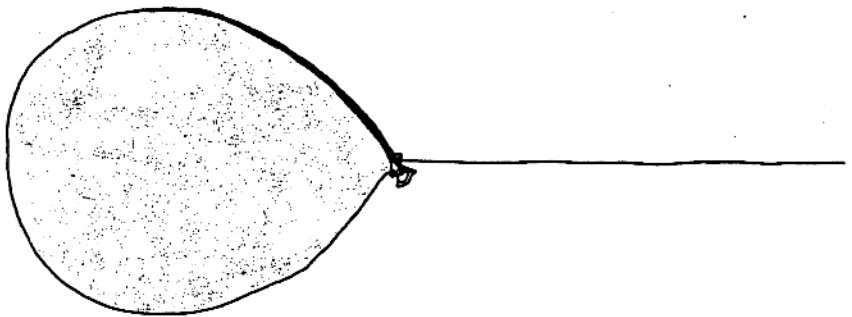
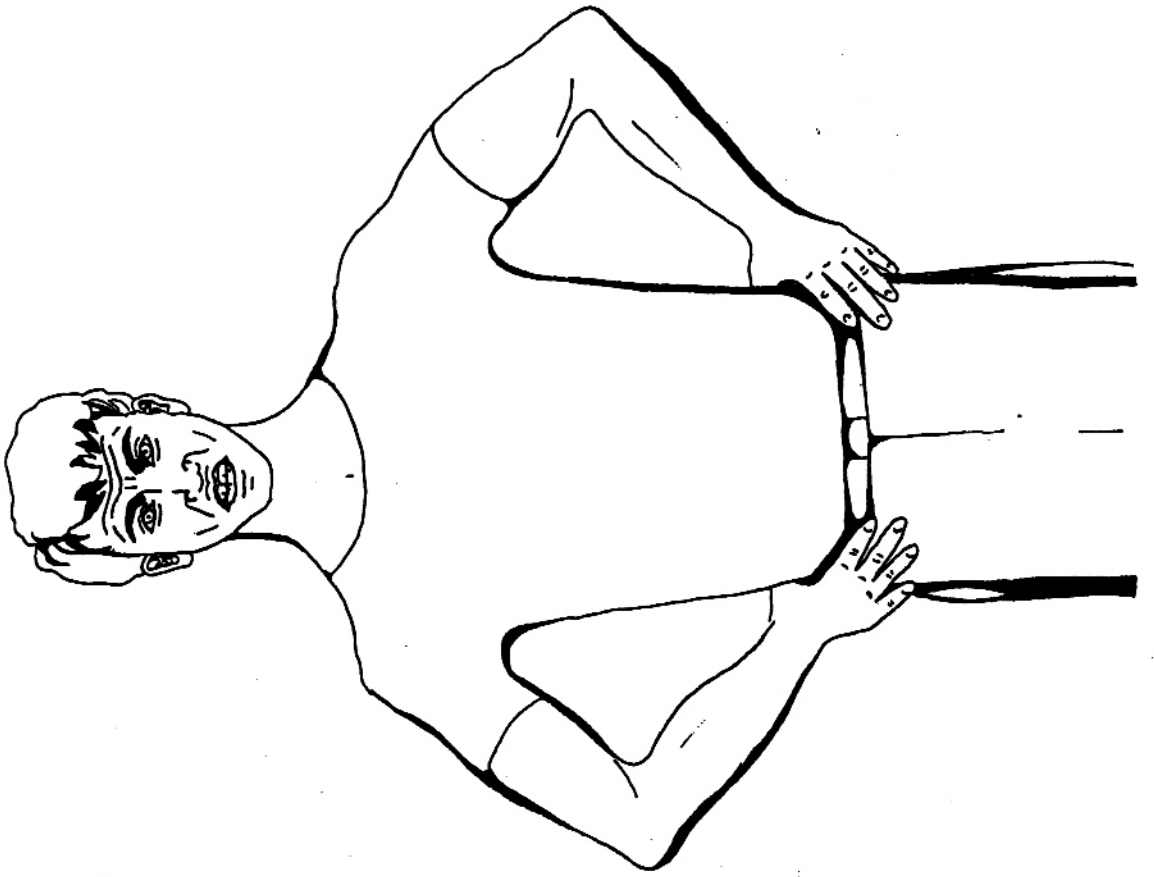


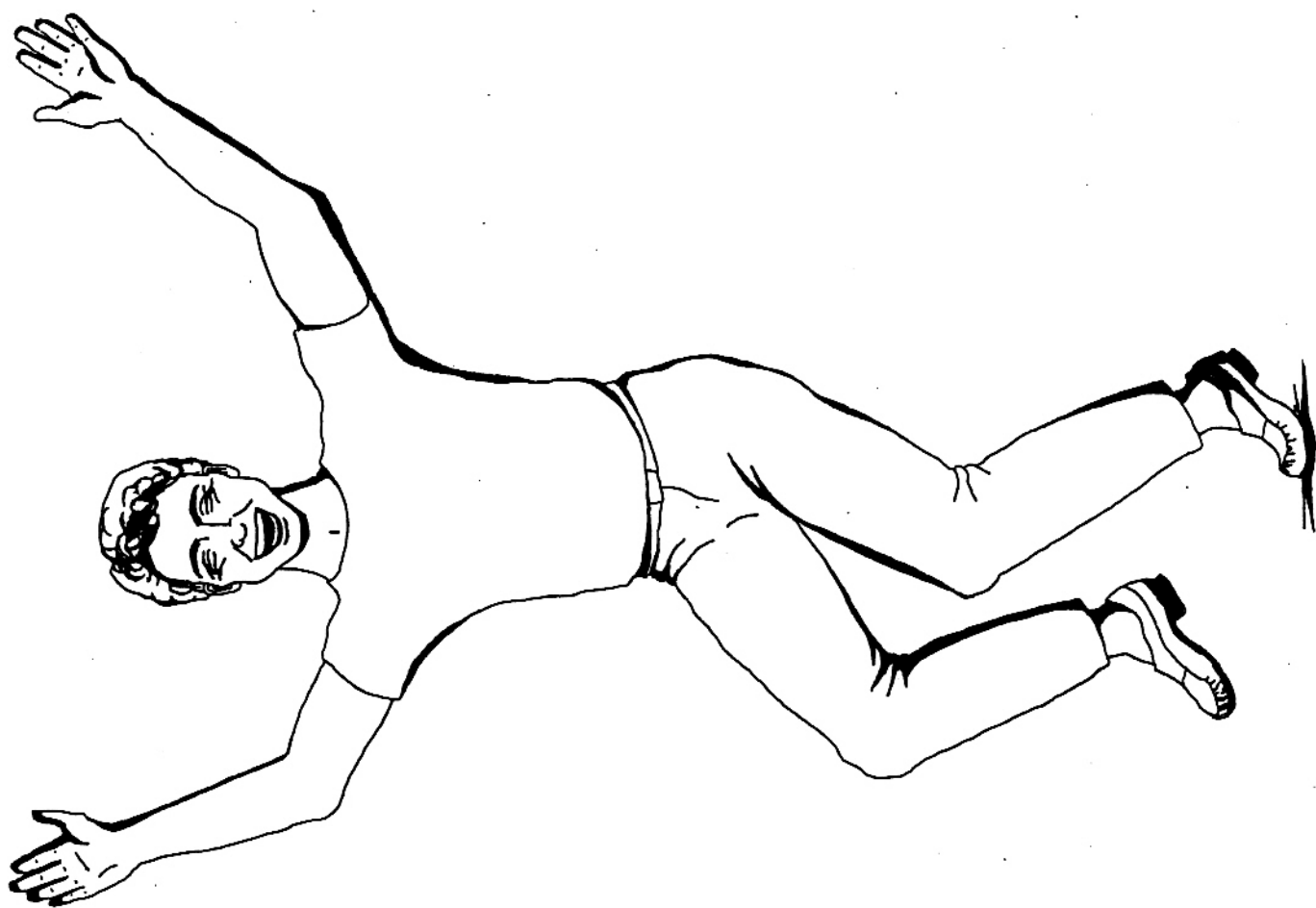
SUBTEST 4: LITERALITY**Complex**

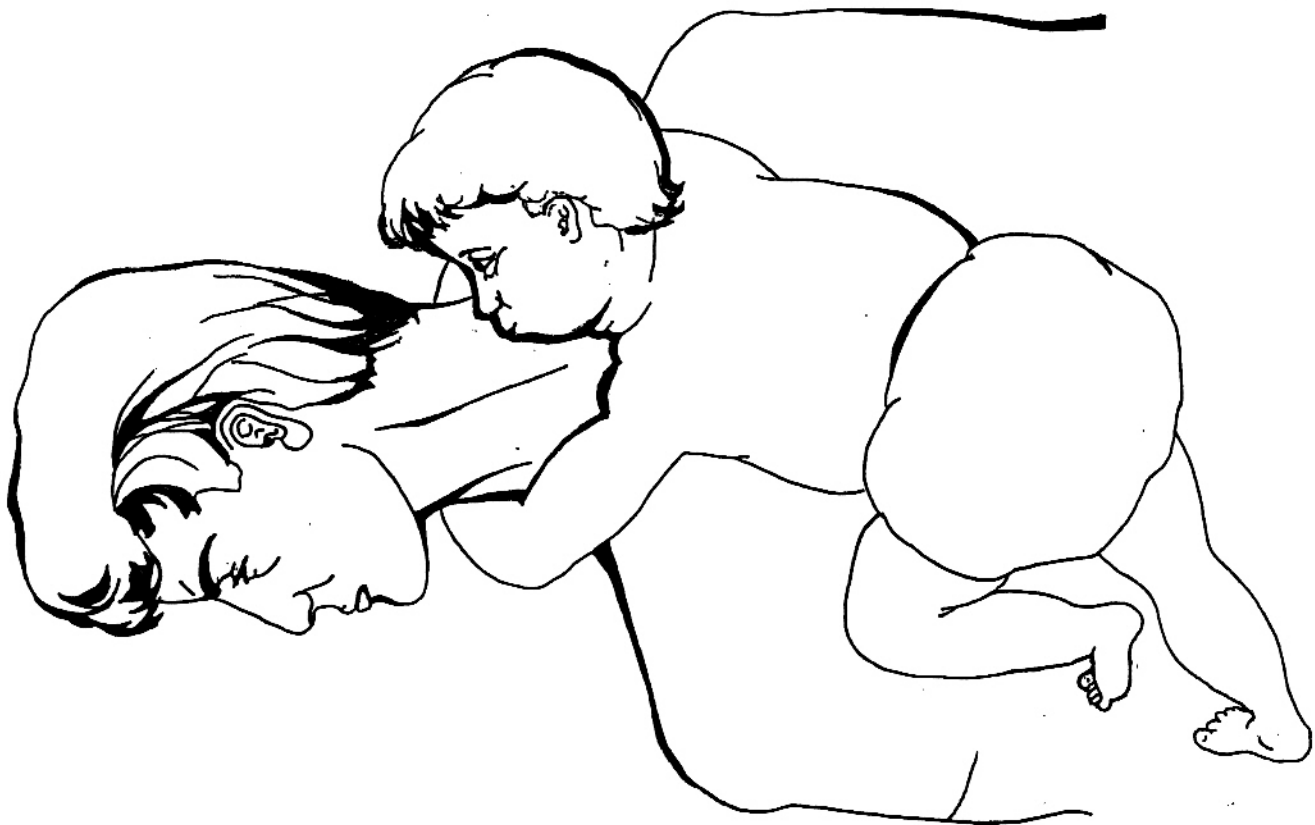
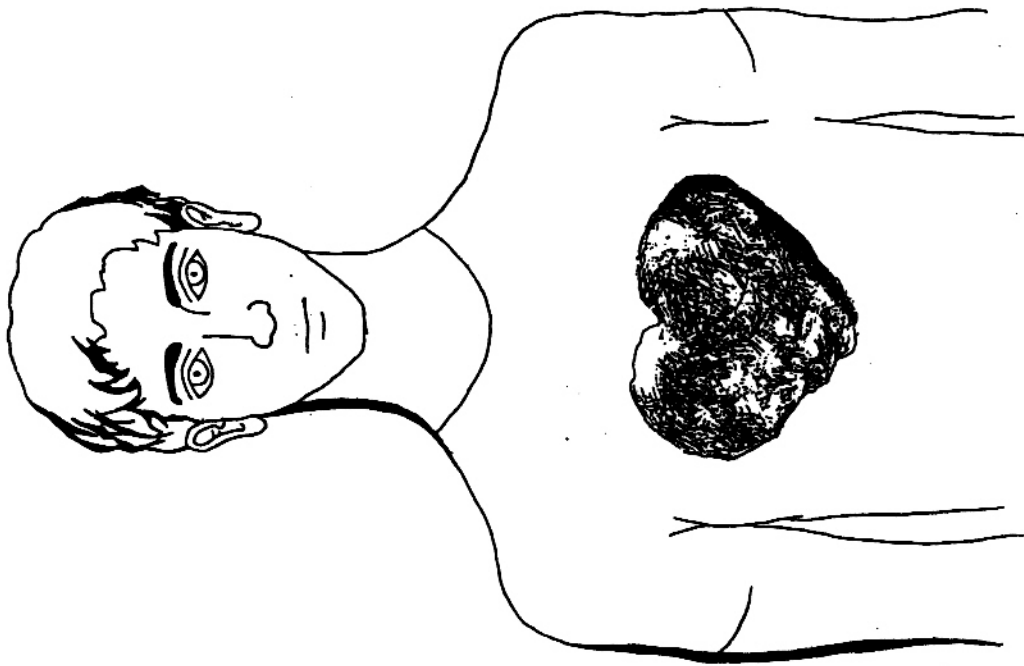
1. He saw red.
2. He was over the moon.
3. He has a heart of stone.
4. She was heart broken.
5. He has a big head.
6. She has a warm heart.
7. The man is a pig.
8. He is tight fisted.
9. They are struggling to make ends meet.
10. She is like a mouse.

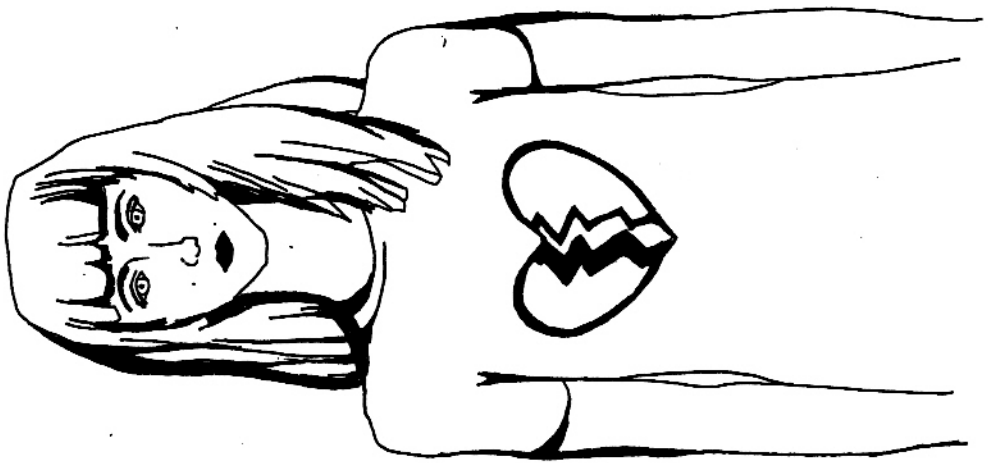
Simple

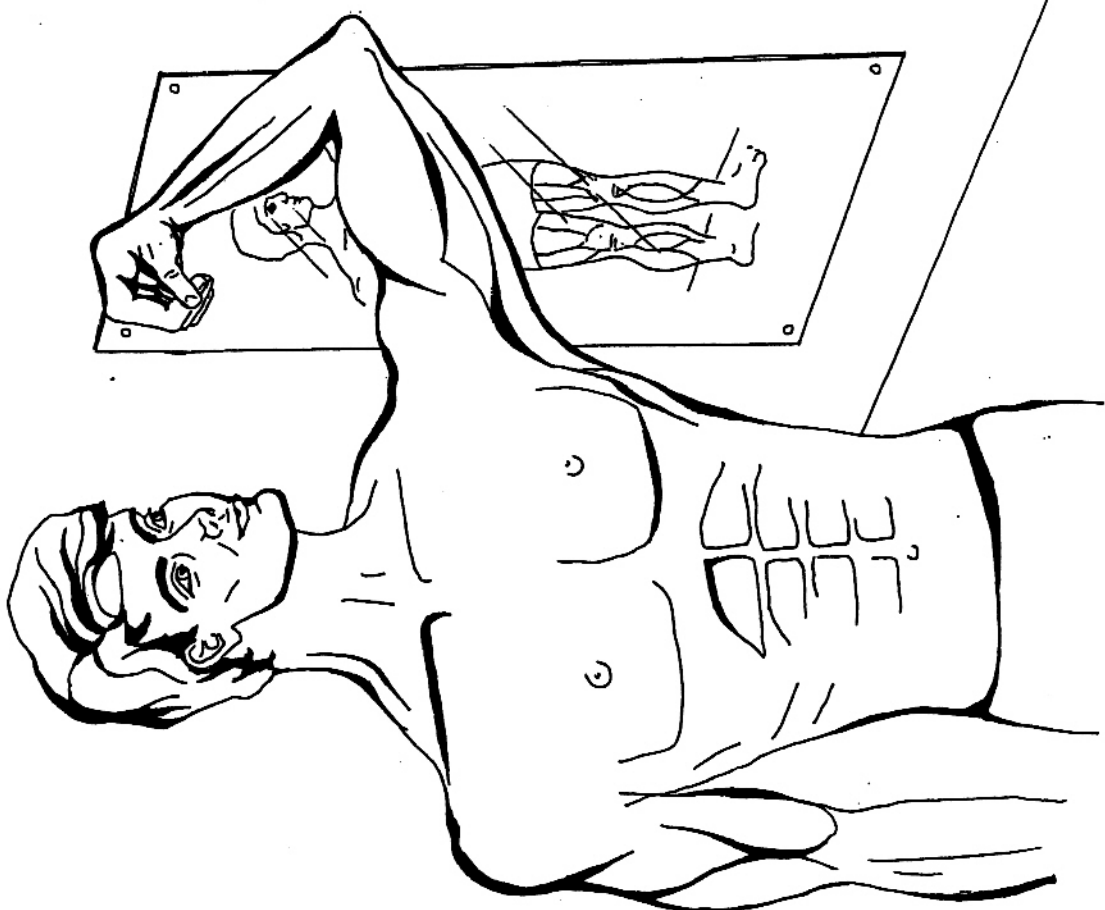
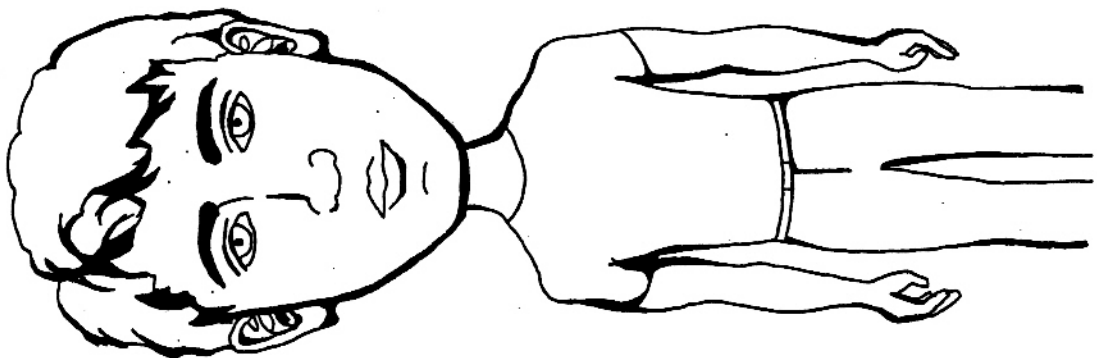
1. He got angry.
2. He was delighted.
3. He is not affectionate.
4. She was very sad.
5. He is very vain.
6. She is caring.
7. He is greedy.
8. He is mean.
9. They are poor.
10. She is very quiet.

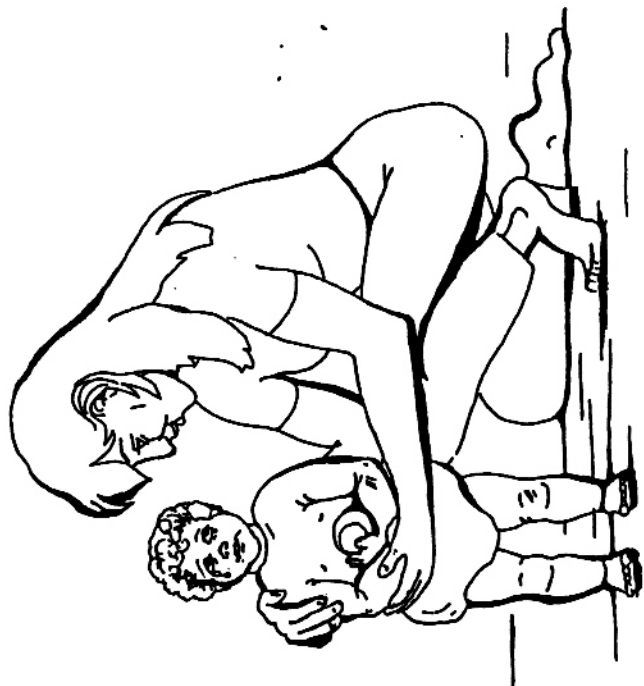
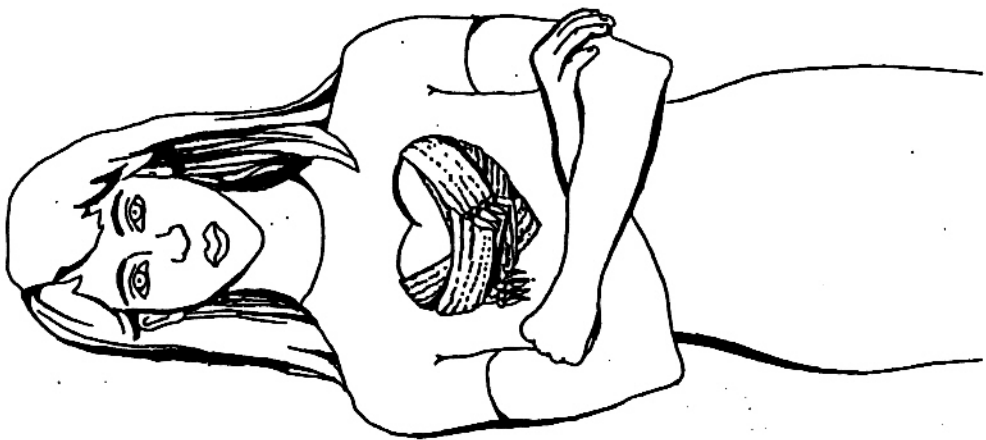


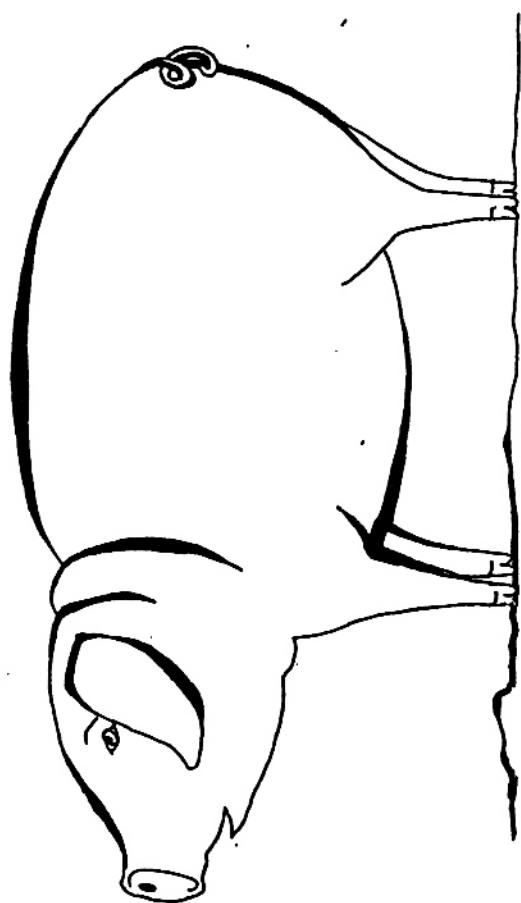
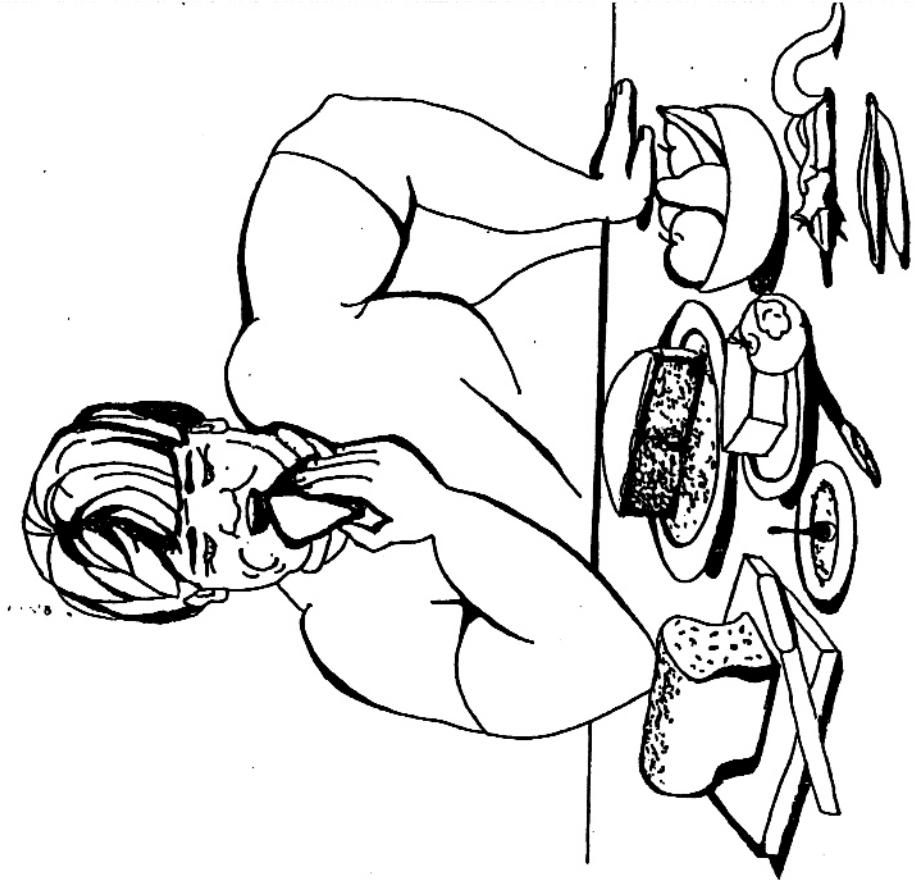


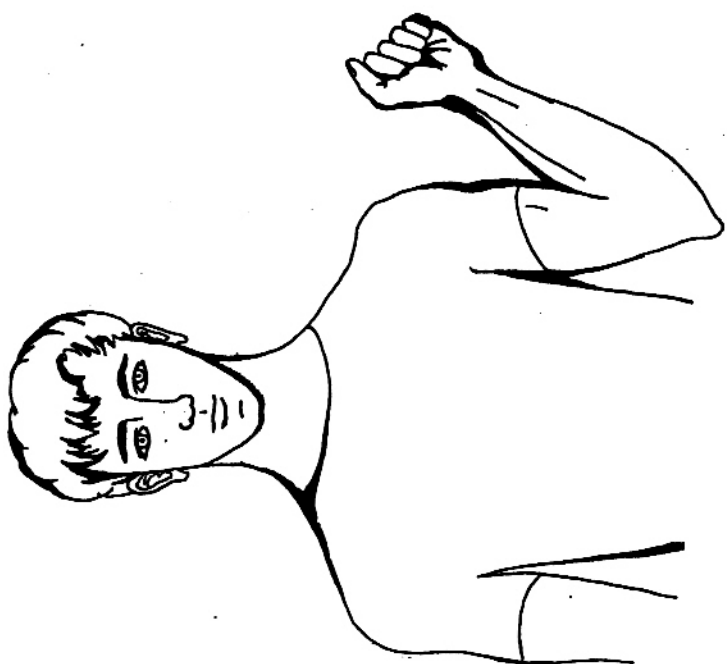
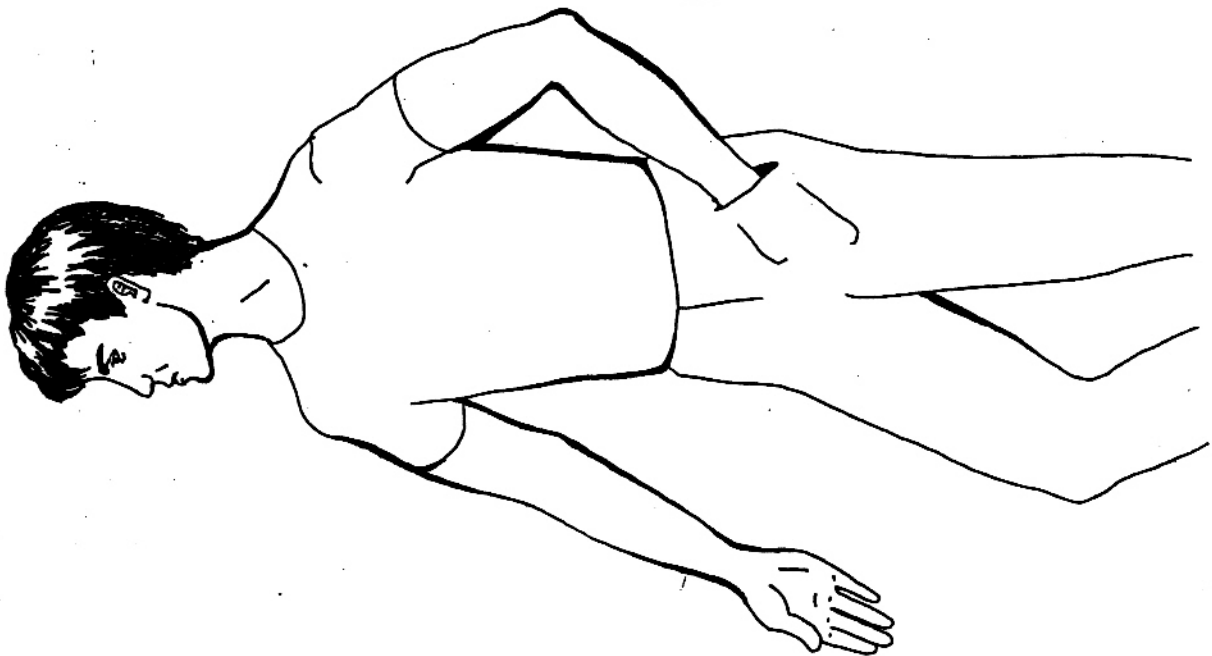


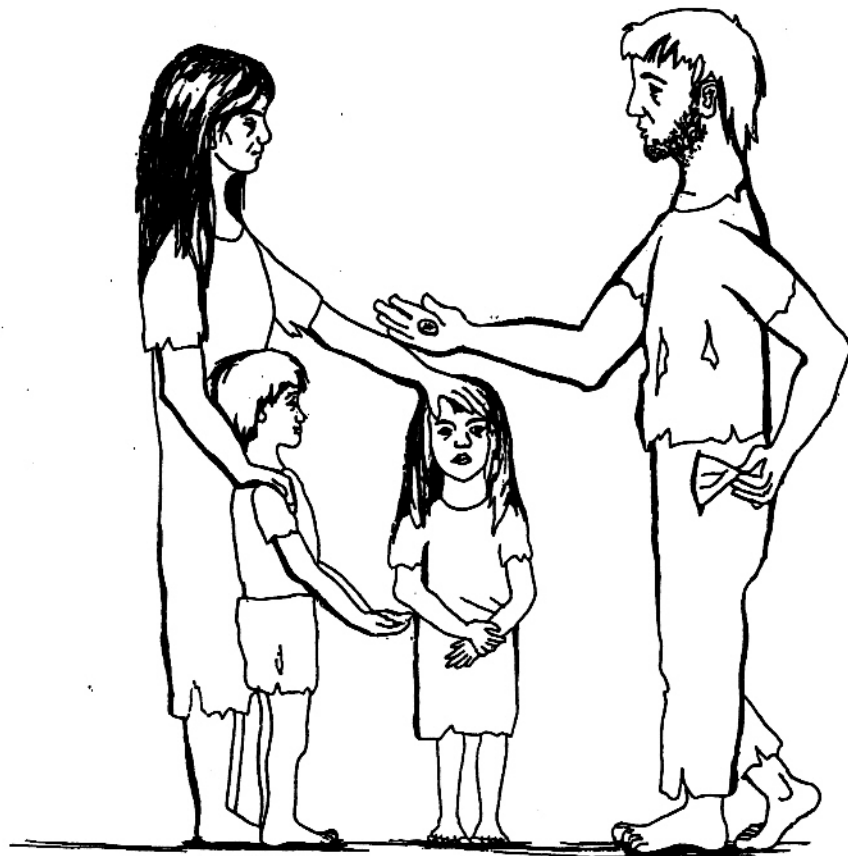
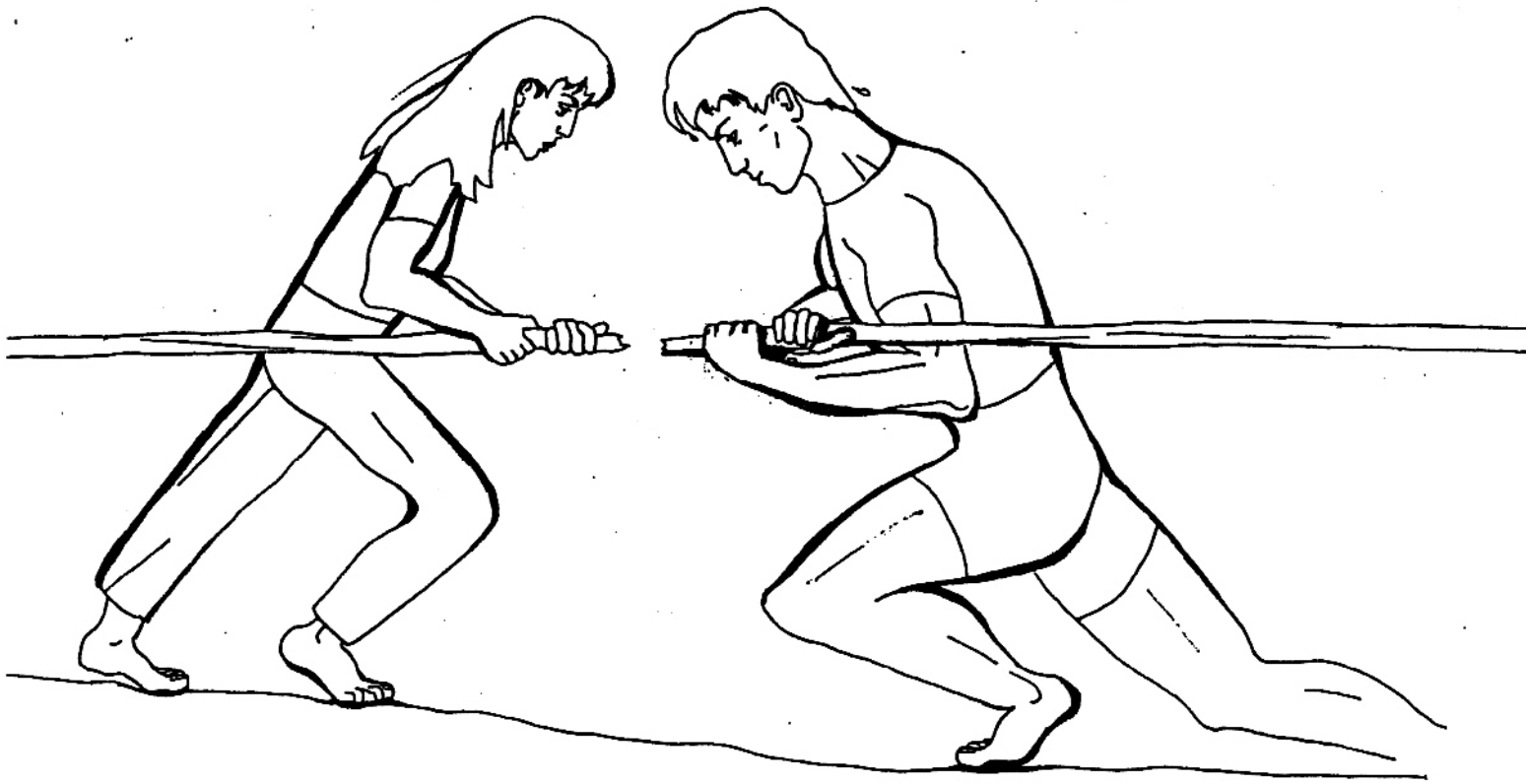


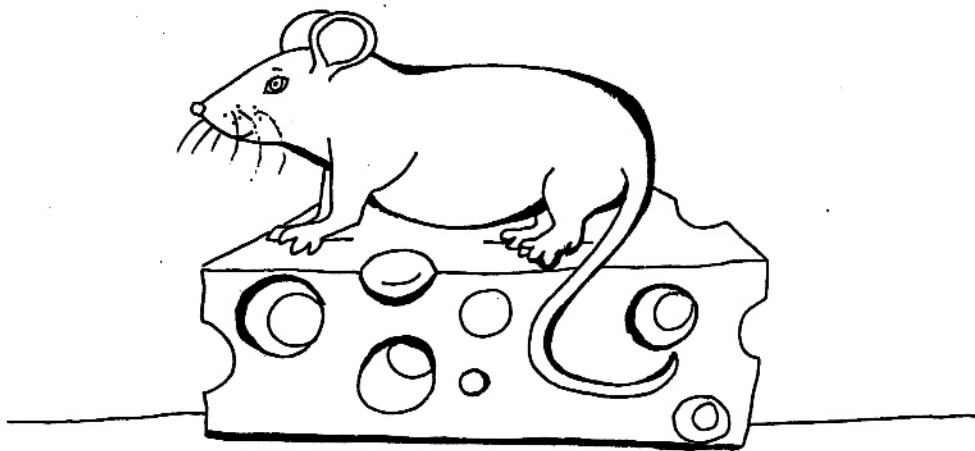
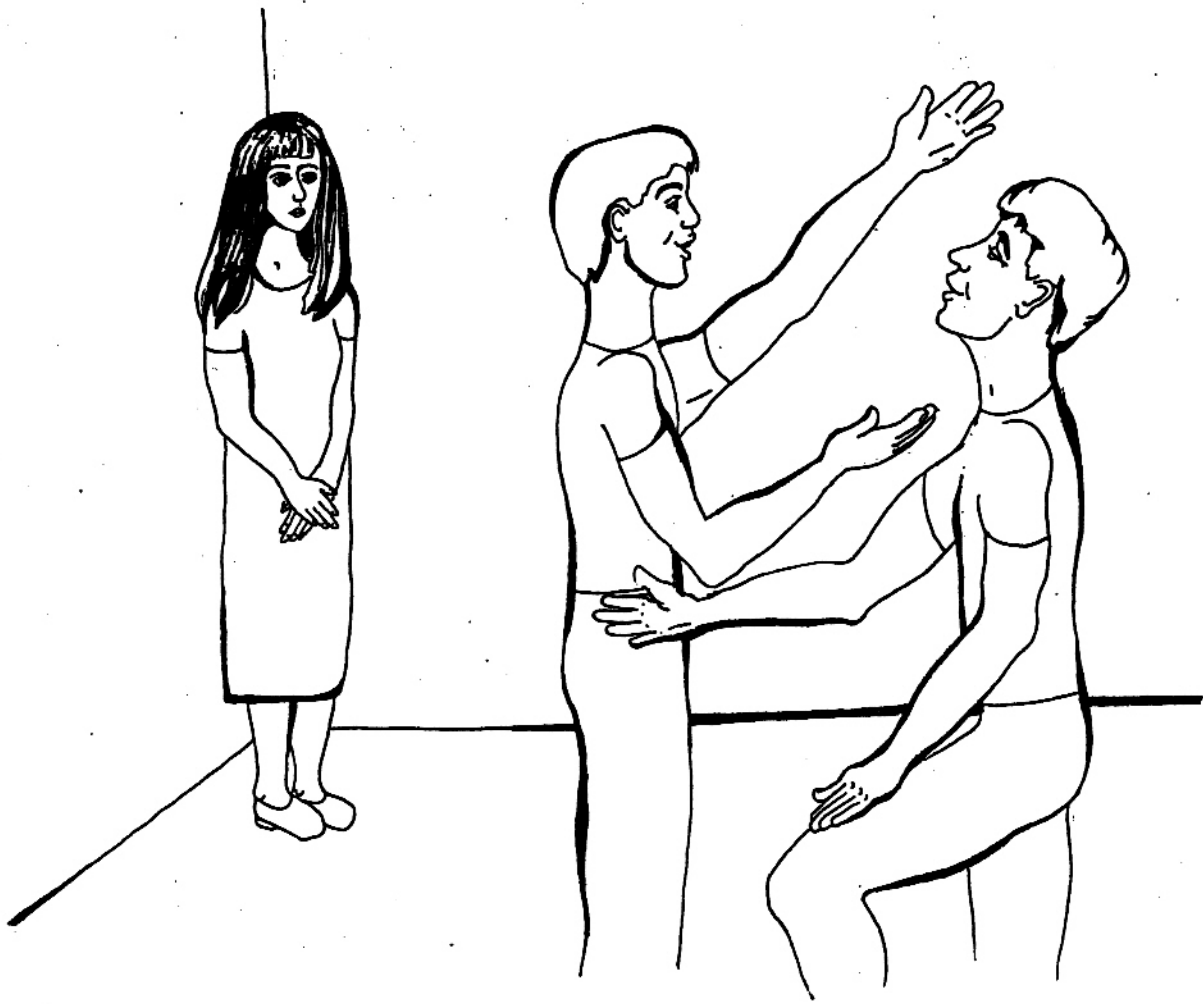


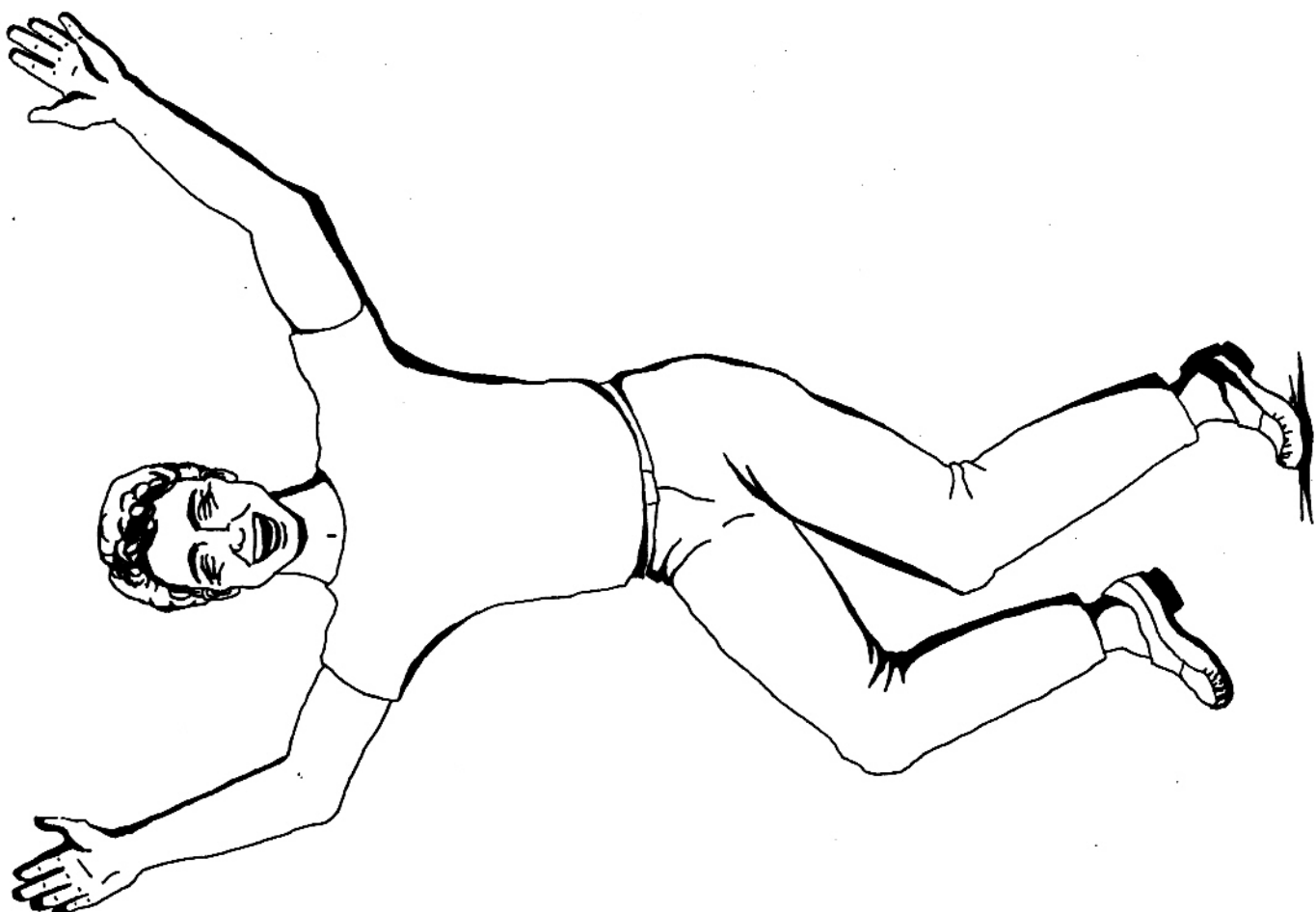
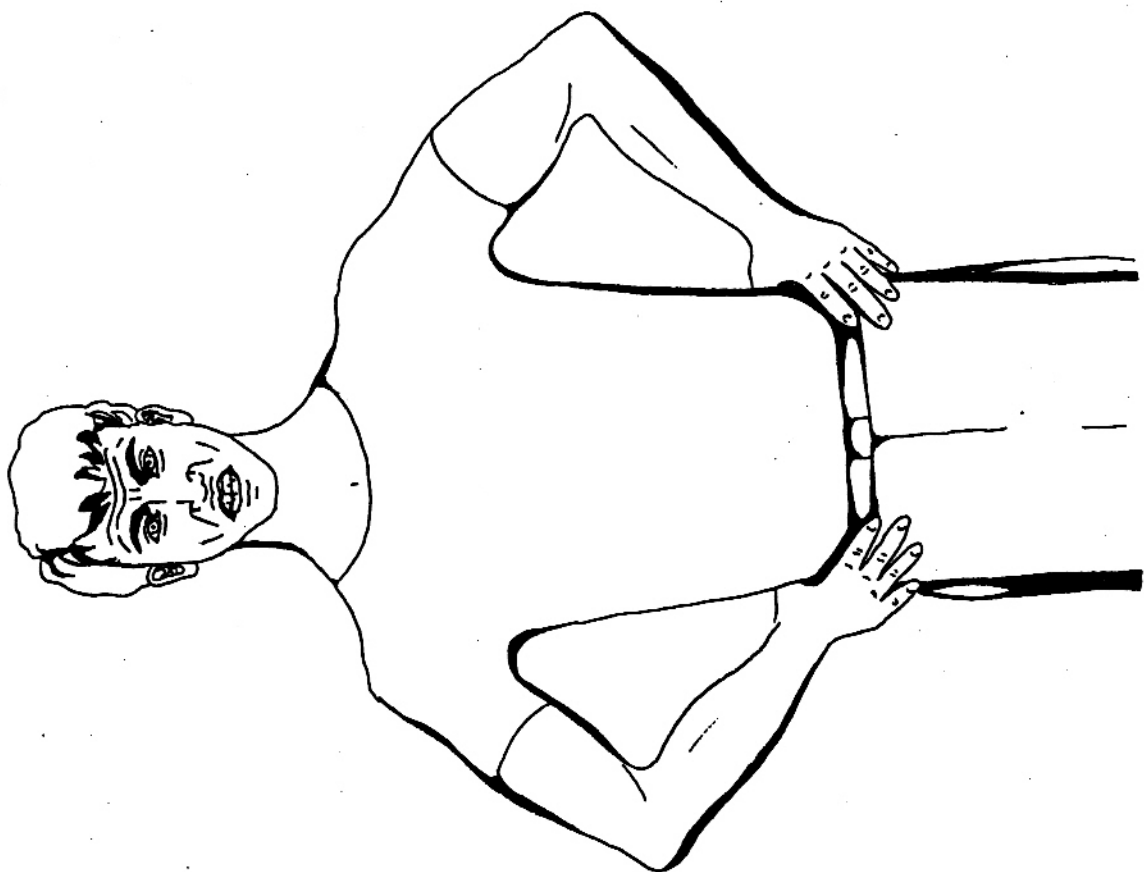


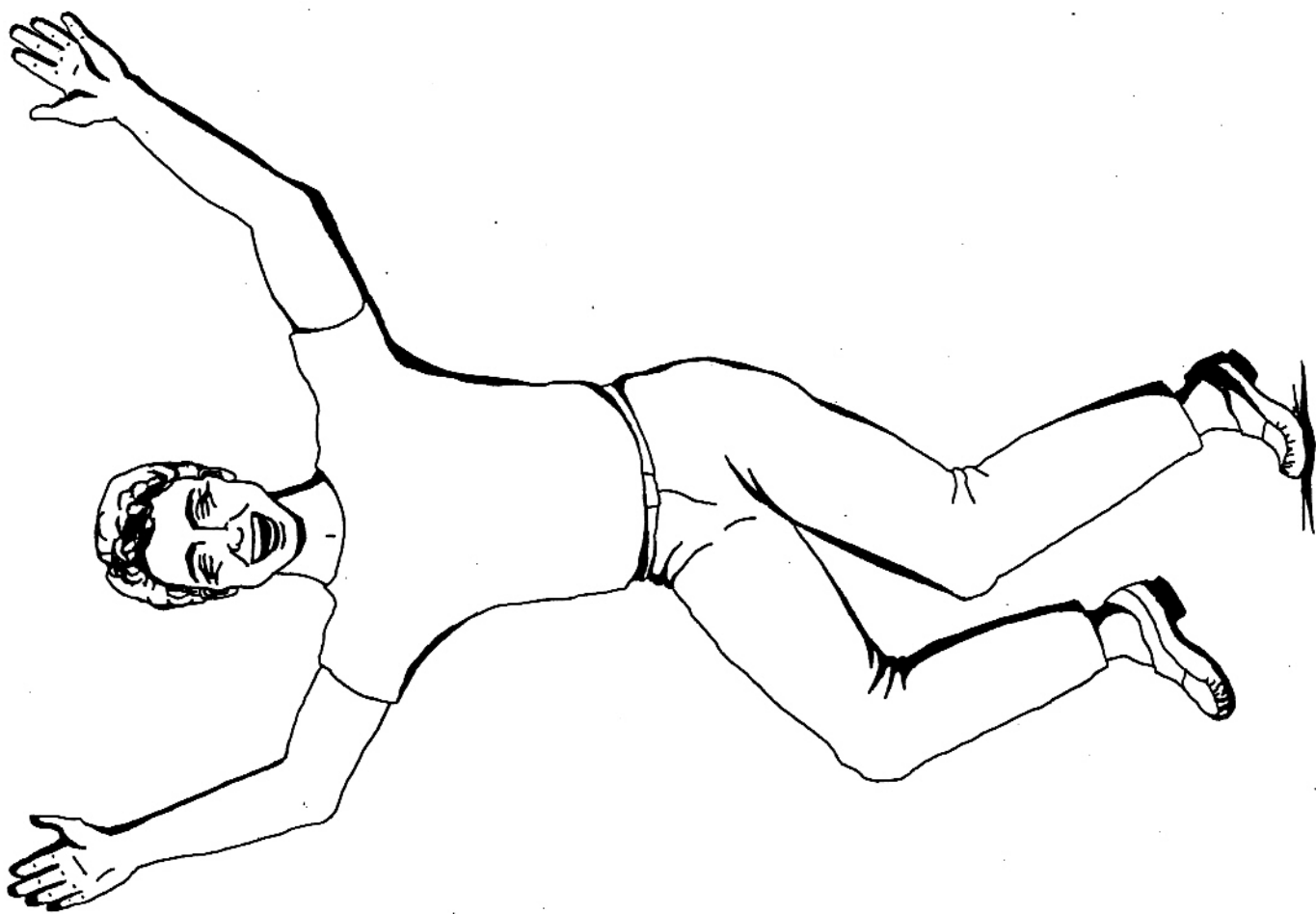
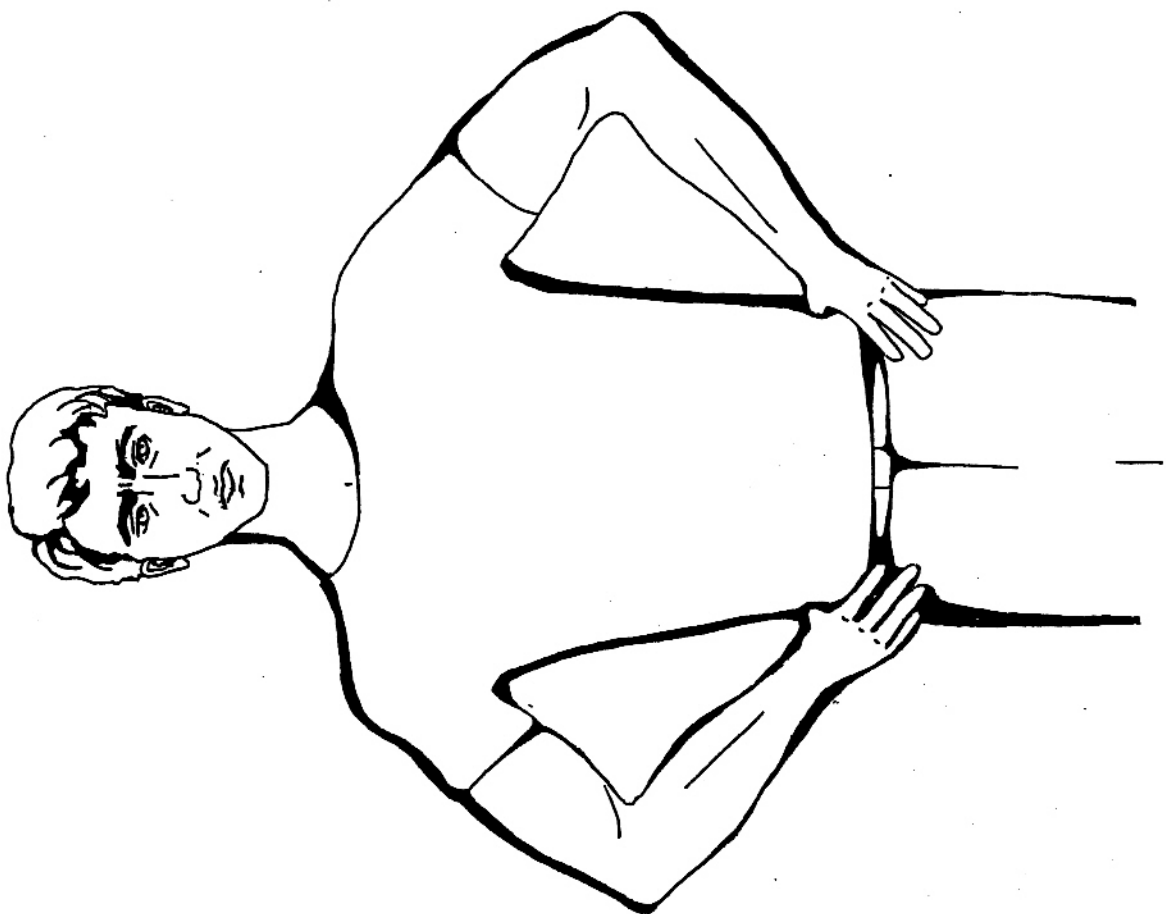


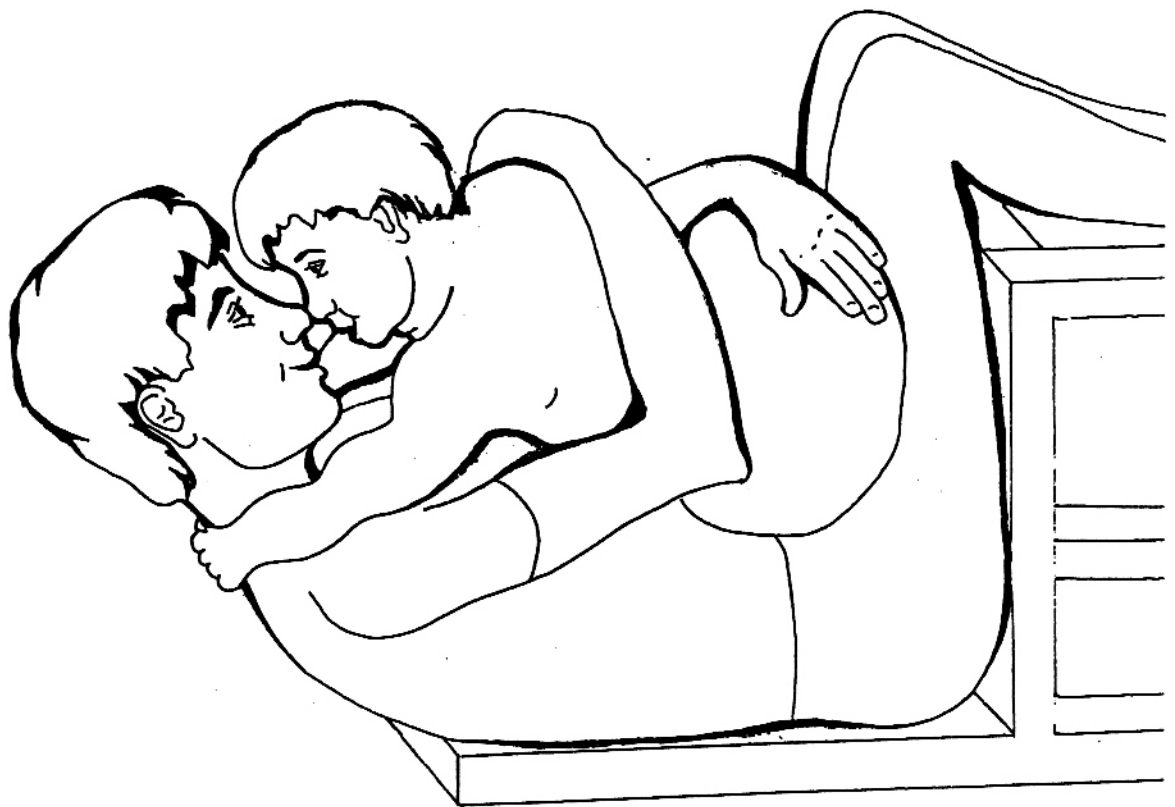


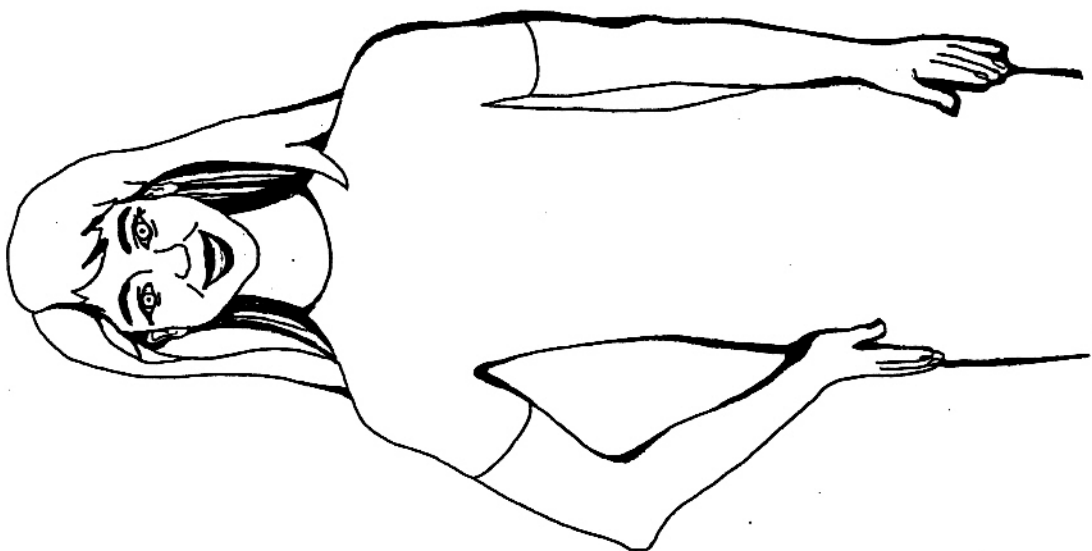


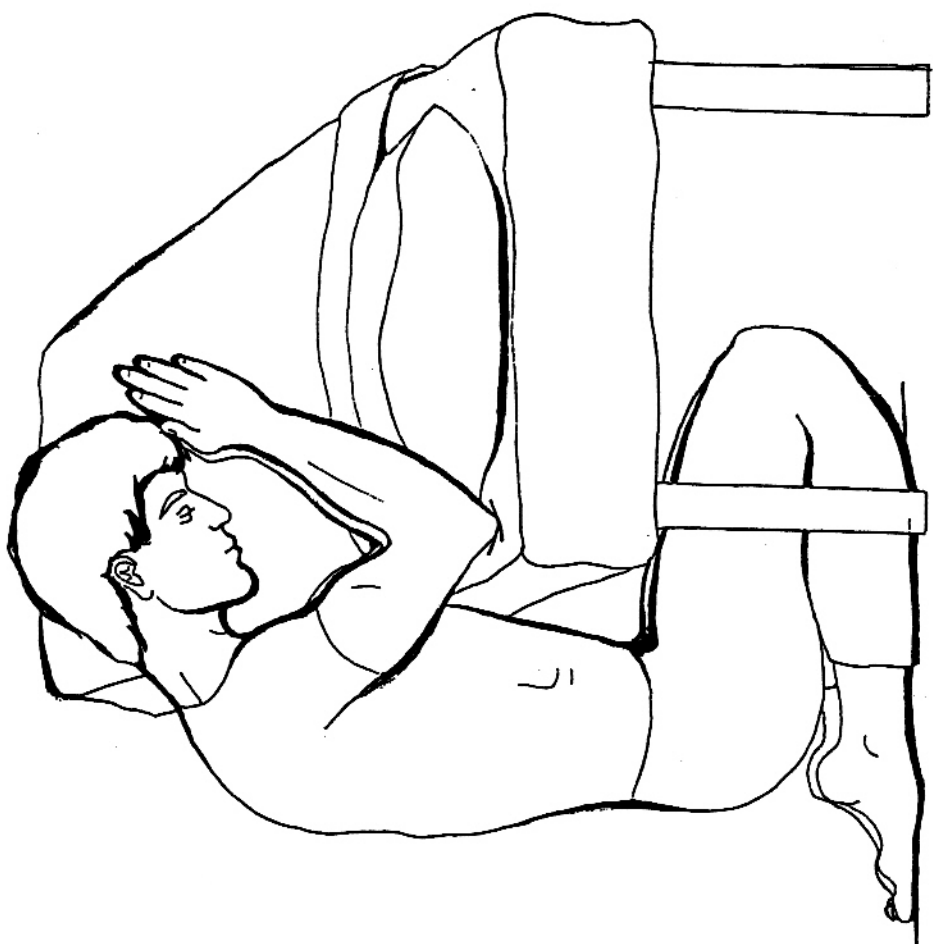
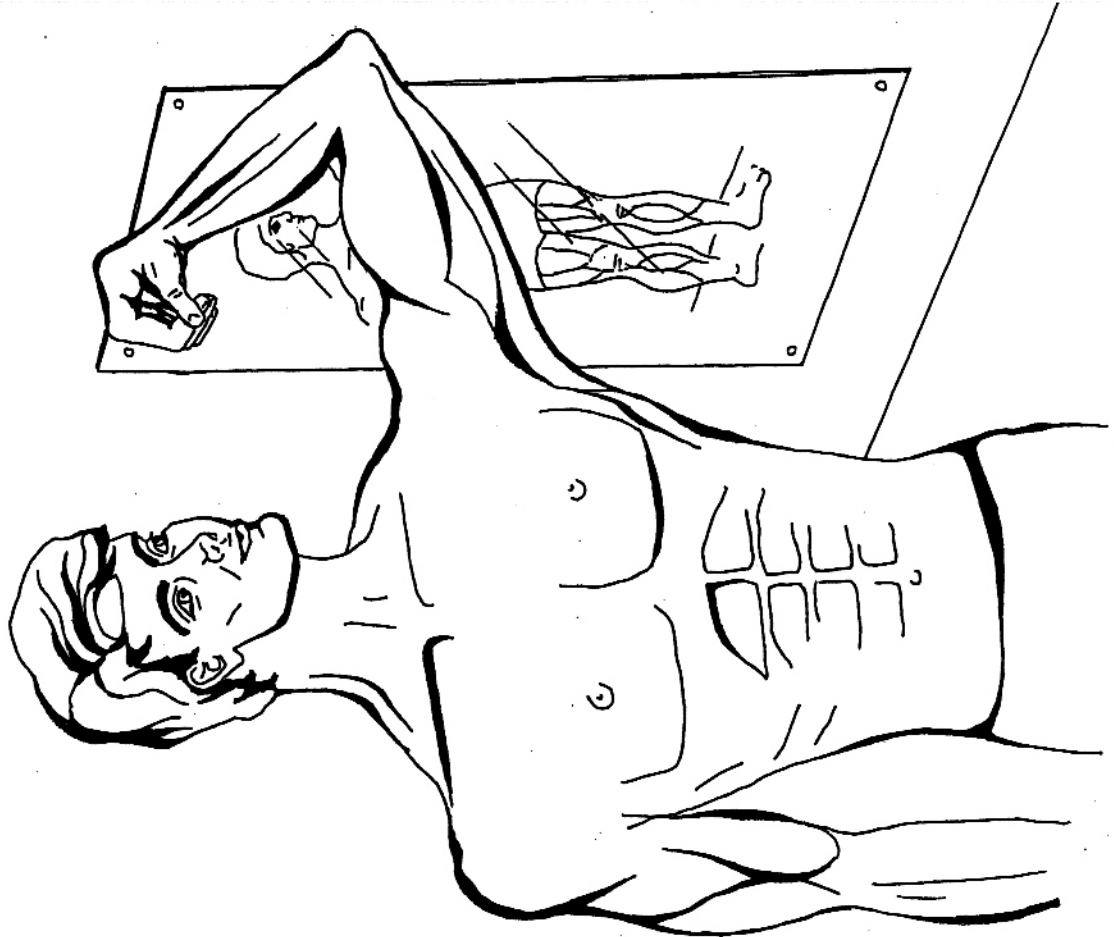


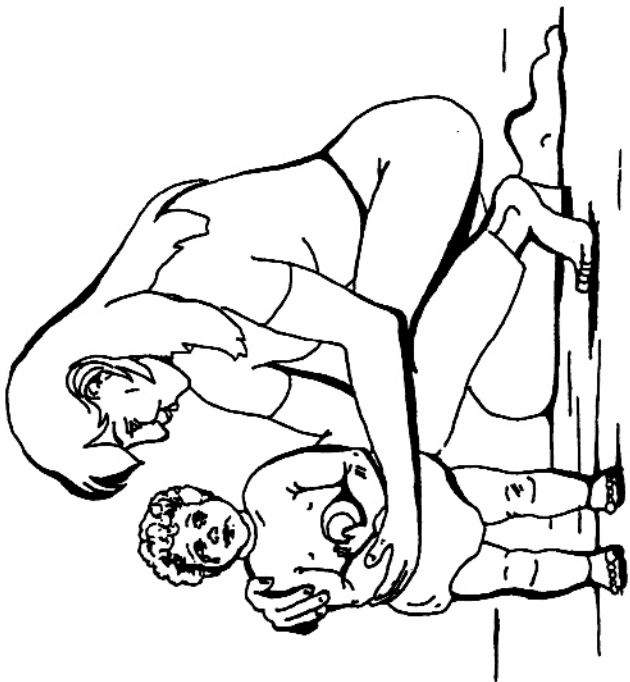
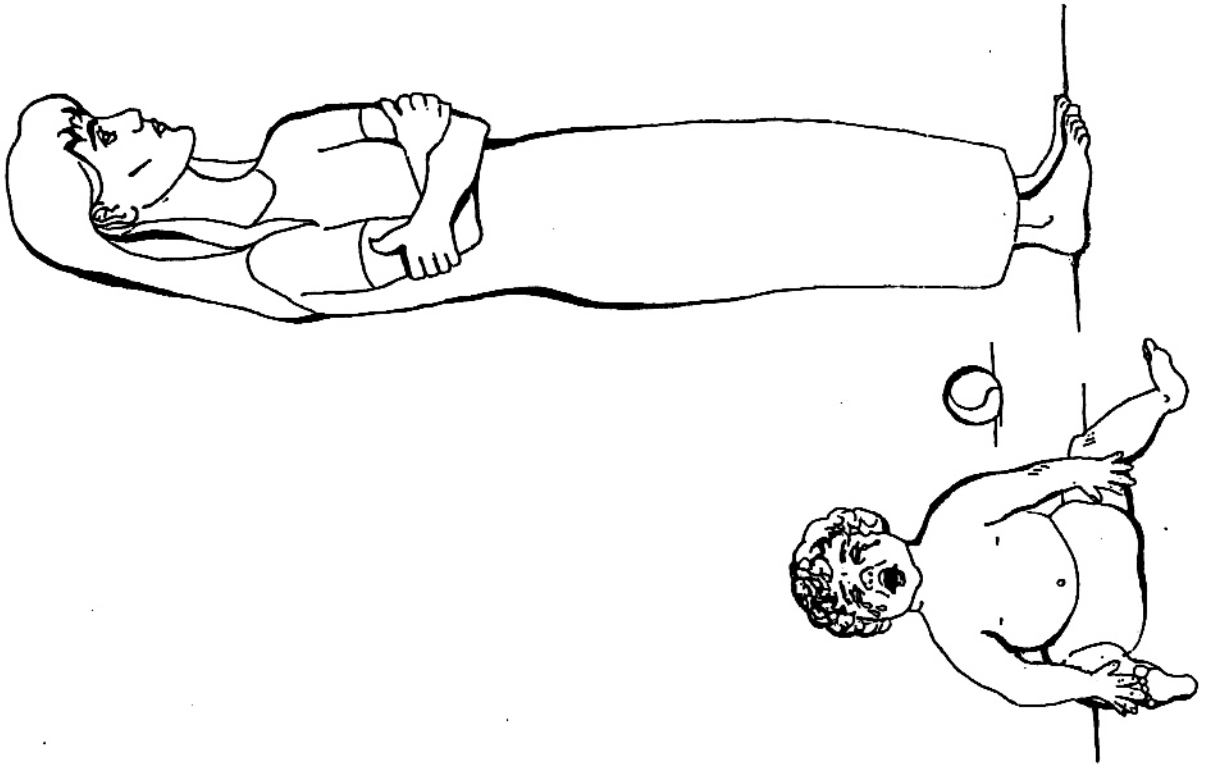


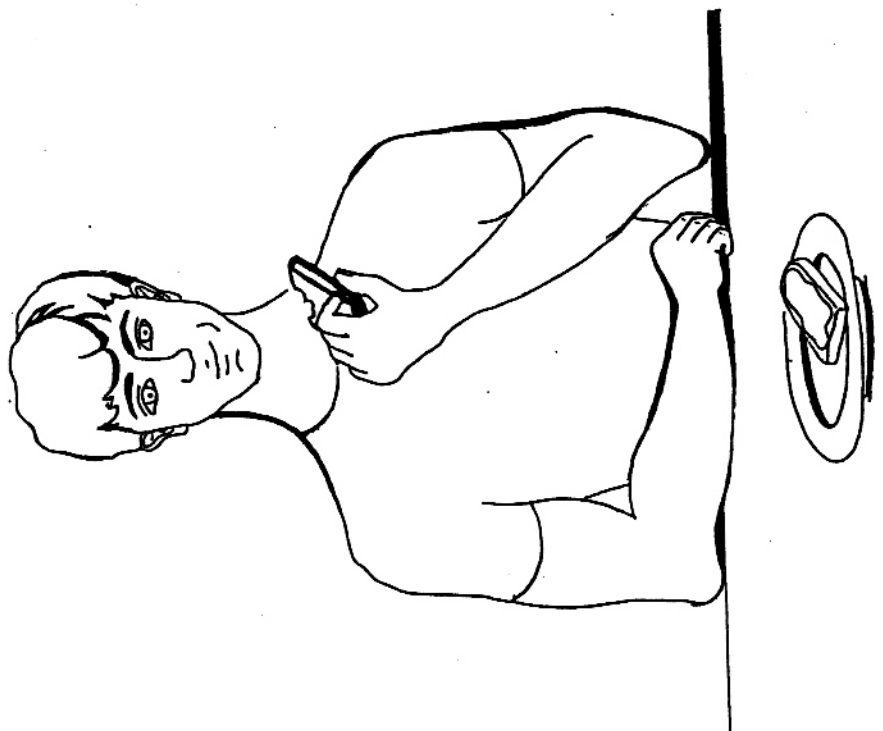
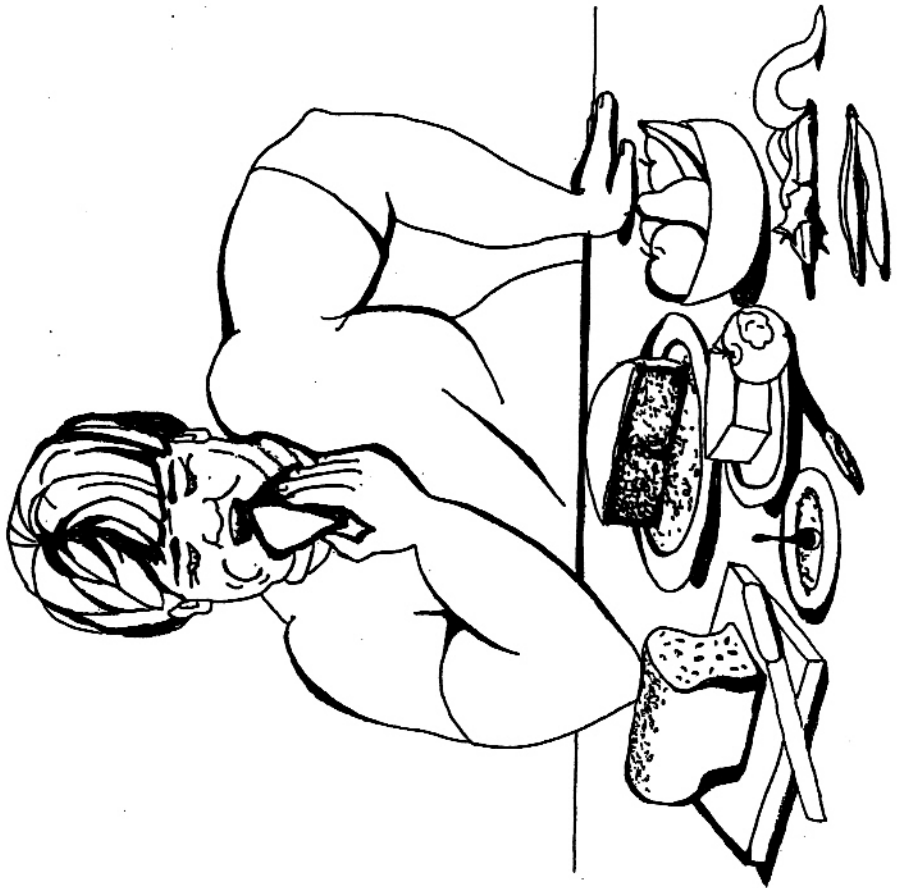


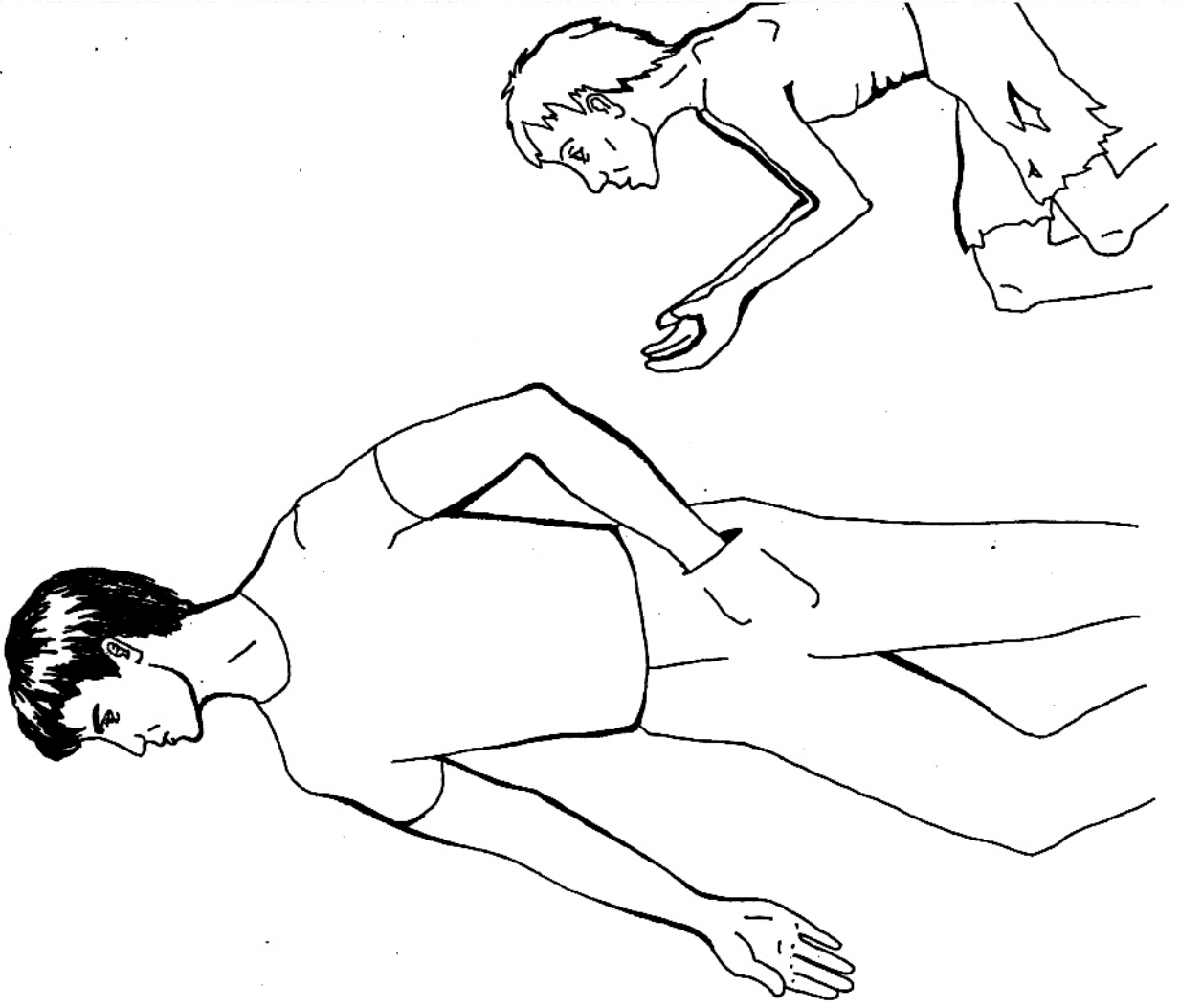


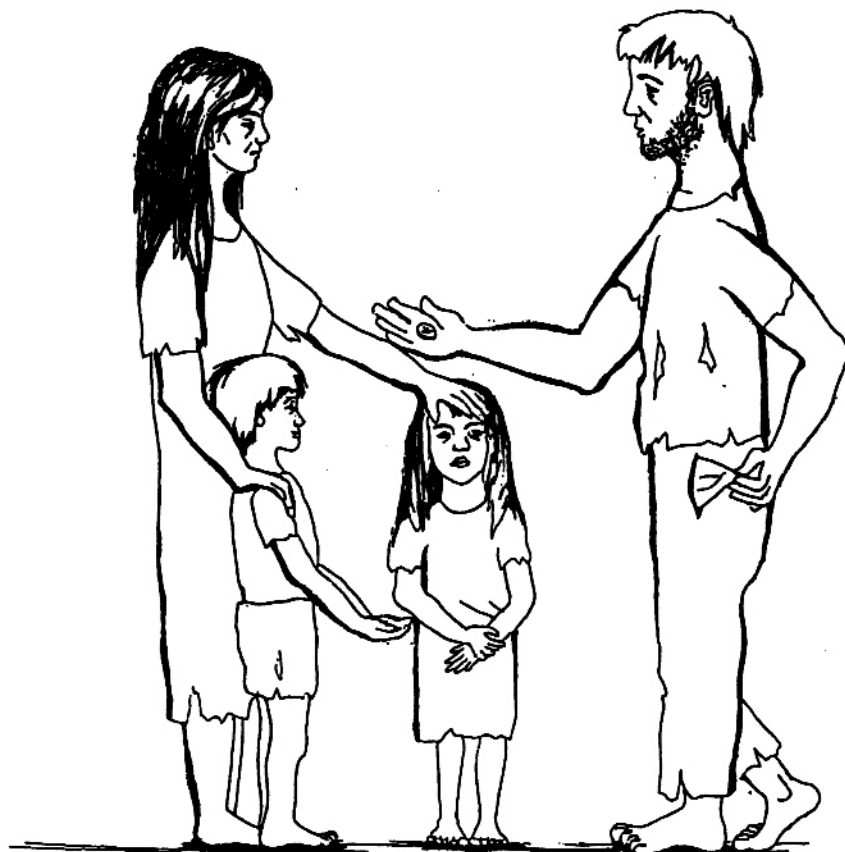


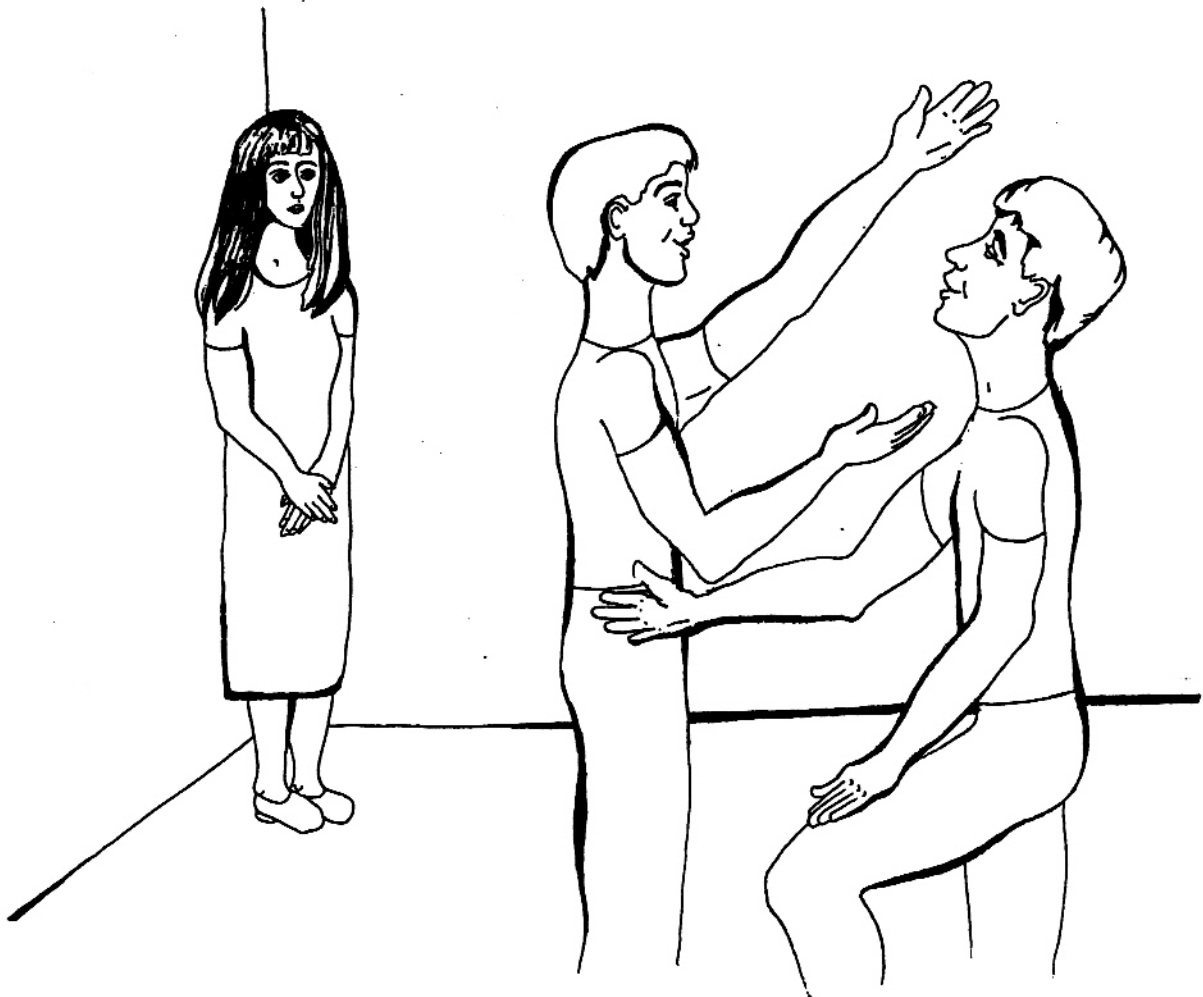












APPENDIX C

DISCOURSE COMPREHENSION TASKS

1. FARMER AND SONS

Complex

A well heeled grape farmer had made a fortune from his vineyards, and wanted his sons to follow in his footsteps. So, on his deathbed, he told them there was a treasure buried in the vineyard. After his death, they dug up the vineyard. Although they found nothing, the harvest that year was the best it had ever been. Then they understood the meaning of the treasure.

Simple

There was a rich grape farmer. The grape farmer got rich because he worked hard. The farmer wanted his sons also to work hard and be rich. The farmer was dying. The farmer told his sons to dig up the vineyard to get rich. The farmer died, and the sons dug up the vineyard. That year, there were lots of grapes. Then the sons understood what the father meant – to be rich, you must work hard.

2. ROYAL SCANDAL

Complex

Many British people are seeing red over the series of scandals caused by Prince Charles and Princess Diana. The Prime Minister announced last year that they would formally separate, after Prince Charles publicly admitted that he had been unfaithful. Princess Diana is said to be heartbroken, despite the rumours that she herself is not blameless. Concerns for the future of the monarchy are being expressed, especially since the news of the divorce of the Prince's mistress.

Simple

Many British people are very angry. They are angry because Prince Charles and Princess Diana are causing scandal. Last year, Prince Charles publicly admitted that he had a mistress. Then the Prime Minister said that Prince Charles and Princess Diana would separate. Princess Diana is very sad. But there are a lot of rumours that she also has a lover. Prince Charles' mistress has got divorced. Now people wonder if Prince Charles will marry his mistress. People wonder what will happen to the royal family if Prince Charles marries his mistress.

REFERENCES

- Abeysinghe, SC, Bayles, KA and Trosset, MW (1990) Semantic memory deterioration in Alzheimer's subjects: Evidence from word association, definition, and associate ranking tasks. *Journal of Speech and Hearing Research*, 33: 574-582.
- African National Congress (1994) *A national health plan for South Africa*. The African National Congress: Johannesburg.
- American Psychiatric Association (1994) (4th ed) *Diagnostic and statistical manual of mental disorders*. American Psychiatric Association: Washington.
- Anderson, ES, Kempler, D and Small, J (1991) *Sentence comprehension in Alzheimer's Disease: Explicit versus implicit access to linguistic knowledge*. Paper presented at the Academy of Aphasia 29th Annual Meeting: Italy.
- Appell, J, Kertesz, A and Fisman, M (1982) A study of language functioning in Alzheimer patients. *Brain and Language*, 17: 73-91.
- Arkin, SM (1998) Alzheimer memory training: positive successes replicated. *American Journal of Alzheimer's Disease*, 13:102-104.
- Armstrong, KA, Borthwick, SE, Bayles, KA and Tomoeda, CK (1996) Using the Arizona Battery for Communication Disorders of Dementia in the UK. *European Journal of Disorders of Communication*, 31: 171-180.
- Baddeley, AD (1992) Memory theory and memory therapy. In Wilson, BA and Moffat, N (eds) *Clinical management of memory problems*. Chapman and Hall: London.
- Baddeley, A, Vallar, G and Wilson, B (1987) Sentence comprehension and phonological memory: Some neuropsychological evidence. In Coltheart, M (ed) *The psychology of reading*. Lawrence Erlbaum Associates: London.
- Basso, A (1993) Therapy for aphasia in Italy. In Holland, AL and Forbes, MM (eds) *Aphasia treatment: World perspectives*. Chapman and Hall: London.
- Bayles, KA (1982) Language function in senile dementia, *Brain and Language*, 19:98-114.
- Bayles, KA and Boone, DR (1982) The potential of language tasks for identifying senile dementia. *Journal of Speech and Hearing Disorders*, 47:210-217.
- Bayles KA and Tomoeda, CK (1983) Confrontation naming impairment in dementia. *Brain and Language*, 19, 98-114.
- Bayles, KA (1984) Language and dementia. In Holland, AL (ed) *Language disorders in adults*. College-Hill Press: San Diego.

Bayles, KA (1985) Communication in dementia. In Ulatowska, HK (ed) *The Aging Brain*. Taylor and Francis: London.

Bayles, KA and Kaszniak, AW (1987) *Communication and cognition in normal aging and dementia*. Taylor and Francis: London.

Bayles, KA, Boone, DR, Tomoeda, CK, Slauson, TJ and Kaszniak, AW (1989) Differentiating Alzheimer's patients from the normal elderly and stroke patients with aphasia. *Journal of Speech and Hearing Disorders*, 54: 74-87.

Bayles, KA and Tomoeda, CK (1991) Caregiver report of prevalence and appearance order of linguistic symptoms in Alzheimer's patients. *The Gerontologist*, 31: 210-216.

Bayles, KA and Tomoeda, CK (1993) *The Arizona battery of communication disorders of dementia*. Pro-Ed: Austin.

Bayles, KA, Tomoeda, CK and Rein, JA (1996) Phrase repetition in Alzheimer's disease: Effect of meaning and length. *Brain and Language*, 54: 246-261.

Bayles, KA (2001) Understanding the neuropsychological syndrome of dementia. *Seminars in Speech and Language*, 22 (4) 251-259.

Benson, DF (1986) , Alzheimer's disease: The pedigree. In Scheibel, AB and Wechsler, AF(eds) *The biological substrates of Alzheimer's disease*. Academic Press: Orlando.

Berko Gleason, J, Goodglass, H, Obler, L, Green, E, Hyde, M and Weintraub, S (1980). Narrative strategies of aphasic and normal-speaking subjects. *Journal of Speech and Hearing Research*, 23: 370-382.

Boller, F, Cole, M, Vrtunski, B, Patterson, M and Kim, Y (1979) Paralinguistic aspects of auditory comprehension in aphasia. *Brain and Language*, 7: 164-174.

Bourgeois, MS (1990) Enhancing conversational skills in patients with Alzheimer's Disease using a prosthetic memory aid. *Journal of Applied Behavioral Analysis*, 23: 29-42.

Brookshire, RH. and Nicholas, LE. (1984) Comprehension of directly and indirectly stated main ideas and details in discourse by brain damaged and non brain damaged listeners. *Brain and Language*, 21:21-36.

Camp, CJ (2001) From efficacy to effectiveness to diffusion: Making the transitions in dementia intervention research. *Neuropsychological Rehabilitation*, 11:495-517.

Cannito, MP, Hayashi, MM and Ulatowska, HK (1988) Discourse in normal and pathologic aging: Background and assessment strategies. *Seminars in Speech and Language*, 9: 117-133.

Cannito, MP, Jarecki, JM and Pierce, RS (1986) Effects of thematic structure on syntactic comprehension in aphasia. *Brain and Language*, 27: 38-49.

Caplan, D and Evans, KL (1990) The effects of syntactic structure on discourse comprehension in patients with parsing impairments. *Brain and Language*, 39: 206-234.

Caramazza, A and Zurif, EB (1976) Dissociation of algorithmic and heuristic processes in language comprehension: Evidence from aphasia. *Brain and Language*, 3: 572-582.

Carrow-Woolfolk, E. (1988) *Theory, assessment and intervention in language disorders - An integrative approach*. Grune and Stratton: San Diego.

Chapey, R, Duchan, J, Elman, R, Garcia, L, Kagan, A, Lyon, J and Simmons-Mackie, N (2001) Life Participation Approach to Aphasia: A statement of values for the future. In Chapey, R (ed) *Language intervention strategies in aphasia and related communication disorders*. Lippincott Williams and Wilkins: Baltimore.

Chertkow, H., Bub, D. and Seidenberg, M. (1989) Priming and Semantic Memory Loss in Alzheimer's Disease. *Brain and Language*, 36: 420-446.

Cipolat, M. (2001) *Attitudes of a group of Speech-Language Pathologists and Audiologists towards the perceived value of speech therapy in the treatment of patients with Parkinson's Disease as well as their perception regarding the adequacy of their university training in this area*. Unpublished research report, University of the Witwatersrand: Johannesburg

Cohen, G (1979) Language comprehension in old age. *Cognitive Psychology*, 11: 412-429.

Constitution of the Republic of South Africa (1996).

Craik, F.I.M. and Lockhart, R.S. (1972) Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behaviour*, 11: 671-684.

Cummings, JL. and Benson, DF (1983) *Dementia: A Clinical Approach*. Butterworth: Boston.

Davis, GA and Wilcox, MJ (1985) *Adult aphasia rehabilitation: Applied pragmatics*. College-Hill Press: San Diego.

Desgranges, B, Eustache, F, Rioux, P., de La Sayette, V. and Lechevalier, B. (1996) Memory disorders In Alzheimer's Disease and the organization of human memory. *Cortex*, 32: 387-412.

Faust, ME, Balota, DA, Duchek, JM, Gernsbacher, MA and Smith, S (1997) Inhibitory control during sentence comprehension in individuals with Dementia of the Alzheimer Type. *Brain and Language*, 57:225-253.

Foldi, N, Lobsco, J and Schaefer, L (2002) The effect of attentional dysfunction in Alzheimer's Disease: Theoretical and practical implications. *Seminars in Speech and Language*, 23 : 139-150.

Fromm, D and Holland, A (1989) Functional communication in Alzheimer's Disease. *Journal of Speech and Hearing Disorders*, 54: 535-540.

Gauthier, S. (1999) (2nd Ed.) *Alzheimer's Disease in Primary Care*. Martin Dunitz: Quebec.

Goldberg, B. (1996) A Very Long Goodbye: The Ravages of Alzheimer's Disease. *ASHA*, 25-31.

Grafman, J, Thompson, K, Weingartner, H, Martinez, R, Lawlor, B and Sunderland, T (1991) Script generation as an indicator of knowledge representation in patients with Alzheimer's Disease. *Brain and Language*, 40: 344-358.

Grossman, M, Mickanin, J, Robinson, KM. and D'Esposito, M. (1996) Anomaly judgements of subject-predicate relations in Alzheimer's disease. *Brain and Language*, 54: 216-232.

Grossman, K, Robinson, K, Jaggi, J, Ding, X., Mercer, E, White-Devine, T, Biassou, N, Morrison, D, D'Esposito, M and Alavi, A (1996) The neural basis for semantic memory: Converging evidence from Alzheimer's disease. *Brain and Language*, 55: 96-98.

Harris, N. (1992) *The support system of the caregivers of patients suffering from Alzheimer's disease*. Unpublished M.A. dissertation, University of the Witwatersrand: Johannesburg.

Hart, S. and Semple, J.M. (1990) *Neuropsychology and the dementias*. Taylor and Francis: London.

Helm-Estabrooks, N (2001) Foreword. *Seminars in Speech and Language*. 22: 247-248.

Henderson, V.W. (1996) The investigation of lexical semantic representation in Alzheimer's Disease. *Brain and Language*, 54: 179-183.

Hier, DB, Hagenlocker, K and Schindler, AG (1985) Language disintegration in dementia: Effects of etiology and severity. *Brain and Language*, 25: 117-133.

Hirst, W, le Doux, J and Stein, S (1984) Constraints on the processing of indirect speech acts: Evidence from aphasiology. *Brain and Language*, 23: 26-33.

Hopper, T. (2001) Indirect interventions to facilitate communication in Alzheimer's disease. *Seminars in Speech and Language*, 22 : 305-315.

Hopper, T and Bayles, K (2001) Management of neurogenic communication disorders associated with dementia. In Chapey, R (ed) *Language intervention strategies in aphasia and related neurogenic communication disorders*. (4th ed), Lippincott Williams and Wilkins: Baltimore

- Hopper, T, Bayles, KA and Kim, E (2001) Retained neuropsychological abilities of individuals with Alzheimer's disease. *Seminars in Speech and Language*, 22: 261-273.
- Hough, MS (1990) Narrative comprehension in adults with right and left hemisphere brain damage: theme organization. *Brain and Language*, 38: 253-277.
- Howard, D and Hatfield, FM (1987) *Aphasia therapy: Historical and contemporary issues*. Lawrence Erlbaum: London.
- Just, M.A. and Carpenter, P.A. (1992) A capacity theory of comprehension: Individual differences in working memory. *Psychological Review*, 99: 122-149.
- Kahn, HJ and Goulet, P (1996) Commentary on *Cognitive mediation of discourse processing in later life* by Kwong See and Ryan. *Journal of Speech-Language Pathology and Audiology*, 20: 118-122.
- Katon, W, Kleinman, A, and Rosen, G (1982) Depression and somatisation: a review. *American Journal of Medicine*, 72: 127-135
- Kausler, DH (1988) Cognition and aging. In Shadden, B (ed) *Communication behavior and aging: A sourcebook for clinicians*. Williams and Wilkins: Baltimore.
- Kempler, D (1988) Lexical and pantomime abilities in Alzheimer's disease. *Aphasiology*, 2, 147-159.
- Kempler, D (1995) Language changes in dementia of the Alzheimer type. In Lubinski, R (ed) *Dementia and communication*, Singular: San Diego.
- Kinsella, K and Ferreira, M (1997) *Aging trends: South Africa*.
http://www.census.gov/lpc/prod/lib_9702
- Kintsch, W. (1977) On comprehending stories. In Just, MA. and Carpenter, PA (eds), *Cognitive processes in comprehension*. Lawrence Erlbaum Associates: New Jersey.
- Kwong-See, S and Ryan, EB (1996) Cognitive mediation of discourse processing in later life. *Journal of Speech-Language Pathology and Audiology*, 20: 109-117.
- Lee, H, Casadesus, G, Zhu, X, Joseph, J, Perry, G and Smith, M (2004) Perspectives on the amyloid- cascade hypothesis. *Journal of Alzheimer's Disease*, 6: 137-145.
- Louw, S (1995) Guidelines for health screens in the elderly. *South African Journal of Continuing Medical Education*, 13,2, 155-164.
- Lubinski, R (1995) Environmental considerations for elderly patients. In Lubinski, R (ed) *Dementia and communication*, Singular: San Diego.

Lubinski, R and Welland, M (1997) Normal aging and environmental effects on communication. *Seminars in Speech and Language*, 18: 107-125.

Mace, N.L. and Rabins, P.V. (1992) *The 36-hour Day*. Warner Books: Baltimore.

Mahendra, N. (2001) Direct interventions for improving the performance of individuals with Alzheimer's disease. *Seminars in Speech and Language*, 22: 291-304.

Marcus, MP (1982) Consequences of functional deficits in a parsing model: Implications for Broca's aphasia. In Arbib, MA, Caplan, D and Marshall, J (eds) *Neural models of language processes*. Academic Press: New York.

Margolin, DI, Pate, DS and Friedrich, FJ (1996) Lexical priming by pictures and words in normal aging and in dementia of the Alzheimer's type. *Brain and Language*, 54: 275-301.

Martin, A and Fedio, P (1983) Word production and comprehension in Alzheimer's disease: The breakdown of semantic knowledge. *Brain and Language*, 19: 124-141.

Maxim, J and Bryan, K (1994) *Language of the elderly: A clinical perspective*. Whurr Publishers: London.

McDonald, S (1992) Differential pragmatic loss after closed head injury: Ability to comprehend conversational implicature. *Applied Psycholinguistics*, 13: 295-312.

McKhann, G, Drachman, D, Folstein, M, Katzman, R, Price, D and Stadlan, EM (1984) Clinical diagnosis of Alzheimer's disease: Report of the NINCDS-ADRDA work group under the auspices of department of health and human services task force on Alzheimer's disease. *Neurology*, 34: 939-944.

Mc Reynolds, LV and Kearns, KP (1983) *Single subject experimental designs in communicative disorders*. Pro-Ed: Austin, Texas.

Mdlalo, T. (1994) *The knowledge, attitudes and perceptions of speech-language and hearing therapists and their role in the management of patients with dementia*. Unpublished research report, University of the Witwatersrand: Johannesburg.

Miller, E (1989) Language in dementia of the Alzheimer's type. In Crawford, JR and Parker, DM (eds) *Developments in Clinical and Experimental Neuropsychology*. Plenum Press: London.

Miyake, A, Carpenter, P and Just, M (1994) A capacity approach to syntactic comprehension disorders: Making normal adults perform like aphasic adults. *Cognitive Neuropsychology*, 11: 671-717.

Morris, RG (1986), Short term forgetting in senile dementia of the Alzheimer type. *Cognitive Neuropsychology*, 3: 77-97.

Murdoch, BE, Chenery, HJ, Wilks, V and Boyle, RS (1987) Language disorders in dementia of the Alzheimer type. *Brain and Language*, 31: 122-137.

Murray, L, Ramage, A and Hopper, T (2001) Memory impairments in adults with neurogenic communication disorders. *Seminars in Speech and Language*, 22: 127-135.

Nebes, RD (1985) Preservation of semantic structure in dementia> In Ulatowska, HK (ed) *The aging brain: Communication in the elderly*. Taylor and Francis: London.

Nebes, RD and Halligan, EM (1996) Sentence context influences the interpretation of word meaning by Alzheimer patients. *Brain and Language*, 54: 233-245.

Nicholas, M, Obler, LK, Albert, ML and Helm-Estabrooks, N (1985) Empty speech in Alzheimer's disease and fluent aphasia. *Journal of Speech and Hearing Research*, 28: 405-410.

Ntshingila, F, Gules, N and Pather, S (2005) The Elderly Shall Provide. *Sunday Times*, 6 February.

Orange, JB and Purves, B (1996) Conversational discourse and cognitive impairment: Implications for Alzheimer's disease. *Journal of Speech-Language Pathology and Audiology*, 20: 139-150.

Osimani, A and Freedman, M (1995) Functional anatomy. In Lubinski, R (ed) *Dementia and Communication*. Singular: San Diego.

Palm and Purves (1996) Management of a word-finding deficit in discourse: A case example. *Journal of Speech-Language Pathology and Audiology*, 20.

Penn, C and Jones, D (1999) Depth of processing in closed head injured patients. *Advances in Speech-Language Pathology*, 1: 1-8.

Quayhagen, MP, Quayhagen, M, Corbeil, RR, Roth, PA and Rodgers, JA (1995) A dyadic remediation program for care recipients with dementia. *Nursing Research*, 44: 153-159.

Rau, MT (1993) *Coping with communication challenges in Alzheimer's disease*. Singular: San Diego.

Reiff-Cherney, L (1990) *Informational content and cohesion in the discourse of patients with probable Alzheimer's disease and patients with right brain damage*. Unpublished PhD dissertation, Northwestern University: Evanston, Illinois.

Reisberg, B, Ferris, SH and Crook, T (1982) The global deterioration scale (GDS): an instrument for the assessment of primary degenerative dementia (PDD). *American Journal of Psychiatry*, 139: 1136-1139.

- Ripich, DN and Terrell, BY (1988) Cohesion and coherence in Alzheimer's disease. *Journal of Speech and Hearing Disorders*, 53, 8-14.
- Ripich, DN, Vertes, D, Whitehouse, P, Fulton, S and Ekelman, B (1991) Turn taking and speech act patterns in the discourse of senile dementia of the Alzheimer's type patients. *Brain and Language*, 40: 330-343.
- Ripich, DN and Ziol, E (1998) Dementia: A review for the speech language pathologist. In Johnson, AF and Jacobson, BH (eds) *Medical speech-language pathology: A practitioner's guide*. Thieme: New York
- Ripich, D and Horner, J (2004) The neurodegenerative dementias: diagnosis and intervention. *ASHA Leader*, 9 (8).
- Rochon, E, Waters, G and Caplan, D (1994) Sentence comprehension in patients with Alzheimer's disease. *Brain and Language*, 46: 329-349.
- Scheibel, AB and Wechsler, AF (1986) Dementia of the Alzheimer type: Genetic aspects. In Scheibel, AB and Wechsler, AF(eds) *The Biological substrates of Alzheimer's Disease*. Academic Press, Orlando: 1986
- Schulte, E and Brand, S (1987) Auditory verbal comprehension impairment. In Code, C (ed) *The characteristics of aphasia*. Taylor and Francis: London.
- Schwartz, MF, Marin, OS and Saffran, EM (1970) , Dissociations of language function in dementia: A case study. *Brain and Language*, 7: 277-306.
- Searleman, A and Herrmann, D (1994) *Memory from a broader perspective*. McGraw-Hill: New York.
- Selkoe, DJ (2001) AD results from the cerebral accumulation and cytotoxicity of amyloid β protein: A re-analysis of a therapeutic hypothesis. *Journal of Alzheimer's Disease*, 3: 75-81.
- Shadden, B (1988) Editor's note. In Kausler, DH, Cognition and Aging. In Shadden, B (ed) *Communication behaviour and aging: A sourcebook for clinicians*. Williams and Wilkins: Baltimore.
- Shallice, T (1987) Impairments of semantic processing: Multiple dissociations. In Coltheart, M, Sartori, G and Job, R (eds) *The cognitive neuropsychology of language*. Erlbaum Associates: London.
- Shuaib, A and Boyle, C (1996) Stroke in the Elderly. *South African Neurology Review*, 7-13.
- Siegel, S (1974) *Non-parametric statistics for the behavioural sciences*. McGraw Hill: New York.

Ska, B and Joanette, Y (1996) Discourse in older adults: Influence of text, task and participant characteristics. *Journal of Speech-Language Pathology and Audiology*, 20: 101-117.

Sonnenberg, B (1995) *Communication characteristics of the Parkinsonism-plus syndrome*. Unpublished PhD thesis, University of the Witwatersrand: Johannesburg.

Stachowiak, W, Huber, Poeck, K , and Kerschensteiner, M (1977) Text comprehension in aphasia. *Brain and Language*: 177-195.

Statistics South Africa (2003) *Census in Brief*. Statistics South Africa: Pretoria.

Tomoeda, CK and Bayles, KA (1990) The efficacy of speech-language pathology intervention: dementia. *Seminars in Speech and Language*, 11.

Tomoeda, CK, Bayles, KA, Boone, DR, Kaszniak, AW and Slauson, TJ (1990) Speech rate and syntactic complexity effects on the auditory comprehension of Alzheimer patients. *Journal of Communication Disorders*, 23: 151- 161:

Tomoeda, CK and Bayles, KA (1993) Longitudinal effects of Alzheimer disease on discourse production. *Alzheimer Disease and Associated Disorders*, 7: 223-236.

Tyler, LK (1987) Spoken language comprehension in aphasia: A real-time processing perspective. Coltheart, M., Sartori, G. and Job, R. (eds) *The cognitive neuropsychology of language*, Lawrence Erlbaum Associates: New York.

Ulatowska, HK, North, AJ and Macaluso Haynes, S (1981) Production of narrative and procedural discourse in aphasia. *Brain and Language*, 13: 345-371.

Ulatowska, HK, Cannito, MP, Hayashi, MM and Fleming, SG (1985) Language abilities in the elderly. In Ulatowska, HK (ed) *The aging brain: Communication in the elderly*, Taylor and Francis: London.,

Ulatowska, HK, Hayashi, MM, Cannito, MP and Fleming, SG (1986) Disruption of reference in aging. *Brain and Language*, 28: 24-41.

Waters, GS, Caplan, D and Rochon, E (1991) *Processing resources and sentence comprehension in patients with dementia of the Alzheimer's Type*. Presentation at Academy of Aphasia 29th Annual Meeting, Italy..

Wegner, ML, Brookshire, RH and Nicholas, LE (1984) Comprehension of main ideas and details in coherent and noncoherent discourse by aphasic and nonaphasic listeners. *Brain and Language*, 27: 37-51:

Wilcox, MJ, Davis, GA and Leonard, LB (1978) Aphasics' comprehension of contextually conveyed meaning. *Brain and Language*, 6: 362-377.

Worrall, L and Frattali, C (eds) (2000) *Neurogenic communication disorders: A functional approach*. Thieme: New York.