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PSYCHOLOGICAL AND IMMUNOLOGIC INTERACTION IN
THE ASYMPTOMATIC PHASE OF THE ACQUIRED IMMUNE DEFICIENCY SYNDROME

by

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Mandy Riekstins
September 1995
By October 2, 1985, the morning Rock Hudson died, the word was familiar to almost every household in the Western World.

**AIDS**

*Once...*  a comfortably distant threat...

... a disease for misfortuned people...

outcasts...

*Suddenly!*

A movie star, an idol, was diagnosed with the disease

and the media couldn't stop talking...

the threat loomed everywhere!

A subtle awareness began emerging that the future would always contain this strange new word.

*Alas!*

the timing reflected the unalterable tragedy at the heart of the AIDS epidemic.

Attention came too late... it was already a pandemic...

... people had died!

*People died...*

because officials ignored pleas from

scientists to allocate funds for research...

*People died...*

because scientists didn't devote appropriate

attention to the epidemic...
People died...
because scientists perceived little prestige
to be gained in studying a homosexual affliction...

People died...
because public health authorities and
political leaders who guided them refused to take the necessary tough measures needed to curb the
spread of the epidemic...

People died...
because gay community leaders were too busy
playing politics...

People died...
and nobody paid attention because the mass
media didn't like covering stories about homosexuality...

People died...
because AIDS was viewed as a budget problem...
... a political problem...
... a public relations problem...
... a homosexual problem.

No regard was given...
to the preservation of human life.

... AND THE BAND PLAYED ON ...

Paraphrased from the Prologue in And the band played on (Shilts, 1987, xxix-xxiii) (see appendix 1).
ABSTRACT

The Acquired Immunodeficiency Syndrome not only threatens the world with hitherto unknown rates of mortality and economic ruin, but has also saddled the health sciences with an unprecedented challenge in curing and managing this disease. Herein, the health sciences have not found a cure, and the management of the disease is made extremely difficult because of the unpredictable nature of the interrelationships in biopsychosocial factors inherent in the disease.

In order to attempt a description of the complex interrelationships between biopsychosocial factors in this disease, a group of twenty patients in a treatment programme comprising of an exercise and cognitive-behavioural intervention, were subjected to immunologic and psychological assessment before and subsequent to the intervention.

The data obtained indicated that none of the interrelationships between psychological and immunological variables predicted by psychoneuroimmunological science existed prior to the intervention. It would appear that the interrelationships between these variables were in total disarray - defeating the object of systematic logical description of biopsychosocial factors in this condition.

The post-intervention data suggested a pattern of interrelationships totally within the confines of predicted neuropsychoimmunologic patterns of a biopsychosocial interaction in a disease of immunologic origin.

This pattern of predictability would then render possible a treatment programme of a multidisciplinary nature which would bear predictable fruit. It also underscores the necessity of psychological interventions as an adjunct in the treatment of AIDS.
OPSOMMING

Die Verworwe Immunitheitsgebrek-Sindroom het tot dusver nie net die wêreld bedreig met ongekende vlakke van pasiënt-mortaliteit nie, maar het ook die gesondheidswetenskappe opgesaal met 'n ongekende uitdaging in die behandeling en hantering van die siektetoestand. Hierin, het die gesondheidswetenskappe nog nie 'n kuur vir die toestand gevind nie, en is die hantering van die siektetoestand amper ontmoontlik as gevolg van die onvoorspelbare aard van die interverwantskappe van biopsigososiale faktore inherent in die siekte.

Ten einde 'n beskrywing van die komplekse interverwantskappe tussen die sielkundige en immunologiese faktore in hierdie studie te kon maak, is 'n groep van twintig pasiënte in 'n oefenings- en kognitief-gedragsterapeutiese program blootgestel aan immunologiese en sielkundige taksering voor en na die intervensieprogram.

Die data wat so verkry is, het aangetoon dat die interverwantskappe tussen sielkundige en immunologiese veranderlikes wat normaalweg binne psigoneuroimmunologiese wetenskapverband verwag sou kon word, nie geld vir die HIV-pasiënte voor die ingreep nie. Die interverwantskappe het so 'n gebrek aan saamhangendheid vertoon dat dit nie binne biopsigososiale verband logies en sistematies beskryf kon word nie.

Die na-intervensiedata het daarenteen 'n interverwantskappatroon tussen veranderlikes vertoon wat heetemal binne 'n neuropsigoimmunologiese wetenskapsraamwerk sinvol beskryf kon word.

Hierdie patroon van voorspelbare interaksies maak dus 'n interdisiplinêre behandelingsprogram moontlik wat bepaald vrugte sal afwerp. Dit bevestig ook die noodsaaklikheid van sielkundige intervensies as 'n bykomstige behandelingsfokus in die hantering van VIGS.
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CHAPTER ONE

INTRODUCTION, PROBLEM STATEMENT AND LITERATURE REVIEW

1.1 INTRODUCTION

Few confronted AIDS for what it was...

a profoundly threatening medical crisis!

However,
isolated teams of scientists risked their reputations...
often their jobs... to pioneer early research.

There were doctors and nurses...
who went far beyond the call of duty...
to care for it's victims.

Some officials...
struggled to have the epidemic addressed in earnest...
... to lobby for funds...
... to argue for a sane community response.

And then...
a handful of victims of the epidemic...
who fought rejection
fear
isolation

and their own deadly prognosis...
to make people understand...
and to care.

THE UNFOLDING EPIDEMIC-
a tale of courage as well as cowardice
of compassion and bigotry
of inspiration
and redemption
and despair.

(Shilts, 1987, xxi- xxiii) (see appendix 1).
It has now become common knowledge that the AIDS pandemic has reached such proportions as to exert a meaningful influence on, not only the world's health services, but also socio-politically, socio-economically, and in terms of the very social fabric that underlies and binds together these systems we term world civilization (Hulley & Hurst in Mays et al., 1992). It is estimated that at least one person, somewhere in the world, contracts HIV, the virus that leads to AIDS every 15 seconds (Mays & Moscoso, 1995).

Of importance is not only the amount of people who are actually symptomatically positive in terms of AIDS, and are therefore showing signs of AIDS-related dementia, and becoming less productive and less able to work, becoming a greater burden on the psychosocial and socio-political structures, but specifically the persons who are HIV-positive but who do not yet have clinical AIDS (Leukefeld, 1990; Schneiderman et al., 1992). Mays and Moscoso (1995, p. 1) also stress the fact that "for every identified infected person there are also affected families, friends, and significant others for whom we must plan effective health, mental health, legal and social services."

The World Health Organization (WHO) estimate that there are now 14 to 18 million people worldwide who are either HIV-positive or have symptomatic AIDS (Mays & Moscoso, 1995). This is expected to rise to 40 to 100 million persons by the year 2000. The WHO continues to speculate that of those infected, approximately 85 percent of HIV infections are to be found in the developing world.

Those who have symptomatic AIDS are, to some extent, been treated either by retroviral interventions such as Zidovudine (AZT) and Retrovir, or symptomatically, by managing the opportunistic infective conditions and the opportunistic cancerous conditions of which Kaposi's sarcoma would probably be the main exponent (Busch & Maxell, 1990). These people show increased infections and AIDS-related dementia and their productivity is compromised to a greater or lesser degree (Mann, 1987).
The noteworthy and frightening fact is that for every symptomatic AIDS- sufferer, there are numerous asymptomatic HIV- positive persons. Herein, it is even more frightening to realize and to note that retroviral treatments of this condition would seem ineffective in forestalling, improving or in any way, having an effect on this condition (Brown, 1991a; Schopper & Walley, 1992). It would therefore mean that biochemical and secondary interventions on a pharmacological level would be virtually worthless unless evidence to the contrary is presented to the scientific community.

It is only in isolated research studies that a biopsychosocial approach, notably focusing on exercise and psychological lifestyle interventions, would have any effect on the course and the change of the immunological events leading up to full- blown AIDS. Herein, Antoni et al (1990a), LaPerriere et al (1990) and Schneiderman et al (1992) have noted that exercise would seem to have a strengthening effect on the immune system, and lifestyle interventions would also provide a meaningful input into this condition. Although some studies, notably those of Antoni et al (1990a), LaPerriere et al (1990) and Schneiderman et al (1992) would point towards a specific effect due to exercise and other lifestyle interventions, the precise nature of the HIV/ immunological factors/ psychological factors is not known (Antoni et al., 1990b). The present research doesn't seem to explicate this as clearly as would be necessary.

What is important, even at an early stage, is to develop a model of the predictive interactions of the various psychosocial and immunological factors, so that based upon this, a more efficient and efficacious treatment method for AIDS can be developed.

However, before this can be done, the basic nature of AIDS, of immunology, and psychoneuroimmunology needs to be discussed.
1.2 ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS)

1.2.1 Defining and classifying HIV and AIDS

AIDS is a global pandemic of a viral disease that may take as long as a decade to reveal its worst effects (Hancock & Carim, 1986). Despite its ability to cause devastating immune system dysfunctions that open the way to fatal opportunistic infections, the virus also establishes itself within the cells of the brain whereby direct damage occurs via the slow destruction of cortical tissue (Hancock & Carim, 1986).

The Centre for Disease Control (CDC) has developed a classification system for the diagnosis of HIV and AIDS that classifies and defines the continuum of the illness into four mutually exclusive groups (Ioachim, 1989; Busch & Maxwell, 1990). The classification system was developed in collaboration with public health and clinical specialists; however, it must be stressed that the CDC classification system will continue to evolve over the years (Davis, 1991). At present, women, minorities and people with a history of substance abuse have a higher risk of contracting the virus, which does not correlate with the current CDC criteria.

The clinical expression of HIV and AIDS may differ across the globe as do the epidemiological profile cases and risk groups (Ijsselmuiden et al., 1988; Schopper & Walley, 1992). In addition, two genetically different HI-viruses are now recognized as causative agents in the Acquired Immunodeficiency Syndrome (Baum, 1987; Bor et al., 1992). HIV-1 was identified first and is more prevalent worldwide. Thus, most research and understanding of the virus are based on studies of HIV-1 infection. The HIV-2 virus tends to be concentrated in Western Africa; and scientists are attempting to understand how its biological effects compare to HIV-1 (Dickinson, 1987).
Broadly speaking, it appears that both strains of the virus kill by the same mechanisms and their principal features are the same (Baum, 1987). However, separate and specific tests are required to detect HIV-2. Thus, it must be kept in mind that the CDC classification system will continually change as more conclusive findings emerge.

The CDC classification system for defining HIV-infection includes three separate groups. The fourth group defines full-blown AIDS. The criteria in group I do not always emerge in all individuals who contract the virus; as only certain individuals develop acute, glandular fever-type symptoms soon after exposure to the virus and before the anti-bodies are detected (O' Connel, 1990; McMillan, 1992a). Stage II involves the asymptomatic phase of HIV-infection, with the serum testing positive for the HIV-antibody. The asymptomatic or latent phase is followed by the experiencing of symptoms that are not persistent or continuous in their nature. Thus, at this stage, there are no indications of opportunistic or secondary infections.

An individual may be positively identified for AIDS when the sufferer has a reliably diagnosed disease that points to an underlying deficiency in the immune system which is not due to immunosuppressive drugs or other immunosuppressive diseases; and has been tested positively for the HIV-antibody (Ijsselmuiden et al., 1988; Hulley & Hurst in Mays et al., 1989). Thus, stage IV in the CDC classification system involves the emergence of secondary infectious diseases, that is opportunistic infections (Busch & Maxell, 1990).

1.2.2 Laboratory diagnoses and investigations

Laboratory tests vary in their predictive power. The most accurate test for detecting the HI-virus is the Western Blot. It is a highly complicated confirmatory test and requires trained clinicians to interpret the results (AIDS Monitor, 1988). Many developed countries re-test all blood samples that test positively; ending with a confirmatory test. Bor and
colleagues (1992) recommend sequential values rather than a single clinical value to confirm the diagnosis.

Further laboratory test results, used in combination with other tests or individually, provide prognostic markers of disease progression. These include blood tests measuring the absolute CD4 lymphocyte cell counts, the levels of B2 microglobulins, antigen serostatus as well as medical procedures like x-rays, CT scans, lumbar punctures and so forth (Bor et al., 1992). By combining various test results, important information is gathered concerning the patient's current state of health as well as insights into prognosis.

1.2.3 Clinical expression

The HI-virus attacks the immune system, thus decreasing its ability to defend itself against opportunistic infections; rendering the body vulnerable, defenceless and susceptible to a range of infectious conditions, neurological impairments and dermatological conditions (Borden, 1991; Fisher, 1991). The virus has a clever strategy- it strikes at the heart of the body's defences, invading the very cells of the immune system which should normally be capable of destroying it (Sattentau, 1988). Thus, the virus itself does not kill. It renders the body defenceless against opportunistic diseases by compromising the immune system. The course and clinical expression of the illness varies widely among individuals and is difficult to predict (Borden, 1991; McMillan, 1992a). This "...variability in the effects of HIV-infection has led to some clinicians in recent years to prefer to think in terms of a range, a spectrum, of HIV-related illnesses and conditions, rather than in terms of sharply defined stages of illness" (McMillan in Anderson & Wilkie, 1992, p.1).

AIDS is a multiple disease which works in two ways. It results in negative effects on the body's immune system; as well as effects on the Central Nervous System (CNS) and the brain. The effects on the individual's immune system occur, if at all, well before the individual shows signs of neurological impairment (Hancock & Carim, 1986).
Hancock and Carim (1986) suggest that the term Acquired Immunodeficiency Syndrome (AIDS) is an inadequate description of the range of detrimental effects which the virus causes, as the term omits any reference to the damage done to the brain and the nerves.

Some individuals develop an acute glandular fever-type illness soon after exposure to the virus; and before the anti-bodies are detected in the individuals serum (O'Connel, 1990; McMillan, 1992a). This is followed by an asymptomatic phase, during which the virus is dangerously contagious (Schoub et al., 1990). The incubation or latent period is of variable duration, sometimes only lasting a few months to as long as ten years. After this period, evidence of immune dysfunction begins to occur as indicated by laboratory findings, that is a falling CD4 cell count or clinical observations. According to O'Connel (1990), early in HIV-infection, autoimmune illnesses associated with a hyperactive immune system may be observed.

The initial symptoms and early clinical expressions of AIDS, that is, the final stage in the natural course of HIV-infection, include persistently swollen glands, prolonged fever, diarrhoea, night sweats and weight loss (Teenagers & AIDS, Department of National Health and Population Development). Weight loss is almost universal in the late stages of AIDS, along with fatigue and difficulties in coping with continued employment. Full-blown AIDS occurs when the individual contracts a disease which signifies an underlying deficiency in the immune system like recurrent pneumonia, cancers, fungus infections and mental and central nervous system deterioration (Women & AIDS, Department of National Health and Population Development); that is, the onset of a designated opportunistic infection which may be caused by a virus, bacteria, fungi or protozoa (O' Connel, 1990; McMillan, 1992a).

AIDS encephalopathy is a brain disease identified in certain AIDS-sufferers resulting in progressive dementia, memory loss, cognitive impairments and a lack of concentration (Sattaur, 1985).
The disease is not attributable to any opportunistic infection which indicates that the virus has the ability to parasitize and replicate within other cell types like those within the brain. This results in difficulties in treating the illness. Steinberg and Abdool Karim (1993) stress the need for more research which would identify the factors which influence the progression from HIV-infection to AIDS as well as more data on how opportunistic infections are related to HIV-illness.

It needs to be stressed that the course and clinical expression of the syndrome varies widely among individuals and is difficult to predict (Borden, 1991). The onset of symptoms may be acute, gradual, mild or severe; and the outcome may be sudden death or an extended period of illness and disability. The progression of the illness is thus a prolonged experience of uncertainty and the variability in effects of the virus requires that care-givers be well-prepared to meet the different needs of individuals living with HIV who are asymptomatic, those experiencing some HIV-related symptoms as well as those with very serious health problems (Anderson & Wilkie, 1992).

1.3 THE AIDS EPIDEMIC

Every 15 seconds, someone in the world is infected with the HI- virus, the virus that causes AIDS. The World Health Organization (WHO) estimates that 14 to 18 million people are now infected, and it is speculated that this figure will increases to 40 to 100 million persons by the year 2000 (Mays & Moscoso, 1995). Although the pandemic is worldwide, it appears that 85 percent of HIV infections are concentrated in the developing world. When we look at the worldwide impact of the disease; it becomes apparent that no community or group has been left unscathed. It is thus important to address the laws underlying such epidemics.

All epidemics are shaped and developed by various basic factors which intricately interact with one another to follow a set pattern or an epidemic curve (Prozesky, 1993).
An epidemiological understanding of the AIDS pandemic, that is an epidemic that spreads worldwide; while obeying these basic laws, is complicated by the specific properties of the actual virus, and secondly, by factors determined by man, the only natural living host of the virus. Thus, there is no simple model of disease causation which can adequately describe the spread of the virus, as biological, environmental and behavioural factors all interact in maintaining the pandemic (Darrow et al., 1986; Flam & Stein, 1986).

The transmission of the virus occurs according to two known identified patterns. Pattern I refers to homosexual or bisexual transmission and intravenous drug abuse, and Pattern II occurs via heterosexual contact, mother-to-child transmission and transfusion-related transmission (Prozesky, 1993). However, due to the fact that most people become infected via sexual contact, Kriel (1993, p.24) alleges that "...AIDS is for all practical purposes, an obligatory sexually transmitted disease..." in terms of maintaining the epidemic. Thus, it is specific behaviours of man, the host of the virus, which complicates an accurate prediction of the epidemic curve. Prozesky (1993) also mentions factors such as high population density and mobility, geographic and socio-economic factors which strongly influence the spread of the virus.

Prozesky (1993) believes the predictions of the pandemic should be based on the set pattern of the biological growth curve, and not on exponential (straight-line) curves. Predictions made on the biological growth curve would reveal that the pandemic, although a catastrophic problem at present, is at least self-limiting to some degree.

Prozesky's (1993) description of the biological growth curve can be diagrammatically summarized as follows:
Figure 1: **The biological growth curve (%)**

1. **Critical mass of infected individuals** reached in a community within a surrounding number of susceptible people.
2. **Time taken to double the number of infections is short.** Africa is currently in the exponential phase.
3. Those at highest risk, that is the number of susceptible people, have already been infected.
4. **Plateau is reached.** The number of infected individuals in the community is gradually reduced.

* Prozesky’s (1993) description of the biological growth curve.
By this stage Prozesky (1993) stresses the hope that a vaccine is developed in order to halt the emergence of a new epidemic, which occurs when enough susceptible individuals are available to begin the growth curve once again. If a vaccine has not been developed, hopefully man will have altered high-risk behaviours; so as to avoid transmission of the virus.

1.4 AIDS IN SOUTH AFRICA

1.4.1 Demographics

Due to the seriousness of the HIV/AIDS epidemic in South Africa, forecasts of the course of the disease have been demanded from decision-makers in the health sector, industry, the business community and the general public (Schall, 1990). In order to forecast the extent of the epidemic, a detailed modelling of the illness and it's underlying population as well as knowledge concerning the demographic, social and epidemiological factors is required (AIDS Monitor, 1988a). This data is relatively scant in South Africa (Schall, 1990; Schoub et al., 1990).

Varying predictions exist as to the extent of the epidemic in South Africa (Padayachee & Groeneveld, 1992), although most researchers and authors indicate a shortfall in reportings (AIDS Monitor, 1986; Kingman, 1988c). Prozesky (1993) alleges that as many as 41% of AIDS cases in South Africa go unreported. Quinn and colleagues (1986) believe that this may be due to the fact that epidemiology and the clinical expressions of the virus vary depending on cultural differences, endemic diseases and other unidentified risk factors. In an African country, other infectious diseases are common, the blood is often loaded with antibodies that may cross-react with the HIV/ AIDS test resulting in both false positives and/ or false negatives (Quinn et al., 1986; AIDS Monitor, 1988).
Dr. Ruben Sher, head of the AIDS Centre in South Africa, states that 300 people are infected every day (Medical Reporter, 1992). The fact that only a few new cases are being reported daily is due to an inability of the present reporting system to cope with the incoming load. Dr. Sher stresses that a major problem in curtailing the epidemic via interventions like education is that AIDS is not the only problem in the country at present. It is very difficult to highlight AIDS and HIV when so many people are dying daily because of the continuous violence currently occurring.

The early phase of the disease is clinically silent, thus masking the exact nature of the epidemic. The most recent statistics reveal approximately 4,000 full-blown AIDS cases and about 300,000 people infected with the virus (Sunday Star, November 27, 1993); of which at least 75% acquired the virus through heterosexual contact (Joyce, 1986). Based on scenario planning, demographers speculate that by the year 2000, 5.6 million people will be infected (Prozesky, 1993). A further 20 to 40 million people will be indirectly affected through the loss of bread-winners and income earners, parents and loved ones. At present, the plight of AIDS babies in South Africa has become urgent. The problem with AIDS babies, as with many HIV/AIDS sufferers, is that families often reject and abandon the infant. The AIDS Monitor (1991) highlights the effects of the epidemic on the elderly sector of the population. An immense problem occurs when the child, infected or not, loses both parents, and relatives in the extended family are also infected. The grandparents are thus left with more children than they can support.

The HIV/AIDS pandemic is undermining the stability of communities, and it is significantly altering the roles and functions of families. In addition, Mays and Moscoso (1995) report that the pandemic has had major impacts on certain traditional beliefs and rituals. An example cited states that the "former most profound symbols of life- the womb, semen, blood, and childbirth- are now linked with death" (Mays & Moscoso, 1995, p. 6).
The number of AIDS cases in South Africa tends to double every 8.5 months; thus, the expected personal, social and economic consequences of the epidemic will be enormous (Perkel et al., 1991). However, there still remains much controversy and uncertainty regarding the current scale and rate of growth of the AIDS epidemic in South Africa (Barnett & Blaikie, 1988; AIDS Monitor, 1986).

A newspaper article (Sunday Star, November 27, 1993) reported that the impact of the epidemic is going to be disastrous to South Africa’s economy. It is expected that it will cost the economy R5 billion a year in treatment, hospitalization and research by the year 2 000. Prozesky (1993) also mentions the rise in the cost of health-care for other diseases like tuberculosis, which is currently the most expensive item on South Africa’s health budget.

However, even more disturbing, is the fact that the epidemic is killing the most active and productive sectors of the population (Mann, 1987). Prozesky (1993) alleges that this may change demographic and family structures significantly, as it will result in more orphans and more elderly people without support. The Department of National Health and Population Development is not only disturbed about the direct costs of treatment and care, but about the loss of production, the loss of work years and the replacement of workers (Sunday Star, November 27, 1993). The article reports that in 1991, South Africa lost 47 130 work years and that this would increase to 936 029 by the year 2 000, if the virus is not curbed.

Schoub (1992) is more optimistic about the future of the epidemic. Schoub believes that South Africa is into the second decade of the AIDS epidemic which will involve educational campaigns demonstrating success as observed by increases in condom usage and a decrease in Sexually Transmitted Diseases (STD's). The first decade of the epidemic involved an indifferent, casual attitude directed towards the disease; which then swayed towards panic; and finally, involving some positive action by the country. Other authors, however, believe that the pace of the epidemic is accelerating daily, while the response
remains stalled, thus widening the gap between the two as the virus rapidly spreads throughout the country (Miller, 1992). The worst scenario, as mentioned by Dr. Coen Slabber, director-general of the Department of National Health and Population Development, is that the virus continues to spread uncurtailed and results in entire towns or villages been wiped out as has occurred in the rest of Africa.

A more positive outlook is offered by Mays and Moscoso (1995) who believe that with effective prevention programs, the number of infections can be reduced by as much as 50 percent. Their main emphasis is on the role of psychology: helping to support families, aiding in better links between medical and support services, addressing the issues of discrimination and the stigma's attached to HIV/AIDS infection. Mays and Moscoso (1995) also suggest preventative management interventions, which involve using intervention strategies in schools and communities to help those infected as well as affected by the virus.

1.4.2 South Africa and the AIDS epidemic

Considerable literature exists concerning the management and care of AIDS sufferers in industrialized countries (Schopper & Walley, 1992). However, the clinical expression of the disease, the opportunistic infections, epidemiological profiles and risk groups vary across regions (Ijsselmuiden et al., 1988). South Africa possesses a unique socio-political structure and is confronted by unique problems as the epidemic spreads in a society experiencing rapid political change against a background of apartheid (Steere, 1984; Barnett & Blaikie, 1992). Thus, the situation is compounded by a number of social and economic factors intrinsic to South African society. Crewe (1992, p. 2) alleges that "the entire subject is shaped by a cultural agenda that is as medically misinformed as it is socially misleading and politically motivated."
Armstrong (1991) believes that apartheid played the key role in the AIDS epidemic by promoting migrant labour. Shernoff (1991) questions the ability of the country to care for the victims of the epidemic, given it's history of apartheid and discrimination and the fact that "...it is (most often) the poor, the marginalized and the powerless who bear the brunt of AIDS" (Kuhn, 1993, p.20). In South Africa, the negative perceptions and stereotypes surrounding AIDS sufferers are further compounded by the racial divisions in society (Matthews et al., 1990; Schlebush et al., 1991); and is influenced by the various social, economic and political conditions affecting each group (Eagle & Bedford, 1992; Galloway, 1993).

A study conducted by Galloway (1993) on male inhabitants of informal settlements revealed a crucial need for education concerning the virus. The male subjects did not believe that HIV/AIDS posed a significant problem and felt that they were not at risk. The study concluded that the destruction of home life and the lack of stability in squatter camps makes it impossible to control the spread of the virus without taking into consideration the wider socio-political context. Effective interventions can only be implemented against a broader backdrop of social reconstruction (Galloway, 1993). Noya and colleagues (1993) stress the need for community-based interventions that would not involve centralizing the intervention in formal settlements exclusively.

Similarly, the association of AIDS with minority status has the potential to reinforce the stigmatization of minority communities. Desjariais and co-authors (in Fisher, 1991) allege that this often results in prevention and resource activities being caught in 'no-win' situations of either unjustly singling out minorities or of ignoring the problems of minority communities. Zuma and colleagues (1993) also identify the strong influence of perceptions or beliefs held by key leaders in the country which may lead to further stigmatization. Thus, individuals who fall into high-risk categories are exposed to a hazardous environment which in turn confounds the difficulties associated with the contraction of the virus, like long periods of social unrest and economic disruption (Barnett & Blaikie, 1992), and the lack of adequate health-care resources (Dommisse, 1987). Thus, attempts to curb
the epidemic are further complicated by other issues; and interventions have to be carried out within the context of these related issues and the wider socio-political context. Recent research conducted by the Human Sciences Research Council (Galloway, 1993) and by Noya and colleagues (1993) reported that most respondents indicated that socio-economic problems such as poverty, violence, crime and other health problems like TB, were of greater immediate concern than the epidemic. These studies also revealed confusion as regards the transmission of the virus, as was also found by Padayachee (1991).

Kelly and Murphy (1992) mention the challenges and barriers to HIV/AIDS prevention and treatment approaches across different cultures; such as cultural differences regarding sexuality and sex-role relationships; and the enmeshment of factors contributing to AIDS risk with related problems arising from disempowerment and socio-economic disadvantages. Every culture has a different ideological system explaining illness or an 'explanatory model' (Bolognone & Johnson, 1986) which are sets of beliefs relating to the etiology, symptoms, treatment and so on of the illness (Casper, 1986; Scaffer & Davis, 1990).

A qualitative study conducted by Abdool Karim (1993) reported the potential preventative role that traditional healers such as the isangoma could play in curbing the epidemic and changing health beliefs. The results reported that the knowledge of transmission, risk groups and preventative strategies of the isangoma were accurate. It was concluded that isangoma's could be essential sources of AIDS information within the community. Certain beliefs such as the origin of the virus and a conviction that AIDS could be treated, were two factors identified as unacceptable to the scientific community. However, Abdool Karim believes that traditional healers have the potential to influence factors such as increased condom usage. Social and economic factors such as the migrant labour system, densely populated single-sex dwellings and political tensions all serve to confound preventative and treatment strategies (Ijsselmuiden et al., 1988). It is also likely that coping needs and responses to treatments differ cross-culturally.
Economically disadvantaged and disempowered individuals often have many unmet mental health needs even before contracting the virus.

Given resource constraints of health-care systems even before the AIDS epidemic, it is imperative to devise interventions which can be delivered without infringing on the existing primary health-care activities (Kingman, 1988a; Schopper & Walley, 1992). Considering the large clientele of the traditional healer, the extensive distribution of healers in rural poverty-stricken areas as well as their established preventative health ethic; they could aid immensely in modifying risk-related behaviours in areas here health-care facilities are very limited. Barnett and Blaikie (1992) stress that co-operation is required between the behaviours of individuals and groups such that the entire community may mobilize it's resources collectively in order to confront the epidemic as effectively as possible; keeping in mind the limits of existing and accessible technology and forms of social organization.

Makubula (1993) stresses the importance of research geared towards large-scale community-based interventions, in order to curb the current epidemic. Such research should involve intervention trials whereby the relative costs and benefits of the intervention can be scientifically validated; as well as revealing which interventions are the most practical and most effective and would allow for adaptation to the local context.

Thus, even before contracting the virus, there are a large number of factors already present for the large majority of the population, which serve to complicate the management of the epidemic as well as the treatment of individual sufferers (see Figure 2). Thus, despite the fact that much has been learned regarding the AIDS epidemic in South Africa, there are still large gaps in knowledge which need to be addressed in future research (Steinberg & Abdoool Karim, 1993). Welman and Scheepers (1993) believe that AIDS research should be supported at a national level in order to translate findings into effective actions and interventions.
Figure 2: South Africa as a multi-cultural society experiencing rapid socio-political change against a background of Apartheid
1.4.3 AIDS research in South Africa

Makubula (1993) alleges that there is a shortage of quantitative research in the HIV/ AIDS field in South Africa. Most studies concerning AIDS in South Africa report the prevalence rates of the virus in specific communities or population groups such as ante-natal clinic attenders or inhabitants of informal settlements (Galloway, 1993). Researchers should strive to recognize the strengths of quantitative research which could focus on the reduction of the epidemic via large-scale intervention trials; while qualitative research can be used to focus on specific issues relating to aspects like the psychosocial responses to AIDS and the more intimate details involved in counselling and caring for HIV/ AIDS-sufferers.

Brown (1992a) acknowledges that researchers are hampered by political instability as well as a lack of available funds and/or unreliable funding. Given restricted resources and limitations at the onset, it is vital that researchers are supported for their efforts and that research undertaken nationally is acknowledged (Steinberg & Abdool Karim, 1993) in order to generate future research endeavours. The University of South Africa (UNISA) has established a national data base on AIDS organizations and people working within the field. In addition, the AIDS programme of the Department of National Health and Population Development has been striving to structure a base of information regarding AIDS in South Africa (Galloway, 1993). The field is constantly changing and a base of information such as developed by the AIDS programme in 1992/1993 would facilitate in dispersing information and keeping organizations and people in the field up-to-date with the most recent research findings.
1.5 THE HUMAN IMMUNE SYSTEM AND HIV/AIDS - INFECTION

1.5.1 The human immune system

The human immune system is very complex and its understanding has been "...based on observations that have been made repeatedly throughout recorded history - the resistance of some individuals and the susceptibility of others to infectious diseases" (Langman, 1989, p.1).

An infant begins to acquire protection against specific pathogens during the first few months of life, that is 'acquired immunity'. This allows the child to mount a specific response towards pathogens and, in normal circumstances, results in eradicating the foreign agent (Pratt, 1991). However, for the specific response to come into play, the body's first line of protection; namely the non-specific defenses such as the skin and mucous membranes need to be breached (Sattentau, 1988). Non-specific defenses also include macrophages which operate by detecting foreign particles in the body, binding to the particle and finally, engulfing it (McMillan, 1992).

Specific immune responses consist of two inter-related processes involving both humeral and cellular immunity. The former is mediated by antibodies, produced by the B-cells, which are placed in different classes and collectively referred to as immunoglobulins such as IgG and IgA (Pratt, 1991). Their function is to recognize foreign proteins or sugars on the surface of certain antigens and to bind to these antigens. However, antigens do not have the ability to penetrate living cells and are thus limited in preventing the replication of a virus within the body's own cells. The most important function of antigens, therefore, is the destruction of micro-organisms circulating freely in bodily fluids (Sattentau, 1988).

Cellular immunity is primarily controlled by the white blood cells or lymphocytes, of which the t-cells have the ability to recognize antigens that have attacked the body's own cells (McMillan, 1992b).
T-cell subsets have become of particular relevance since the advent of HIV/AIDS as well as the chronic fatigue syndrome. Four types of t-cells have been identified as aiding in this complex function; namely killer, memory, helper and suppressor t-cells.

Sattentau (1988) describes cell-mediated immunity as follows: Helper t-cells are activated by an antigen on the surface of a macrophage which, in turn, stimulates the activation of the other t-cells as well as the B-lymphocyte cells, which then produce an antibody. The macrophage is induced to begin phagocytosis, which involves engulfing the infectious particle and destroying the agent. The killer t-cells or cytotoxic cells act to destroy cells infected with intracellular parasites. The memory cells, under normal circumstances, ensure that the body is immune to further attacks by the same organism. The role of the suppressor cells is to decrease or stop the activities of the B- and t-cells once the infection has been eradicated.

1.5.2 The characteristics of the Human Immunodeficiency Virus

Viruses are the smallest disease-causing agents identified, and can only reproduce and survive by acting in a parasitic manner, that is, by invading host cells and using the material of the cell to create further virus particles. Thus, virulent viruses need to be transmitted before the death of the host in order to survive (Prozesky, 1993). Viruses which enter the population for the first time tend to result in rapidly developing pandemics, affecting many people simultaneously and causing serious or fatal infections.

The Human Immunodeficiency Virus (HIV) appears in many forms and operates by attacking the very cells that should order it's destruction; which then mutate and multiply rapidly by invading the immune cells until many years later the host dies a cruel and wasting death (Mays et al., 1989; Crewe, 1992). The Hl-virus is a minuscule piece of biological material called a retrovirus which is predisposed to attack the human immune system resulting in an impaired ability to protect the body against a range of disease-
causing agents (Hall & O'Grady in Mays et al., 1989). Together with the genetic material RNA, at the heart of the virus, the HI-virus also contains some molecules of an enzyme called reverse transcriptase which the virus uses to multiply (Scott, 1987a).

1.5.3 The effects of the HI-virus on the human immune system

A virus can only enter a cell with the right receptors on the surface. For the HI-virus, these receptors are found on the surface of the T4-cells, to which it binds and then proceeds to enter the nucleus of the cell. At this point reverse transcriptase results in the RNA being converted into DNA. A latent period begins as the virus awaits chemical signals which activate multiplication of the infectious agent. Scott (1987a) alleges that the signal may be the arrival of some other infection which activates the infected T4 cell to assemble into virus particles, which then break free from the cell, spreading to other T4 cells as well as infecting further cells, including those in the brain.

A crucial effect of this process is the death of the host cell which results in impaired immune defenses, rendering the body vulnerable to opportunistic infections (Scott, 1987b). The immunologic abnormalities associated with the HI-virus include cell-mediated (t-cell), humeral (B-cell) and natural (monocyte and natural killer cell) immune systems (Antoni et al., 1990b).

The characteristic immunodeficiency associated with AIDS is caused by the destruction of the T-helper/inducer cells (CD4) by the virus. CD4+ cells decline after seroconversion, that is, after the development of the HIV- antibodies. CD4+ cells drop to an average of 60% of their original levels within 12-18 months. Subsequently, the CD4+ cell levels then remain constant in most HIV- infected persons for several years. In those sufferers who develop AIDS, there is a further rapid fall in the CD4+ level in the 2 years prior to the development of clinical or overt AIDS.
Throughout the course of HIV- infection, total T- cell numbers (measured as CD3) remain constant, mainly due to the expansion of CD8+ lymphocyte population. The helper: suppressor (CD4: CD8) cell ratio becomes reversed as the number of suppressor cells increase (Pudifin et al., 1990). The CD4+:CD8+ cell ratio falls to below 1:0. This results in deficiencies in CD4 cells to signal B-cells to respond with the production of an antibody. Instead, immunoglobulins are secreted by the B-cells which are undirected and non-specific in their functions.

HIV/ AIDS- infected individuals show elevated levels of immunoglobulins, specifically IgG and IgA (Pratt, 1991). The result is a failure to provide any defense against toxins, bacteria or viruses. Thus, the cellular and humeral immune responses to antigens are already adversely affected at this stage due to the alteration of the T-cells' normal signals and feedback mechanisms (Antoni et al., 1990b).

The CD4 cell number count is one of the best and most scientifically sound predictors of the strength of the immune system. The normal T4 cell range is approximately 500. Thus, a fall in T4 cell measurement is an important clinical indicator of immune suppression (Davis, 1991), whereby individuals are at risk for developing a symptomatic disease which usually occurs in the final, terminal stage of the HIV/ AIDS- infectious continuum. It is usually recommended that the individual begin anti-retroviral treatment if T4 cell measurements fall below 500. A blood sample analysis of CD4 and Lymphocyte cell counts can reveal to what degree the individuals immune system is intact or depleted, and these findings may serve as a predictor of the specific individuals' immunological deterioration (Evian, 1993).
Table 1: The significance of CD4 and total Lymphocyte cell counts (*) (**)

<table>
<thead>
<tr>
<th>Clinical condition</th>
<th>CD4 cell count</th>
<th>Lymphocyte count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well with no symptoms</td>
<td>&gt;500-600 cells/cmm</td>
<td>&gt;2500 cells/cmm</td>
</tr>
<tr>
<td>Minor symptoms</td>
<td>350-500 cells/cmm</td>
<td>1000-2500 cells/cmm</td>
</tr>
<tr>
<td>Major symptoms</td>
<td>200-350 cells/cmm</td>
<td>500-1000 cells/cmm</td>
</tr>
<tr>
<td>AIDS</td>
<td>&lt;200 cells/cmm</td>
<td>500-1000 cells/cmm</td>
</tr>
</tbody>
</table>

* Table adapted from Evian (1993).

# CD4 cell counts below 500/cmm on two or three tests obtained at least one month apart indicate the need for Zidovudine (AZT) therapy.

# The decline in CD4 cells to below 400/cmm may be associated with the symptoms of AIDS-Related Complex, such as fevers, night sweats, weight loss, fatigue and thrush.

# CD4 cell counts below 200/cmm, and/ or CD4 % below 20%, pose a particular risk for the development of AIDS- defining opportunistic infections. In addition to receiving Zidovudine, these individuals should be given medication for primary prophylaxis of pneumocystosis and TB.

# The CD4: CD8 ratio is characteristically low in HIV- infected persons and is a less useful measure of immunosuppression.

** Information provided by Drs. Mauff, Zail, Skudowitz & Partners: Pathologists.

The monocyte becomes the storehouse for the virus and it is within these cells that the virus may remain latent for up to 10 years. Natural killer (NK) cell activity is also negatively impacted resulting in an inability to recognize parasites, tumours or pathogens; thus, failing to provide immune surveillance. This loss of cell-to-cell signalling is speculated as being a primary factor in the loss of overall immunocompetence (Antoni et al., 1990b).

Brief deficiencies in immune function over a period of months or weeks are observed in several other viral infections, such as measles or glandular fever (Sattentau, 1988).
However, either the body is able to eventually eliminate the virus, or the level of the virus decreases to a point at which the immune system is able to function effectively. However, in HIV/AIDS infection the number of t-helper cells decrease over a period of years without ever recovering.

Sattentau (1988) offers several hypotheses to explain this phenomenon. The first hypothesis simply states that the cells rupture as a direct result of the viruses multiplication. That is, the number of virus particles produced is so great that the cell eventually bursts. The second hypothesis alleges that cells infected by the virus fuse with uninfected cells. The final, and most complex explanation, maintains that the cells die as a result of a condition called autoimmunity, where the body's defenses turn against itself. This could occur in any one of four ways. The t-helper and other infected cells become the targets for the killer t-cells to destroy. As already mentioned, HIV/AIDS infection causes the B-cells to produce antibodies in an uncontrolled manner. Thus, a second explanation is that this may result in the antibodies attacking the body's own tissue. Thirdly, it is believed that the virus may in fact have the ability to mimic certain molecules found on the cells of uninfected individuals. Finally, the virus may play a more direct role by producing proteins which are immunosuppressive to the t-helper cells. However, these are hypotheses which require scientific validation before they are accepted as causes of the depletion of the t-helper cells.

Many researchers have questioned why HIV/AIDS infection results in such devastating immuno-suppressive effects when it initially infects only a few cells for a long period of time. In other words, how does the virus cause such destruction and confusion in the immune system when it takes years for the number of CD4 cells to decline? Hestel and Brown (1993) propose a less direct mechanism for the depletion of the t-helper cells. It is suggested that when the body's t-cells begin to decrease, the immune system tries to compensate by bringing the overall t-cell count back to normal. However, the body fails to differentiate between the CD4 (helper) and CD8 (suppressor) cells and, thus, makes copies of both types.
This would not usually create a problem, but due to the fact that the characteristic immunodeficiency associated with AIDS is caused by the destruction of the t-helper cells, the suppressor cells are left intact while the virus kills the t-helper cells, resulting in the observed skewed CD4:CD8 ratio. Thus, as the virus continues to kill the CD4 cells, the body simply produces a greater amount of CD8 cells. Hestel and Brown (1993) allege that the body's replacement mechanism may kill the t-helper cells at a similar rate to the progressive loss caused by the virus itself, which is seen early in HIV-infection.

A further variable which is troublesome in terms of identifying the precise structure and mechanisms of the HI-virus is that, although some basic similarities are identified in the virus particles found in all HIV-sufferers, it is also clear that a certain amount of genetic variability occurs (McMillan, 1992b). This has been detected in the coding of certain parts of the virus. Thus, different strains of the virus have been identified which makes the production of a vaccine a challenging task.

Certain scientists have decided to shift the focus of AIDS research from 'what causes disease' to 'what causes immunity' (Cohen, 1992). Thus, instead of examining the correlates of disease progression, they have moved towards looking at correlates of protection. The reasoning behind the shift in focus is that the optimal vaccine should teach the immune system how to stop HIV from establishing an infection. Thus, researchers are looking into why some infected individuals stay healthy, and then attempting to mimic their immune systems. However, as one begins to comprehend the field of psychoneuroimmunology, the task of simply mimicking the immune system seems too simplistic. The effects of stress and other psychological variables influence the functioning of the immune system; and also need to be taken into consideration.
1.6 THE PSYCHOLOGICAL IMPACT OF HIV-SEROPOSITIVITY

1.6.1 Introduction

It is now well recognized that HIV/AIDS-sufferers face profound psychological, psychiatric and neurological sequelae as the disease progresses. "HIV-infection and AIDS challenges human beings to adapt to the myriad of changes that it brings into one's life" (Pizzi & Johnson, 1990, p.3). Coping with HIV-related illness involves a number of emotional challenges including dealing with the pain, fatigue and restrictions placed on one's daily activities. Often one has to deal with new treatment procedures and to adjust to frequent hospitalizations (Anderson & Wilkie, 1992).

HIV-seropositivity evokes a myriad of emotions with an increase in anxiety and uncertainty about the future as well as a need to deal with the social stigmas attached to the illness. One's relationships with friends, family and partners often undergo dramatic changes due to the stress evoked by contracting the illness. There is often a need to re-define one's goals in life in order to meet the difficulties imposed by a potentially life-threatening illness and, therefore, a less uncertain future.

As the incidence of heterosexually acquired HIV-infection increases, more women are becoming infected, and Bradbeer (in Bor et al., 1992, p. 104) believes "women are doubly infected by HIV-disease." Not only do they have to deal with the psycho-social sequelae that occur after acquiring the potentially fatal disease and the related stigmas attached to sexually transmitted diseases, but also with the complex issues surrounding their roles as child-bearers, care-givers and sexual partners (Anderson & Wilkie, 1992).

Miller (1990) and Richardson (1992) mention the problems associated with diagnosing the psychological effects of HIV/ AIDS-infection. Symptomatology frequently overlaps between the medical and psychological dimensions of HIV-illness (Fernandez & Levy, 1990).
Richardson (1992) broadly categorizes the psychiatric sequelae of HIV/AIDS-infection into two broad categories; those primarily involving psychological problems of varying severity, and those more directly concerned with organic brain function. Unfortunately, it is easily possible to confuse the two and, thus, the danger exists of potential misdiagnosis and mismanagement.

1.6.2 A psychological and an immunologic disease

Hall and O'Grady (in Mays et al., 1989) allege that HIV illness and AIDS consists of two diseases. Initially, the individual must deal with the subsequent anxiety and psychosocial sequelae associated with knowing that one has a disease for which there is currently no available cure; followed by a disease caused by and involving the destruction of the immune system. Thus, HIV infection and AIDS consists of a number of neuropsychiatric and psychosocial complications which inter-relate with the functioning of the immune system (Ironson et al., 1990; Rundell & Brown, 1990).

1.6.3 Stress and anxiety

Ostrow (1990b) alleges that a biological model of the psychological consequences of HIV-infection must include and recognize that the virus not only contributes biologically to various psychological problems like stress and anxiety, but that the serologic test itself embodies many psychological implications. An HIV-positive serostatus notification may be characterized as a major source of stress and anxiety. The stress involved is immense; resulting in an adverse impact on mental health (Kelly & Murphy, 1992). Studies conducted by Ironson and colleagues (1990) and McCann and Wadsworth (1991) revealed that the stress involved in waiting for the test result is immense and the anticipatory period may be viewed as a potent psychosocial stressor which results in adverse changes in affect and cognition which further impairs immune functioning.
This not only occurred in individuals who were eventually identified as HIV-positive, but also in subjects who tested negatively for the virus.

McCann and Wadsworth (1991) conducted a study reporting the experiences of 252 gay men who had an HIV-test which proved to be positive. Reports from subjects within the study indicated that the distress induced by the anticipatory period of uncertainty was more stressful than actually receiving the result, even though it proved to be positive.

Ironson and colleagues (1990) examined the psychological and immunologic effects of both the anticipation and the impact of HIV-1 antibody notification among 46 asymptomatic homosexual men. Measures of cell-mediated immunity and psychological functioning were obtained at various intervals across the 10-week observation period. It is of interest to note that most of the immunologic changes, except for NK cell activity, occurred in the seronegatives; whereas psychological changes were apparent in the seropositives. The initial impairments in immune functioning at baseline for the seronegatives returned to normal levels five weeks later. It has been suggested that the psychological effects of the decision to participate in the study may have impacted upon some aspects of immune functioning- even among healthy non-HIV-1 infected individuals.

Individual differences in anxiety responses to notification of seropositivity predicted declines in NK cell cytotoxicity among seropositives. One would have expected that seropositives who believed that they were antibody positive and who were clearly more anxious upon notification, would have displayed a corresponding decline in several other immunological variables during both the anticipatory and post-notification periods. However, the results of the study revealed a dissociation between psychological and immunological phenomena. It has been suggested that asymptomatic HIV-1 infected individuals, even at the earliest stages of infection, may be unable to mount an immune response to potent psychosocial stressors. This may be due to the fact that the viral contribution to immune functioning over-rides any influence of environmental stimuli (Ironson et al., 1990).
Ironson and co-workers (1990) reported that seropositives displayed clinical levels of anxiety, intrusive thoughts and avoidant responses during the week of notification. However, these returned to baseline levels 5- weeks after testing. In addition, NK cell function returned to baseline 3- weeks after notification. These results question the resiliency of the particular sample used in the study and their forms of psychosocial coping skills and resources. The overall results of this study provide evidence; firstly, suggesting the inter-play of cognitive-affective processes and cell-mediated immunity in at-risk seronegative gay males; and secondly, revealed that for those infected with the virus, immunologic responses to psychosocial stressors appeared to be dampened.

A traumatic experience threatens one's personal resources and well-being. One begins to question the resiliency of the self and one's fundamental perceptions of life (Borden, 1991). Schneiderman (1992) includes distress and depression, uncontrollable stressors, social support and coping strategies as important psychosocial and behavioural sequelae of HIV-1 disease. The reactions, concerns and psychological themes of the identified HIV/AIDS sufferer have been shown to be similar to terminally ill cancer patients (Chuang et al., 1989; Kelly & Murphy, 1992). The shock of discovering one has a terminally-ill disease may be immediate or delayed (Anderson, 1992b).

The stages that follow may indicate shock, denial and anger which are common reactions to major traumas or losses (Miller, 1990; Ross, 1990). Often, denial may function as an adaptive response since it may aid in buffering internal stress. The next stage in coming to terms with a terminal illness is withdrawal; followed by bargaining and acceptance. However, due to stigmatization and the difficulty found in predicting the course of the disease; HIV/AIDS involves additional unique stressors such as a prolonged experience of uncertainty (Borden, 1991) and consequently, the fear of the unknown (Chuang et al., 1989). In addition, the variability of the disease, that is, acute periods of illness interspersed with long periods of well-being, also aid in increasing stress and anxiety levels (Anderson & Wilkie, 1992).
1.6.4 Stigmatization

High-risk groups, that is homosexuals, prostitutes, intravenous drug users and blacks tend to characterized by negative stereotypes which influence the general social perceptions of AIDS sufferers (Kingman, 1988b). Stigmatization results in reactions of fear, intolerance, rejection and blame (Matthews et al., 1990; Crewe, 1992). Studies conducted on the attitudes of South African health-care workers revealed an array of unconscious negative feelings projected towards homosexuals and black sexuality (Schlebush et al., 1991; Eagle & Bedford, 1992). As a result, many sufferers feel isolated and rejected by family, friends and the health-care sector, which is further complicated by emotions of guilt, anger and disempowerment. This loss of interpersonal and institutional support may be detrimental to the sufferer as the individual no longer has sufficient resources to buffer the stressors involved and subsequently, has to deal with the disease alone. Additionally, in a country like South Africa, the association of AIDS with minority status has the potential to reinforce the stigmatization of minority communities (Desjariais et al. in Fisher, 1991). Ross (1990) believes that the psychological reactions to HIV-seropositivity are often related to the stigmatization of the illness rather than to the possibility of death (see figure 3).

1.6.5 Depression, distress and helplessness

The incidence of depression and sustained distress levels are high throughout the course of the disease. The suicide rate has been shown to be 36 times higher among HIV and AIDS sufferers than the normal population (Hays et al., 1992; Schneiderman, 1992), although Chuang and colleagues (1989) report conflicting results. Suicidal ideation occurred infrequently in their sample of HIV-sufferers.
Schneiderman (1992) reports that the incidence of DSM-111-Axis 1 affective and adjustment disorders are high throughout HIV-1 disease; the most common of which appears to be adjustment disorder with depressed mood. Hays and colleagues (1992) examined the impact of social support and HIV-related conditions on depression among 508 gay men.
Their study demonstrated that greater depression was associated with HIV-positive gay men exhibiting physical symptoms; as the disease is no longer remote or abstract. Similarly, with the emergence of HIV-symptoms, the individual can no longer use coping strategies such as denial in response to the situation. AIDS becomes a reality and an immediacy. The depression may result from issues which may have been previously avoided, including a confrontation with the possibility of deteriorating health and approaching death.

A common symptom of HIV-illness includes neuropsychiatric complications (Rundell & Brown, 1991), which progress as the disease progresses. Thus, increases in depression may, in part, be biologically based, coinciding with other physical manifestations present in the HIV-disease progression continuum (Hays et al., 1992). However, one cannot exclude the impact of psychosocial factors like the loss of social and familial support, anxiety and fear as additional etiologies in depression. Hays and co-workers (1992) suggest the need for future research to assess the relative contribution of neuropsychiatric as well as psychosocial factors in HIV-related depression.

Rundell and Brown (1990) compared rates of psychiatric illness and levels of psychosocial distress in 48 individuals who had just been notified that they were seropositive and in 41 individuals who had known of their seropositivity for at least a year. Although higher levels of dysphoria and psychological distress were found in the group who had recently been notified of their seropositivity, an important number of psychiatric symptoms occurred in both groups for many months following their respective serostatus notifications. The most common diagnoses for both groups included personality disorders, major depression and alcohol abuse.

Disempowerment and a feeling of helplessness and a loss of control occur as a result of uncontrollable stressors. These include the overt signs of progressive physical and neurological deterioration, the stigmas associated with a positive diagnosis and practical issues like increasing medical costs and the loss of medical insurance (Schneiderman,
These stressors are beyond the individuals control; and in South Africa, are further compounded by social unrest, limited medical support and the lack of suitable housing for a large proportion of the population (Dommisse, 1987). It is necessary to renew a sense of control in HIV/AIDS sufferers at this stage (Noordhof-De Vries, 1989).

Thus, a positive HIV-serostatus notification may be viewed as a potent stressor which, in turn, results in an acute psychosocial crisis after the diagnosis (Noordhof-De Vries, 1989). The subsequent behavioural and psychological sequelae of a positive diagnosis are multifaceted and inter-relate closely with immune functioning. It is imperative to note that coping demands and psychological distress and well-being change over the progression of the illness (Chuang et al., 1989; Hays et al., 1992). Hays and colleagues (1992) reveal that asymptomatic HIV-sufferers and patients with AIDS-related complex experience higher levels of distress than symptomatic AIDS sufferers due to an uncertainty regarding the progression of the illness, the implications of a positive diagnosis and fears of pain and suffering. Health-care workers need to take this into consideration when planning intervention strategies. As the needs and demands of the infected individual differ significantly across the progression of the illness; the psychotherapeutic interventions should also change across the full spectrum of the HIV-illness (Chuang et al., 1989). Bor and colleagues (1992) believe there is always a tension between feelings of hope and hopelessness, certainty and uncertainty; and that so long as a minimum degree of certainty exists, there is an element of hope.

1.6.6 The psychological impact of HIV-seropositivity on women

Contracting the virus evokes the same emotions of disbelief, anger, sadness, fear and so on in women; however, due to their traditional roles as care-givers and child-bearers in society, women are faced with additional complex psychological issues that need to be dealt with.
Often, an infected woman reacts with an overwhelming feeling of isolation. Anderson and Wilkie (1992) suggest that this is due to the fact that seropositive women do not form a homogenous group and, thus, lack a unifying sense of identity. Similarly, society tends to be more intolerant and unaccepting towards women who have contracted a sexually transmitted disease (STD). Thus, the stigma attached to an infected woman can be uncompromisingly harsh at times.

Infected women need to make decisions about bearing children, which can cause conflict between the rights and wishes of the mother and the ultimate rights and welfare of a child who may be born with the virus (Bor et al., 1992). If the woman decides not to have a child, she needs to deal with this additional loss which may add to her feelings of loss of investment in the future. Often, having a child marks a significant stage of development and growth in the woman's life and the family life-cycle. All these decisions are complex and emotive. Anderson and Wilkie (1992) stress the need for more literature which focuses on identifying the specific psychological responses and needs of women.

Many women only discover their positive HIV-status when attending a pre-natal clinic. A seropositive expectant mother experiences panic, fear, indecision and despair which evokes much anxiety and guilt if it is too late to consider termination of the pregnancy. Similarly, new data indicates that certain symptoms of pregnancy such as fatigue might mask the symptoms of HIV-related illness (Wilkie & Anderson, 1992), thus delaying treatment of the illness. However, even if seropositivity is diagnosed in pregnancy, the effects of AZT and other retroviral drugs on the foetus are unknown at present.
Figure 4: The psychological impact of HIV-seropositivity on women

IF ALREADY PREGNANT

- Terminate
- OR
- Too late/decide not to

DECISION TO HAVE CHILDREN

- YES
- NO

LOSSES:
1. Role as mother
2. Role as care-giver (could lead to)
3. Loss of investment in future
4. Potential loss in important stage of growth and development in woman's life and family cycle

GUILT

ANGER DISPLACED
ANGER SELF-DIRECTED
WITHDRAWAL & ISOLATION

LOSS OF SUPPORT

Society views women as more conservative in their sexuality
Harsh stigmas attached to women contracting STD's
Fear
Panic
Indecision

Fear
Panic
Indecision

No common identity
Complicated because don't form a homogenous group

If have children, who will look after them when ill
Not fulfilling traditional role as mother/care-giver
1.6.7 Neurological problems

Fernandez and Levy (1990) characterize dementia as an intellectual impairment recognized by persistent deficits in multiple areas including memory, language, cognition, visual-spatial skills, and personality and emotional functioning. Individuals suffering from dementia frequently report complaints such as forgetfulness, difficulties in attention and concentration, early morning wakening, loss of interest in daily activities, libido, appetite, and so forth. Thus, many early symptoms of AIDS dementia are indistinguishable from clinical depression (Richardson, 1992).

Clinicians may often misinterpret the individual's symptoms as reactive depression in response to having contracted the virus. Conversely, common symptoms of acute anxiety such as chest pains, sweating and diarrhoea may be misinterpreted as physical symptoms of the HIV-disease spectrum.

Diagnosing psychological sequelae of HIV/AIDS is problematic (Miller, 1990). Symptoms could be physical symptoms of the disease itself, or reactive psychological disorders to the illness; or symptoms of both organic brain function and psychological origin such as weight loss which occurs in both the progression of HIV-illness and in clinical depression (Richardson, 1992).

1.6.8 Beneficial outcomes

In a study conducted by Chuang and colleagues (1989), levels of psychosocial distress and well-being were examined in 65 gay or bisexual men infected with the HIV virus. The authors allege that many HI-infected individuals are able to adjust to their medical condition without experiencing any disabling psychosocial problems; and that certain individuals even succeed in maintaining or improving the quality of their lives.
Although most participants in the study experienced high levels of psychosocial distress, this did not appear to compromise the balance of their feelings of well-being so drastically that all positive affect was eliminated. Participants reported a relatively balanced experience of both positive and negative affect.

In a study conducted by Borden and co-workers (1991), 15 young gay male adults with HIV-seropositivity were interviewed regarding their adjustment to their serostatus. The results revealed a range of negative feelings as well as positive outcomes. 14 of the participants reported positive changes and beneficial outcomes following this adverse life event. The negative emotions included heightened feelings of vulnerability, depression, anxiety and demoralization. However, as shown by Chuang and colleagues (1989), negative affect did not eliminate beneficial outcomes such as positive changes in perceptions of the self, core values and life priorities; health-related behaviours and lifestyle; and social relationships.

Chuang and colleagues (1989) believe this fact underscores the importance of integrating both well-being and distress in any one analysis of the psychosocial impact of HIV-illness. Borden’s study shifts the focus from vulnerability and psychopathology to resilience, competency, successful coping and adaptation. Thus, despite the negative sequelae associated with a positive diagnosis, psychological growth and even an improvement on the quality of life has been shown to occur in spite of the traumatic experience of a positive diagnosis (Borden, 1991; Hamilton, 1992).

1.6.9 A proposed model for the psychological reactions to HIV-seropositivity

In coming to terms with a terminal illness, one experiences a number of different emotions which are considered “therapeutic” in order to reach the final stage of acceptance. Similarly, the bereavement cycle follows a pattern of emotions which ultimately transform into acceptance of the original loss along with an increased self-reliance once the cycle
has been completed. By combining the two cycles, a very similar pattern emerges which is common to both cycles (see figure 5). The psychological stability and coping mechanisms used in the past as well as the resiliency of the individual's personality before the trauma or loss, also play a role in determining how the individual will progress through the cycle (Anderson, 1992b).

The emotional reactions as indicated in the cycle are considered adaptive following a major loss or trauma. In order to reach acceptance and self-reliance - the final stage in the cycle - one needs to resolve each stage before moving onto the next stage. Society often plays a role in negatively reinforcing these emotions, thus not allowing the individual to proceed towards acceptance. Therapeutic support may be given in order to facilitate the individual with the completion of the cycle. Often, the person merely seeks confirmation that what he/she is experiencing is a common or normal reaction to the trauma or loss.

Chuang and colleagues (1989) and Kelly and Murphy (1992) believe that the reactions, concerns and psychological themes of HIV/AIDS sufferers are similar to those found in terminally ill cancer patients. Before considering the criticisms and limitations of suggesting a model or cycle of the psychological reactions to an HIV-seropositive notification and subsequent losses, the implications of such a model need to be addressed.

Notes for figure 5 (following page):

* Chuang and colleagues (1989) and Kelly & Murphy (1992) believe that the reactions, concerns and psychological themes of HIV/AIDS sufferers are similar to those found in terminally ill cancer patients.

** Anderson (1992b) describes the loss/bereavement cycle which, when superimposed on the 'coping with a terminal illness cycle'; reveals a very similar pattern.

*** Psychological stability, coping mechanisms in the past and resiliency of the personality/hardiness before the trauma or loss all play a role in determining how the individual will move through the various stages (Anderson, 1992b).
Figure 5: Combining stages in coping with a terminal illness * and the loss/bereavement cycle**

Psychological health & stability***

MAJOR TRAUMA OR LOSS

1. displaced
2. suppressed
3. acknowledged

ACCEPTANCE

increased self-reliance

search for meaning

SHOCK

delayed or immediate

loneliness
meaninglessness
internal conflict

DENIAL

(may be an adaptive response to internal stress)

gradual realization
of real consequences

WITHDRAWAL

UNIVERSITY OF JOHANNESBURG

BARGAINING

PREPARATORY DEPRESSION
One can regard a positive HIV-notification as a major trauma. The subsequent reactions of shock, denial, anger and so forth have already been discussed in depth. The discussion on the beneficial outcomes of a positive serostatus notification (see 1.6.8: Beneficial outcomes), reveal studies by Chuang and colleagues (1989) and Borden and co-workers (1991) in which subjects report resiliency, competence, successful coping and adaptation to the diagnosis. Chuang's study revealed that certain individuals succeed in maintaining or even improving their quality of life, despite experiencing high levels of psychosocial distress at certain stages of the infectious-continuum. Ultimately, subjects reported positive changes in perceptions of self, core-values and life priorities; health-related beliefs and life-style; and social relationships (Borden et al., 1991).

If a certain pattern or cycle of psychological reactions could be identified (see figure 6), which would ultimately result in an improvement in the quality of life of HIV/AIDS sufferers, the implications would be startling. One would be able to facilitate and support sufferers along the cycle, ensuring that each successive stage is resolved.

Keeping in mind that affect influences immunity, the successful completion of the cycle could positively effect the immune system resulting in a prolonged asymptomatic phase. Therapeutic interventions could be implemented in order to facilitate coping. Similarly, due to the fact that the HI-virus effects immune functioning, which is further influenced by various emotions such as anger and depression; the combination of therapeutic interventions with immunotherapy such as AZT or aerobic exercise may enhance the possibility of completing the cycle successfully. Figure 6 reveals a model or cycle which may tentatively describe the stages to be resolved in order to improve one's psychological functioning or quality of life. The cycle incorporates both the grief cycle and the stages involved in coming to terms with a terminal illness, as described by Miller (1990) and Ross (1990). Hereafter, follows a list of potential limitations to the proposed model.
Figure 6: A proposed model for the psychological reactions to HIV-seropositivity

- **Psychological health & stability**
- **Anticipatory period**

**SEROSTATUS NOTIFICATION OR LOSS***

1. displaced
2. suppressed
3. acknowledged

**ANGER**

- isolation
- disempowerment
- search for meaning

**WITHDRAWAL**

from friends/society/family

**DENIAL****

- depression & anxiety
- loneliness, guilt
- intrusive thoughts
- meaninglessness
- helplessness
- internal conflict

**SHOCK**

- gradual realisation of real consequences

**BARGAINING**

**ACCEPTANCE**

1. improve quality of life
2. positive changes in perceptions of self, core values, life priorities, health-related behaviours & relationships*****

**PREPARATORY DEPRESSION**
Psychological stability, coping mechanisms in the past and resiliency of the personality/‘hardiness’ before the diagnosis could serve to play a role in determining how the individual would move through the various stages (Anderson, 1992b).

The anticipatory period prior to testing may be viewed as a potent psychological stressor or trauma; which in itself could result in an adverse impact on mental health (Ironson et al., 1990; McCann & Wadsworth, 1991; Kelly & Murphy, 1992) (see chapter 1.6.3).

A seropositive notification may be conceptualized as a major trauma or loss (see chapter 1.6.3).

Much controversy surrounds the role of denial in coping with a seropositive diagnosis (Reed et al., 1994) (see chapter’s 1.6.9 & 1.7.2).

Chuang and colleagues (1989) and Borden and co-workers (1991) reveal beneficial outcomes following a seropositive notification (see chapter 1.6.8).

The cycle (figure 6) recognizes that the psychological stability of the individual is negatively influenced by the stressful anticipatory period preceding the HIV/ AIDS-test. This additional stressor may be alleviated via certain interventions (see chapter 1.8.4 Cognitive behavioural treatment packages).

It needs to be stressed that multiple losses occur along the HIV/AIDS-disease spectrum. Thus, a positive HIV-notification is merely the first major trauma that initiates the cycle. Uncontrollable stressors such as the inability to work and the loss of familiar roles in society, function as additional psychological traumas. It is not known how often an individual is able to successfully cope with the psychological effects of several simultaneous losses. The individual may have to repeat the cycle many times as each loss occurs.
A list of potential limitations to the proposed model

1. The anticipatory period already serves to negatively impact on emotional stability and health status (see chapter 1.6.2 Stress and anxiety).

2. HIV/AIDS infectious continuum is unpredictable (see chapter 1.2.3 Clinical expression of HIV/AIDS).

3. Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) is a disease which affects immunocompetence, which in turn, impacts on psychological functioning (see chapter 1.7.1 Psychoneuroimmunology).

4. Issues relating to depression vary greatly depending on the stage of the illness (see chapter 1.6.5 Depression, distress and helplessness).

5. Misdiagnosis of psychological reactions and/or disorders frequently occur because the HIV virus has the ability to enter the brain; negatively impacting on affect and cognitions. Therefore, a physiologic or neurological explanation or etiology may be the basis for various emotions (see chapter 1.6.7 AIDS-related dementia or AIDS Encephalopathy).

6. Multiple losses occur along the disease spectrum (Schneiderman, 1992).
   Additional (multiple) losses include:
   6.1 physical abilities
   6.2 friends/lovers etc.
   6.3 physical beauty
   6.4 mental functioning
   6.5 familiar roles in society, family, workplace
   6.6 support systems
   6.7 loss of sense of community

7. There is a stigma attached to Sexually Transmitted Diseases (STD's) and HIV/AIDS by society (see chapter 1.6.4 Stigmatization).

8. Realistic acceptance may serve to decrease survival time (see chapter 1.6.9).
Unique stressors such as a prolonged experience of uncertainty (Borden, 1991) and consequently, the fear of the unknown, also impact upon the entire cycle; as does the variability of the disease (Anderson & Wilkie, 1992). The individual may experience acute periods of illness interspersed with long periods of well-being. Furthermore, the stigma society attaches to HIV/AIDS and other sexually transmitted diseases intensify feelings of isolation and rejection, thus complicating emotions of guilt, anger and so on. Ross (1990) believes that stigmatization is so powerful that the psychological reactions to HIV-seropositivity are often related to the stigmatization rather than to the possibility of death.

There is much controversy surrounding the issue of denial, and it's impact on immune responsivity. Authors like Miller (1990), Ross (1990) and Kelly and Murphy (1992) characterize acceptance as the final stage, immediately preceding death in models that deal with 'coming to terms with a terminal illness'. They argue that acceptance is psychologically adaptive, allowing the individual to come to terms with one's deteriorating condition and eventual death. However, others have argued (Taylor et al., 1992; Reed et al., 1994) that positive illusions or beliefs that represent the self and one's future as more positive than is actually the reality, may be more adaptive than realistic beliefs.

A recent article by Reed and co-workers (1994) points to a totally different approach to the effect of positive and negative emotions on immune responsivity. In a study of the effects of psychosocial variables to survival time in AIDS, Reed and colleagues (1994) found that the primary factor previously thought to be associated with improvements in health and therefore, improvements in immune responsivity, namely realistic acceptance or conceptualized as stoic acceptance by Greer et al (1979), Peetingale et al (1985) as well as Antoni and Goodkin (1988), was inversely related to morbidity and mortality in HIV-positive persons. It would appear that the absence of stoic acceptance or realistic acceptance would be associated with increased survival time.
From this it can be deduced that immune responsivity is improved in the absence of realistic or stoic acceptance and is thus enhanced by denial and positive illusions of well-being in HIV-positive persons. It would therefore appear that coping with AIDS is different, on a psychosocial level, from coping with other illnesses with high morbidity and mortality on an immunological basis, namely cancer.

It is possible that buffering against the stress of the knowledge of having AIDS is moderated by the effects of non-realistic approaches to the eventual mortality in each individual (Reed et al., 1994). It would seem then that the presence of positive illusions or denial would act as a strong predictor of the effects of positive and negative emotions on immune responsivity. Thus, the need to realistically accept one's diagnosis in order to increase survival time, as stipulated in traditional models concerning 'coping with a terminal illness', requires revision in the context of AIDS.

It is clear that the model is too simplistic to include all the aspects related to the psychological impact of HIV-seropositivity. However, future research could aim to examine the stages in more depth; taking into account the limitations identified. The development of a model which may be used as a reference in the management of the psychological needs of HIV/AIDS-sufferers needs to include the immunologic effects of HIV-seropositivity; as the illness is both a psychological and an immunologic disease.
1.7 THE INTER-RELATIONSHIP BETWEEN PSYCHOLOGICAL AND IMMUNOLOGIC VARIABLES

1.7.1 Psychoneuroimmunology

The field of psychoneuroimmunology attempts to examine how stress may influence immunologic processes. It has evolved as a defined multidisciplinary field which deals with the complex bi-directional interactions of psychological factors such as emotions and behaviour, the central nervous system and the immune system (Hall & O'Grady in Mays et al., 1989). The field is concerned with identifying mediating mechanisms by which psychosocial factors; which are associated with initiation, severity and progression of certain diseases; might plausibly be linked to disease processes (Coates et al., 1984).

The recent advances in the field of psychoneuroimmunology have given firm support to the original theoretical position of a rather close correlation between certain psychological variables and immunologic measures (Jemmott & Locke, 1984; Weisse, 1992). In this regard, it has been shown by numerous researchers that changes in psychological status would cause and/or correlate with changes in immunologic status. A wide range of acute psychosocial stressors have been associated with corresponding decrements in immune function, especially cell-mediated immunity (Ironson et al., 1990).

It seems logical to assume that when an individual is exposed to an infectious pathogenic agent, that the individual will develop the disease caused by that agent. However, this assumption is inaccurate. Firstly, the individual must be susceptible to the disease; and secondly, among those susceptible, only a fraction of those infected with the pathogen actually develop the full clinical illness (Jemmott & Locke, 1984). The argument is that it is not stress that produces an infection, but that stress impairs immunologic functioning and renders the individual more likely to develop the disease if exposed to the infectious agent.
Thus, psychological conflict, anxiety and stress can enhance and hasten disease processes (Pennebaker et al., 1988; Bell, 1991). A competent immune system ensures health via protecting the host from pathogenic processes by promoting health and recovery from illness and injury (Weisse, 1992). If an individual's immune system is functioning satisfactorily, it may not be possible to enhance immune functioning above normal levels. Kiecolt-Glaser and Glaser (1992) allege that an overactive immune system may in fact lead to autoimmune disease, which could be maladaptive. By examining the effects of the inter-relationships between psychological and immunologic variables, clues may be provided regarding the role of affect in the etiology and course of disease states.

Jemmott and Locke (1984) question how stress may negatively affect health. Although literature suggests that stress impairs a facet of immunologic defense creating a greater susceptibility to disease, Jemmott and Locke (1984) question the clinical significance of stress-induced diminished immunocompetence. Firstly, they suggest that most aspects of the immune system used as indices of immunocompetence are clearly critically important components of host defense. It follows logically that if these functions were impaired, the host would be more vulnerable to disease. However, more research is required in studies regarding stress and immunity in order to demonstrate this assumption. Even if immunocompetence indices are related to the incidence of disease, it still remains unclear whether decrements in immunologic functioning following stress and exposure to a specific pathogen, would actually result in the full clinical disease.

Coates and colleagues (1984) suggest four heuristic models for the causation of immunosuppression as observed in immunologically-related diseases such as cancer and AIDS. The first model simply links stress to immunosuppression, which is linked to a predisposition to immunologically-related diseases. The second explanation includes a broader range of psychosocial factors besides stress which may affect immunity. The third model involves the conception of conditioned learning and it's effect on immunologically-related diseases. Finally, a multifactorial biopsychosocial approach is adopted which takes into account the interaction of genetic, environmental and psychosocial factors in the
The pathogenesis of all diseases. These interacting variables may temporarily enhance immunity at times; may predispose the individual to disease onset; or may influence the course of the illness once contracted; perhaps resulting in an acquired immunodeficiency (Mays et al., 1989).

In human psychoneuroimmunologic research, the underlying assumption is that if a behaviour change is observed in a group and a subsequent change in immune function occurs, that this immune change is due, to some extent, to the psychological variable manipulated by the investigator (Weisse, 1992). However, this assumption may be rejected if differences in other confounding variables such as substance abuse or quality of sleep may be equally, or even more accountable for the observed immunologic changes.

Jemmott and Locke (1984) propose that researchers examine multiple indices of immunocompetence and not merely the effects of stress on immunity due to the evidence indicating that stress can be associated with both immunologic depression and immunologic enhancement. Immune responses are complex and dynamic; a characteristic which is lost in static, one-time, single-immunologic-index research designs (Jemmott & Locke, 1984).

Even though particular studies may be criticized methodologically, one cannot fail to conclude that stress plays a critical role in the etiology of immune-related diseases as evidenced in the considerable amount of available literature. Similarly, stress has the ability to affect parameters of immunologic functioning. The available research in the field of psychoneuroimmunology covers a diverse field. Numerous illnesses have been examined using a variety of immunologic variables as well as many psychosocial measures such as examination stress (Kiecolt-Glaser et al., 1984; Valdimarsdottir et al., in press), social support (Hofer, 1984; Kiecolt-Glaser, 1984; Theorall et al., 1990), depression (Darko et al., 1991; Weisse, 1992), academic pressure (Meyerhoff et al., 1988) and life changes (Locke et al., 1984).
1.7.2 Stress, psychological distress and immunity

Research done on animals subjected to uncontrollable stressors has revealed immune system decrements including a decrease in natural killer (NK) cell activity and suppressed lymphocyte proliferation (Antoni et al., 1990b). Human studies have revealed that anxiety and depression tend to inhibit immune responses (Locke et al., 1984); both of the humeral and the cellular kind, notably the lymphocytes and the immunoglobulins. It has also been found that specific kinds of depression, such as that induced by learned helplessness, would induce even greater changes in immunologic status (Wolff & Roux, in press). On the other hand, changes in psychological status to a more positive emotion is often associated with an improvement in immunologic reactivity (Esterling et al., 1990; Borden, 1991).

Kiecolt-Glaser and colleagues (1984) examined the effects of a naturally occurring stressor on components of the immune system in a healthy adult population. Blood was drawn from first year medical students one month prior to final examinations and on the first day of the examination period. NK cell activity decreased significantly across this period, and a strong correlation was revealed between decreased NK cell activity and high scores on stressful life events and loneliness. The significant association between stressful life events and NK cell activity lends greater credence to the belief that an accumulation of stressful life events can have negative consequences on health status.

Heisel (1986) compared NK cell activity and MMPI scores in 111 healthy college students. The results indicated correlations between NK values and psychopathology on 10 of the 12 MMPI scales. Students with the highest NK values obtained the healthiest MMPI scores. Heisel's (1986) study supports the theory of an interaction existing between mental states and immune states. However, the mechanisms of the interaction as well as the direction of the interaction remain largely unclear.
Meyerhoff and co-workers (1988) demonstrated that a psychosocial stressor such as a competitive oral examination has the ability to rapidly activate physiologic and biochemical indices of arousal in healthy young males. As part of their training and preparation for promotion examinations, the military encourage soldiers to enter 'Soldier of the Month' contests; which consist of vigourous, structured interviews before a panel of senior officers. Eleven of the male contestants volunteered for the study which involved consent to monitor their heart rates and to draw blood samples. The study revealed increases in heart rate and in plasma levels of epinephrine, norepinephrine and cortisol as a result of the stressful social interaction.

Depressed mood may increase susceptibility to illness via aberrations occurring within the immune system. Immunocompetence is lower in people with depressive symptomatology (Weisse, 1992). Linn and colleagues (1984) examined the relationship of depression and the occurrence of a stressful event to immune functioning. It was found that the higher the degree of depression, the lower the lymphocyte responses to mitogens (Darko et al., 1991), and the lower the NK cell activity (Weisse, 1992). Calabiese and colleagues (1987) note that the immunologic abnormalities associated with depression are very similar to those seen in the bereaved and in chronically stressed people.

The literature reveals that indexes of immunocompetence are lower among people exhibiting depressive symptomatology. Weisse (1992) stresses the need for further research and investigation concerning depression and it's role in altering immune states due to the large number of people who suffer from depression while sick with chronic illnesses and immune-related disorders like cancer and AIDS. Immunologic disturbances arising from depression may increase susceptibility to disease or prolong any existing medical problems.

Weisse (1992) provides a review of the literature and empirical studies concerning depression and immunocompetence.
The studies suggest that altered immunity among patients with major depressive disorder may be related to age, diagnostic sub-type and/or hospitalization status. That is, a hospitalized older patient suffering from bi-polar depression reveals more severe immune aberrations than a younger, uni-polar, non-hospitalized patient. This may, in part, be due to the premise that the former suffer from more severe depressive symptomatology. Thus, Weisse (1992) concludes that immune changes are more a function of the severity of depressive symptomatology than of a specific situation or event.

However, the precise mechanisms underlying the relationship between depression and immunocompetence remains unclear. Changes in sleeping patterns, nutritional status and alcohol/drug use -which usually accompany the diagnosis of depression- may also play a role in accounting for the observed depletions in immunologic functioning (Weisse, 1992). This highlights the importance of including assessments of health-related behaviours such as cigarette smoking, exercise and sleep when conducting a study examining such a relationship. This would allow researchers to establish the extent to which these variables may contribute to the observed immune changes.

Bachen and colleagues (1991) examined the relationship between the expression of negative affect, such as depression and anger, versus the harbouring of negative affect, and quantitative aspects of cellular immunity. The immunological measures included: the levels of circulating T- lymphocytes (CD3+), T- helper lymphocytes (CD4), T- suppressor lymphocytes (CD8), NK cells and T- helper: suppressor cell ratio (CD4:CD8). The Beck Depression Inventory and the Spielberger Trait Anger and Anger Expression Scales were administered to measure depression and anger respectively. The study revealed that the expression of negative affect resulted in a higher CD4:CD8 cell ratio, which is indicative of cellular immunocompetence. In contrast, the harboring of emotions such as depression and anger, that is, a lack of emotional expression, resulted in higher levels of CD8+ cell counts and reductions in CD4:CD8 cell ratios. From the study, it can be deduced that the expression of negative affect has a more positive effect on the immune system than the lack of expression of negative affect, such as anger.
The results of Bachen and co-workers (1991), however, do not explain the mechanisms or direction of the interaction between psychological states and immune parameters. Bachen and colleagues (1991) recommend that other factors need to be investigated as potential mediating factors, such as the influence of health behaviours, nutritional status and so on, in predisposing the individual to experience and express negative emotional states.

A further complexity regarding the study of depression and immunocompetence is the possibility that depression could be the result, rather than the cause, of altered immunity. Schindler (1988) characterizes an emotion as a state of mind that manifests because of changes in the body. Thus, an emotion is a very fundamental biological change. Depression may occur as a reaction to major life experiences; but immune processes could be affected even before the development of the depressed mood.

Theorell and colleagues (1990) examined the role of social support, including its availability and adequacy, job strain, and levels of immunoglobulins in the blood of working adults. It was shown that levels of immunoglobulins increased with increases in job strain. However, this did not occur in those subjects with adequate social support. Subjects who reported adequate levels of social support, did not reveal as much job strain and thus showed lower levels of immunoglobulins. The more inadequate the social support, the higher the reported job strain and, consequently, the more immunoglobulins in the blood. An issue which Theorell and co-workers (1990) identify as important for future studies, is whether good social support from friends and family will protect against changes in immunoglobulin levels despite a deterioration in job situation.

Bui and co-workers (1990) investigated the impact of stress and positive social ties on immunologic functioning in a sample of 58 elderly adults. A modest association emerged between positive social ties and enhanced immune functioning. Of importance is the finding that social stress such as loss, conflict or demands from others, predicted immune functioning more accurately than global stress measures or non-social stress such as
financial difficulties or moving. This highlights the positive role of social support in ameliorating the adverse effects of stress on the immune system.

Kiecolt-Glaser (1984) examined the associations between loneliness, urinary cortisol levels and immunocompetency. Urine and blood was taken from 33 psychiatric inpatients the day after admission. The UCLA Loneliness Scale, the Life Events Scale and the MMPI were completed by each of the patients. Kiecolt-Glaser (1984) found that patients who reported high levels of loneliness revealed higher urinary cortisol levels, lower NK cell activity and poorer T-lymphocyte responses.

Jemmott III and Maglorie (1988) examined social support and it's effect in relation to salivary concentrations of secretary immunoglobulin A (S-IgA) in 15 healthy undergraduate students. S-IgA is an antibody class that plays an important role in mucosal defense against acute upper respiratory tract infections. S-IgA concentrations were analyzed 5-days prior to the final exam, during the exam, and 2-weeks after completion of the examination. It was hypothesized that social support serves to enhance health outcomes irrespective of the stressful experience the individual is exposed to. The findings revealed that the students with greater social support had consistently higher S-IgA levels than students with less social support. However, it needs to be stressed that individual differences be taken into account. That is, individual needs for social support vary, and the greater the support- relative to individual needs- the greater the S-IgA levels.

The above demonstrations of a significant association between loneliness, or a lack of social support, and cellular immunocompetency in three very different populations, namely inpatients (Kiecolt-Glaser, 1984), students (Jemmott III & Maglorie, 1988) and working adults (Theorell et al., 1990), provides evidence for the impact of loneliness, or a lack of social support, on health and immunocompetence.
Social support has been recognized, for many years, as a psychosocial factor that may serve to protect individuals from adverse health effects caused by stress, that is, a buffering effect against stress; and secondly, as having a more direct effect by directly promoting health and longevity (Theorell et al., 1990).

Locke and co-workers (1984) and Wolff and Roux (in press) allege that although stress plays an important role in immune responsiveness, it only accounts for a partial amount of the variance attributable to psychosocial factors. Locke and colleagues (1984) showed that self-reported psychiatric symptoms were inversely correlated with NK cell activity suggesting that symptoms like anxiety and depression may negatively affect immune functioning. Life change stress alone did not seem to affect NK cell activity; only when combined with psychiatric symptomatology. Thus, it is how one responds to stress and not the specific stressful event, which determines the impact on immunity (Linn et al., 1984; Locke et al., 1984).

Much controversy exists surrounding the consequences of employing denial coping strategies in stressful situations. Carver (in Antoni et al., 1990a) alleges that denial helps to minimize stress and to facilitate coping. However, others claim that denial and inhibition may magnify the seriousness of the stressor, thereby impeding future active coping responses (Pennebaker & Beall, 1986; Pennebaker et al., 1988; Bell et al., 1990; Esterling et al., 1990).

Pennebaker and colleagues (1988) allege that inhibition and denial require physiological work which places cumulative stress on the body thus increasing the probability of stress-related diseases. The active confrontation of an upsetting experience is hypothesized to reduce the negative effects of inhibition and to result in improvements in physical health. In a further study, Esterling and co-workers (1990) showed that inhibiting the expression of emotional material related to traumatic life experiences led to poorer control of the latent Epstein-Barr virus.
Similarly, Bell and colleagues (1990) concluded that extreme degrees of social introversion in adults and shyness in children, namely behavioural inhibition, lead to the higher prevalence of allergies, such as hayfever, as well as higher degrees of depression and fearfulness.

If depression, anxiety and other psychosocial variables can interfere with optimal immune functioning, they may interfere with healing processes or host defenses against other potential health hazards (Weisse, 1992). Thus, psychosocial interventions need to be utilized with people who have serious or chronic illnesses in order to avoid any further compromising of health status.

1.7.3 HIV/ AIDS-infection and immunity

Coates and colleagues (1984) and Brown (1992c) question why only certain individuals in the commonly cited risk groups develop AIDS. It has been suggested that many healthy people have already been exposed to the HI-virus, but are able to resist it. Joyce (1988) speculates that this could be due to one of three factors. Certain carriers may have a greater volume of the virus in their body fluids than others, thus transmitting the virus more easily. It is also hypothesized that an individual’s level of infectivity may vary over time as do the supplies of antibodies to the virus. Finally, it is questioned whether susceptibility lies with the individual host.

Levy & Ziegler (in Coates et al., 1984) propose that AIDS itself is an opportunistic infection causing disease only in those who are already immunocompromised. It has also been hypothesized that stress may in fact activate HIV from a latent to a rapidly replicating state which in turn alters the incidence, severity and course of the disease (AIDS Monitor, 1989). This may explain why the progression of the syndrome varies so widely among individuals and is so difficult to predict (Borden, 1991).
Antoni and colleagues (1990b) suggest a stressor-related immunomodulatory effects model whereby differences in stress, individual make-up and life-styles may influence susceptibility to HIV-infection resulting in a flow of psychosocial, immunologic and neuroendocrine events which could accelerate HIV-disease progression. This may also explain why certain individuals contract AIDS within a short period of time after only brief exposure.

The inter-relation between behaviour, immune functioning and HIV-1 disease progression is not yet fully understood, although it is believed that such a relation does exist (Antoni et al., 1990b). As already discussed, literature reveals a relationship between naturally and experimentally induced stressors and immunologic functioning. Psychological variables such as depression (Weisse, 1992) and feelings of helplessness (Wolff & Roux, in press) have been associated with altered immunologic functioning. Secondly, studies exist associating psychosocial distress with the progression of HIV-1 infections (Antoni et al., 1990a). It has also been shown that both the anticipation and the impact of being informed of one's HIV-antibody status influences immune functioning in seronegative and seropositive gay men.

Antoni and colleagues (1990a) examined the role of potential mediators on the immunomodulatory effects of the stressful anticipatory period prior to serostatus notification. Subjects showed significant elevations in plasma cortisol at study entry as well as changes in affect and cognitive responses regardless of serostatus identification. Both the HIV- and HIV+ subjects revealed lower NK cell activity and decreased lymphocyte responses. HIV+ subjects also shown lower CD4 cell counts and lower helper-inducer subset counts. It has been suggested that HIV- subjects may have showed a suppressed cell-mediated immune function due to being identified as part of the high risk group and experiencing the stressful anticipatory period (Schneiderman, 1992). Thus, the decision to learn of their serostatus and therefore to confront their perceived risk of infection was functioning as an acute psychosocial stressor.
Finally, it has been shown that immune enhancement occurs in HIV-1 seronegative and seropositive individuals after completing a 10-week aerobic exercise training program (Antoni et al., 1990a; Schneiderman, 1992), providing further evidence for the relationship between psychological and immunologic functioning (Folkins, 1976; Holmes, 1984).

Antoni and colleagues (1990a) assessed psychological and neuroendocrine measures related to functional immune changes in anticipation of HIV-1 serostatus notification. Forty-six gay males were recruited; who were ultimately shown to be seronegative. An important aim of the study was to assess the contribution of the denial coping strategy and its immunomodulatory effects on the stressful anticipatory period. The COPE was used to measure the tendency to refuse to believe in the existence of a stressor or acting as though the stressor isn't real. The results of the study suggest that the denial of a stressor may in fact buffer it's delirious effects. Denial seemed to shield at-risk individuals from ruminating about their perceived risk of infection. However, the consequences of employing denial coping strategies in stressful situations remains a subject of much controversy. Although it may function to reduce and buffer stress in the short-term; it is speculated that it may impair psychological and immunologic functioning if employed as a long-term coping strategy.

Although theoretical accounts of adaption in the terminally ill suggest that realistic acceptance of one's illness is adaptive, a recent article by Reed and co-workers (1994) suggest that such a response is associated with increased mortality. In a study of the effects of psychosocial variables to survival time in AIDS, Reed et al (1994) found that the primary factor previously thought to be associated with improvements in health and therefore, improvements in immune responsivity, namely realistic acceptance or conceptualized as stoic acceptance by Greer et al (1979), Peetingale et al (1985) as well as Antoni and Goodkin (1988), was inversely related to morbidity and mortality in HIV-positive persons. It would appear that the absence of stoic acceptance or realistic acceptance would be associated with increased survival time.
76 gay men infected with the AIDS completed a detailed psychosocial questionnaire, in which it was found that the response pattern of Realistic Acceptance, was a significant predictor of decreased survival time. Those with lower scores on realistic acceptance had a survival time of 9-months longer than those with higher scores.

From this it can be deduced that immune responsivity is improved in the absence of realistic or stoic acceptance and is thus enhanced by denial and positive illusions of well-being in HIV-positive persons. It would therefore appear that coping with AIDS is different, on a psychosocial level, from coping with other illnesses with high morbidity and mortality on an immunological basis, namely cancer. This has important implications for the helping professions. Given that medical science as yet has not found a cure for AIDS, and that the extent to which the available treatments are able to slow disease progression are limited (Reed et al., 1994), any contribution to survival time is potentially important.

The nature of the various affective, cognitive, behavioural and biochemical correlatives of employing a coping mechanism such as denial, requires much exploration (Reed et al., 1994). Likewise, the relationship of denial to other psychological processes as well as to the quality of life, health outcomes and so on, need further research.

HIV-1 infection may be viewed as a chronic disease with clinical sequelae such as opportunistic infections, neuropsychiatric complications and neoplasias associated with psychosocial distress; all representing manifestations of an underlying immune system deficiency (Antoni et al., 1990a; Rundell & Brown, 1990). The effects of the Acquired Immunodeficiency Syndrome on the immune system provides a natural laboratory for studying the relations between behaviour, immuno-modulation and immune-related disease processes. It seems viable to accept the assumption that behavioural factors may serve to further negatively impact immune functioning. This stresses the importance of early immunomodulatory interventions that may help restore competence and halt HIV-1 disease progression at an early point in the HIV-1 infectious continuum.
1.8 THE TREATMENT OF HIV/AIDS AND RELATED STRESS

1.8.1 Introduction

Although progress is slow in developing curative drugs and vaccines against the virus, Schoub (1992) alleges that no other human disease has produced such an immense amount of published literature or has been so intensely studies in such a short period of time. Many of the clinical complications encountered in the daily lives of HIV/AIDS-sufferers are treatable and may improve both the quality of life as well as the life expectancy of the individual. In all cases, an early diagnosis and commencement of treatment encourages favourable outcomes.

Treatment of the biologically complex virus still poses substantial problems. McMillan (1992a) mentions the fact that secondary infections and HIV-related complications are often unusual; more subtle in their onset, yet more severe in their clinical manifestations than in non-infected individuals. Certain treatment regimes are toxic and difficulties are encountered in administering the drugs. The HIV/AIDS-sufferer tends to respond more slowly to specific treatments or therapies and often exhibits a higher frequency of adverse drug reactions as compared to the non-infected individual.

Given that AIDS is spread by social behaviour, the treatment of the disease should not only highlight the medical issues, but equally important, attempt to meet the complex psychological, social and emotional needs of the individual (Byrne, 1989; Miller, 1990; Kriel, 1993). This doesn't imply that clinicians deny the validity of the biomedical paradigm, but that treatment perspectives involve a more holistic or ecological understanding of the disease. As more effective treatments and vaccines for the virus become more likely, so do the need for subjects to take part in clinical drug trials and research studies (Bor et al., 1992), which in themselves, pose additional stress on HIV/AIDS-sufferers.
However, these are the means to test treatment efficacy and an essential feature of medical and/ or psychological practice. As indicated by Rousch and Bateson (in Bor et al., 1992, p.74), "... the theorist (scientist) can only build his theories (hypotheses) about what the practitioner was doing yesterday. Tomorrow the practitioner will be doing something different because of these theories."

1.8.2 Antiretroviral treatment

Although there is no single ideal drug against HIV- infection and no known treatment for the underlying immune deficiency associated with AIDS, it has already been discovered that more than 100 various agents inhibit the growth of the virus (McMillan, 1992a). In addition, 11- vaccine candidates are currently undergoing trials at various centres throughout the world (Schoub, 1992). Recent experimental research has shown that the anti-inflammatory properties of aspirin have the ability to slow down HIV-replication in vitro (Stone, 1993). This occurred in a sample of 46 HIV-positive individuals who exhibited a reduced amount of the virus in their blood after undergoing a clinical trial.

Zidovudine (AZT), formerly known as Azidothymidine, is an antiviral agent which has been shown to prolong life for several months by reducing the risk of contracting opportunistic infections (Dangani, 1987; Schopper & Walley, 1992). It is the first antiviral agent shown to be clinically effective and is licensed for use in treatment (Hager & Liotta, 1991). Double-blind placebo controlled studies have repeatedly and convincingly shown that AZT reduces mortality and the frequency of opportunistic infections in individuals with AIDS or HIV-related illnesses (McMillan, 1992a). Individuals exhibit an improvement within a few weeks, including a decrease in fatigue and opportunistic infections, and an improvement in neurological symptoms.
When the HI-virus infects a cell, it can only replicate by converting it's genetic material RNA into DNA with the help of an enzyme called reverse transcriptase. AZT interferes with this reverse transcriptase activity by slotting itself into the chain of nucleosides in place of thymidine, thus inhibiting the building of the viruses DNA (Brown, 1991a). Thus, AZT is only effective in inhibiting the onward spread of the virus from cell to cell, but has no effect on cells already infected (Bor et al., 1992).

Knowledge that the HI-virus is active in the brain has important implications for treatments. It is estimated that at least 60% of AIDS sufferers will suffer from dementia before they die (Ferry, 1987). AZT, unlike many other drugs, has the ability to cross the blood-brain barrier.

Asymptomatic HIV-sufferers receive medical care based on their CD4 cell counts. However, clinicians are wary of prescribing AZT early in HIV-infection due to the absence of data on the long-term efficacy of the drug and the potential risk of developing a viral resistance to AZT. There is clear evidence that AZT delays the progression of the disease in symptom-free individuals whose immune systems have deteriorated beyond a specific point as measured by the number of CD4 cells in the blood. However, it has also been found that after a long period of treatment, strains of the virus that are resistant to AZT, tend to appear in the individuals blood (Brown, 1991a).

Much of the publicity surrounding the IXth International Conference on AIDS in Berlin in June 1993, reported the null results of the use of AZT in asymptomatic sufferers and the possibility of the antiretroviral benefits being short-lived (Kuhn, 1993; Schoub, 1993).

The combination of AZT with DDI (dideoxinosine) and ddC (2',3'-Dideoxyoxtidine) have been shown to reduce resistance and to enhance the effectiveness of antiviral therapy (McMillan, 1992a; Schoub, 1992). Ongoing research and clinical trials of this sort are currently in progress.
Aside from having unpleasant side-effects, AZT is limited in its usefulness due to its high cost. The side-effects range from physiologic effects like bone marrow suppression, headaches and nausea to psychological effects such as depression (Antoni et al., 1992b). In certain patients with severe HIV/AIDS-infection, a depression in the production of red blood cells may result in anaemia which requires a blood transfusion; and sometimes, the cessation of treatment (McMillan, 1992a). In addition, elaborate patient monitoring is necessary due to drug toxicity (Schopper & Walley, 1992).

The South African Control Council has just recently approved HIVID, a drug which contains ddC for the treatment of individuals with advanced HIV-infection who are displaying signs of immunologic deterioration (AIDS Research/News Flashes, 1993). HIVID may be used in patients who have not responded, or are intolerant to, AZT; or the product may be used in combination with Retrovir (a drug containing Zidovudine).

Standard antidepressants may be recommended in an attempt to control the depression associated with the diagnosis of HIV-seropositivity. However, it is imperative to evaluate whether the depression is reactive, that is, an appropriate reaction to the diagnosis, or whether it warrants a more serious diagnosis (Noordhof-De Vries, 1989). Drugs such as tricyclics, stimulants and anti-psychotics are occasionally prescribed to deal with the psychological effects of the illness. Anti-psychotics have been shown to aid in decreasing the psychotic symptoms which emerge in seropositive individuals with organic mental disorders (Busch & Maxwell, 1990). The pharmacological treatment of opportunistic infections differs according to the opportunistic disease resulting from the virus.

Busch and Maxwell (1990) mention the difficulties associated with the administration of drugs in seropositive patients. These difficulties arise as a result of the AIDS wasting syndrome and the severe diarrhoea exhibited by many HIV/AIDS-sufferers; which doesn't allow for much absorption of the drug. There is little muscle mass available for injections which makes the route of administrating the drug problematic for clinicians.
Due to the fact that AIDS, thus far, is always terminal and that drugs with serious side-effects exist which may only delay death, health economists at the University of York have questioned the logic in spending vast sums of money on drugs such as AZT (AIDS Monitor, 1988b). The World Health Organisation programme for AIDS has been criticized in the past for spending too much money on AIDS, and ignoring other killer diseases such as malaria and polio in the developing countries (Kingman, 1989). Ethical dilemmas such as these are encountered daily while researchers and clinicians search for an effective vaccination against the virus.

1.8.3 Counselling and/ or psychotherapy

In the past, the main focus of HIV/ AIDS management has been concerned with pathology and medical symptoms due to the urgency to find a vaccine and a cure. Recently, however, greater emphasis has been given to the social and psychological aspects of the disease (Pizzi, 1990). If psychological distress such as anxiety, depression and stress can interfere with proper immune functioning, it may interfere with healing processes or host defenses; thus psychiatric interventions should be indicated for individuals suffering from chronic illnesses in order to avoid further compromising of health status (Weisse, 1992).

Counselling and psychotherapeutic interventions serve to enhance the immune system and to decrease stress-related immune responses (Pennebaker & Beall, 1986, Pennebaker et al., 1988, Rundell & Brown, 1990, Kelly & Murphy, 1992 & Lutgendorf et al., 1992). Social support has been shown to buffer the impact of a variety of stressful life experiences (Hays et al., 1992 & McCann & Wadsworth, 1992). The enhancement of immune functioning may occur via psychological interventions, implicating a reciprocal relationship between the body and the mind (Kiecolt-Glaser & Glaser, 1992).

Pennebaker and Beall (1986) showed that confiding in others about a traumatic event is associated with reduced incidences of stress-related disease; whereby coping information is collected from others and the individual is aided in organizing, assimilating and
comparing aspects of the trauma with others. The social support network provided in a
group therapy session aids in buffering the adverse effects of stress (Pennebaker et al.,
1988).

Bor and colleagues (1992) stress the importance of counselling HIV/AIDS-sufferers. Their
motivations involve three main assumptions. Firstly, most HIV/AIDS-sufferers will
inevitably or invariably experience psychological or social difficulties which may emerge
at varied stages along the infectious continuum. Secondly, as with any ongoing debilitating
illness, medical or physical problems have implications for the individuals relationships as
well as the individuals view of him or herself. Finally, the authors conclude that care-givers
should be aware that illness affects people in different ways, and it is important to identify
the meaning each individual attaches to the disease. However, due to the unpredictability
and complexity of the HIV/AIDS-continuum, it is often difficult to provide permanent
solutions. This is further complicated in a country like South Africa, where most of the
population is subjected to violence daily and additional, more immediate problems such
as transport, housing, poverty and so forth (see chapter 1.4: HIV/AIDS in South Africa). Thus, if
possible, alternatives should be offered while keeping the larger context in mind when
attempting to create emotional relief in HIV/AIDS-sufferers.

McCann and Wadsworth (1991) conducted a study reporting the experiences of 252 gay
men who had an HIV-test which proved to be positive. Respondents in the study stressed
the need for information about what to expect in the future, how to prepare for it or adjust
their lifestyle to accommodate the disease, how to stay healthy as well as basic
information about the virus. Gathering information regarding AIDS may be stress-reducing
in that it contributes to a sense of control and predictability over one's situation.
1.8.4 Cognitive behavioural treatment packages

Cognitive behavioural stress management (CBSM) packages produce improvements in psychological and physiological functioning. CBSM interventions have been shown to buffer post-notification depression levels and to increase NK cell activity and CD4 T-lymphocyte cell counts (Antoni et al., 1990a). By identifying potential sources of stress and actively dealing with this stress, both the emotional and the physical health of the individual receive beneficial results (Anderson, 1992b).

Kelly and colleagues (1989), Ostrow (1990a), Brown (1991) and Harris et al (1991) allege that behaviour change is the only way to control the spread of this infectious disease. Underlying cognitive behavioural risk reduction interventions is the presumption that the individual, once appropriately risk sensitized, is able to learn more effectively to alter risk behaviour patterns after acquiring the appropriate behavioural capabilities for change implementation (Kelly & Murphy, 1992). By initiating and maintaining changes in coping style, changes are likely to occur in affective state; as coping style is often related to the affective state of the individual (Kelly & Murphy, 1992). Thus, cognitive therapy and coping training approaches are recommended to help HIV/AIDS sufferers to cope with depressive symptomatology by enhancing perceptions of control, increasing hope and aiding in more adaptive functioning.

Ostrow (1990b) incorporates a psychosocial model of the behavioural consequences of AIDS. The model identifies certain motivations necessary to alter the behavioural responses to AIDS and is very similar to the health belief model as described by Carmel (1990/1991) and Anderson (1992a). The model includes, firstly, the individuals beliefs in the efficacy of behavioural change to alter risk behaviour; knowledge concerning skills for maintaining behavioural change; and thirdly, perceptions of peer and societal support for those changes. Finally, the model includes the availability of services to provide support to the individual for maintaining behavioural changes.
Kelly and St. Lawrence (1986) divide behavioural interventions related to HIV/AIDS into two categories which would take on different forms. Firstly, interventions focusing on prevention or health maintenance for presently healthy but at-risk individuals; and secondly, interventions geared towards the growing number of HIV-infected persons, or people with clinical AIDS. Kelly and St. Lawrence (1986) state that many interventions fall within the realm of traditional individual psychotherapy; and stress that it is unlikely that most individuals will seek these options to alter their high-risk behaviour. Similarly, the authors allege that the traditional approaches are limited as they cannot accommodate the huge number of infected people or persons at high-risk for contracting the HI-virus. Kelly and St. Lawrence (1986) conclude by suggesting the implementation of behavioural change programs into community settings where they would be more accessible and more cost-effective for the majority of infected persons.

Unlike the health belief model, a psychosocial model attempts to recognize that behaviour change is often difficult to accomplish as it is frequently deeply embedded in cultural and subcultural norms as well as personal values. Thus, what the individual perceives to be socially acceptable in society has a major impact on his/her personal attitudes and behaviours (Bye, 1990). Thus, the model recognizes that for behaviour change to be maintained, societal and peer support is necessary, as is assistance in acquiring the social skills to alter behaviour.

In a study conducted by Kelly and colleagues (1989), 104 gay men were recruited to attend 12-session groups which involved instruction, behaviour rehearsal, role-play practice, problem-solving and change assignments in various risk reduction areas. Their results revealed increases in AIDS risk knowledge, sexual assertiveness skills and condom use; and decreases in sexual risk behaviour. These attitude and behavioural changes were observed across a 16-month follow-up period. Similar results were found by Kelly and co-workers (1991) in a further study using additional samples with a more abbreviated group interaction program.
In a study conducted by Antoni and colleagues (1991), 47 asymptomatic healthy gay men were randomly assigned to a cognitive-behavioural stress management (CBSM) condition or an assessment-only control group 5-weeks prior to being notified of their HIV-antibody status. Each 90-minute weekly session involved training in cognitive restructuring, assertiveness skills and behaviour change strategies together with basic information regarding various aspects of stress responses, HIV-1 transmission, risk behaviours and a description of safer sex behaviours. Control subjects showed significant increases in depression along with either no improvements in immune status or pre-post decrements in immune status. The CBSM intervention appeared to buffer post-notification depression levels, although it did not significantly attenuate anxiety. The study also observed significant increases in CD56 and CD4 cell counts as well as increases in NK cell activity. Antoni and colleagues (1991) conclude that CBSM interventions may be effective treatment strategies for normalizing the characteristic CD4 cell decrements and impairments in NK cell activity found in HIV-1 infected individuals. The psychological buffering and immunomodulatory effects of the intervention could be attributable to the relaxation skills learned and practised or perhaps to the willingness to comply with the intervention guidelines or to the increased availability of social support networks. Future research is required in order to identify precisely which components of the CBSM intervention can reliably account for the psychological and immunologic changes observed in the study.

Bandura (in Mays et al., 1989) and Stein (1993) stress the informational component of the CBSM intervention as well as the need to develop skills in self-motivation and self-guidance in order to achieve self-directed changes in motivation and behaviour. It is not sufficient to merely provide reasons to alter risky behaviours, but also the means and resources to do so. Hays and colleagues (1992) revealed that informational support appeared especially critical in buffering the stress associated with experiencing HIV-symptoms. Providing information such as the clarification of medical terms or explaining the biology of the virus, that is demystifying the illness, may aid in making the illness less threatening for the sufferer (Anderson, 1992b).
In addition, by explaining the ways in which shock, denial, grief and so on affect one's thoughts, feelings and behaviour, the individual is able to enhance his/her sense of control.

Behavioural interventions usually combine a number of techniques into a package which would include relaxation skills training (Tsao et al., in press), assertiveness training, cognitive restructuring techniques and instruction in the self-monitoring of environmental stressors (Antoni et al., 1991). These have been found to enhance immune functioning and to retard disease progression. Weisse (1992) alleges that cognitive therapy has been shown to be as effective as pharmacotherapy; an advantage being that it does not interfere with immunologic processes.

### 1.8.5 Aerobic exercise intervention

Research indicates that physical fitness contributes to mental and emotional well-being. An inverse relationship exists between the physical fitness level and mental health of an individual; that is, the higher the physical fitness, the lower the degree of psychopathology (Schneiderman, 1992). This is, in turn, associated with perceptions of well-being and mental health.

Exercise has been shown to enhance immunologic status by increasing T-lymphocytes and B-lymphocytes, and increasing NK cell activity (Schneiderman, 1992). Similarly, significant decreases were found in depression and anxiety in men at high risk for coronary artery disease who were assigned to an exercise group (Folkins, 1976).

As far back as 1918, much literature has evolved regarding the relationship between immunity and exercise. Earlier studies documented on the negative effects of strenuous exercise on the immune system.
Research revealed that almost all cases of pneumonia at a boys school occurred in athletes following a period of intense exercise and competition (Boffard, 1993). A study conducted at the University of Cape Town in 1983 concluded that the occurrence of upper respiratory infections amongst marathon runners was abnormally high. Of particular interest was the finding that faster runners suffered from more colds than did non-runners and slower runners (in Boffard, 1993). The research concluded that the combined psychological and physical stress of training and running a marathon resulted in impaired immune functioning.

Dr. David Nieman at Appalachian State University (in Boffard, 1993) began to question the effects of moderate exercise on the immune system. The study recruited 25- women who participated in a 15-week exercise program which involved 45-minutes of walking, 5- days a week at 60% of their maximum oxygen capacity (VO2 max, that is the measure of aerobic energy activity). The results revealed an increase in NK cell activity when compared to a control group who did not partake in the exercise intervention. In addition, the experimental group (exercisers) experienced half the amount of cold and flu symptoms than the control group along with a 20% increase in their serum antibodies. Further studies conducted by Dr. Nieman indicated that moderate exercise did not only boost the immune system, but also aided in reversing the decline in immune functioning that coincides with the ageing process. Fit elderly women revealed a more superior T-cell function when compared to their peers. However, all the studies indicate and stress the importance of 'exercise-in­moderation' rather than over-exertion, which seems to depress the immune system.

In a study done by Folkins (1976), evidence was presented for the relationship between improvements in physical fitness and psychological health in a group of infirm adult males. The study recruited 36 males, ranging from 40-55 years of age who had been identified as being at high risk for coronary heart disease. The men were matched by age, occupation and risk factors; and were assigned to either an exercise or a control/no-exercise group.
The exercise group participated in 3-exercise sessions per week for 12 consecutive weeks, whereas the control group were asked to refrain from any increase in exercise. The findings of the study reported improvements in physical fitness which were accompanied by significant decreases in depression and anxiety in men at high risk for coronary artery disease who were assigned to the exercise group.

The influence of aerobic exercise on depression was examined by McCann and Holmes (1984). 43- depressed women were randomly assigned to either an aerobic exercise treatment condition consisting of strenuous exercise; a placebo treatment condition which comprised of relaxation training; or a no-treatment condition. The results revealed a reliable decrease in depression after participation in a program of strenuous aerobic exercise as well as improvements in aerobic capacity in subjects assigned to the aerobic exercise intervention. However, the actual process by which the aerobic exercise intervention influenced depression was not researched.

Severe suppression of immunity occurs in people suffering from spinal injuries; placing them at risk to infections of the lungs, skin and urinary tract. Mark Nosh, a physiologist at the School of Medicine at the University of Miami (in Boffard, 1993) tested the effects of moderate exercise on the immune functioning of quadriplegics. Movement was induced by using electrical stimulants which enabled the subjects to ride a bicycle. The results revealed an acute enhancement in NK cell function; even though the movement was generated by computers.

LaPerriere (1992) stresses that exercise can also be an effective therapeutic technique for patients throughout the clinical course of certain chronic diseases. Due to the fact that an individual may be infected with the HI- virus and yet remain asymptomatic for as long as 15 years, AIDS may be conceptualized as a chronic illness. Pharmacological treatments such as Zidovudine (AZT) provide less than optimal results and often cause many undesirable side- effects.
For this reason, Antoni et al (1990a), LaPerriere (1992) and Schneiderman et al (1992) have developed alternative behaviourally- based and adjunctive treatments, such as aerobic exercise training, in the management of HIV- infection. Exercise training has been identified as a viable psychoneuroimmunologic intervention useful in decelerating the progression of AIDS.

Research has revealed that a 5-week aerobic exercise program, prior to receiving a seropositive diagnosis, aided in the attenuation of anxiety and depression and diminished immune decline (Schneiderman, 1992). An aerobic exercise protocol has also been utilized as an intervention strategy in the early stages of HIV-1 infection. Antoni and co-workers (1990b) used an aerobic exercise protocol on early stage seropositive gay men and evaluated the effects on psychologic and immunologic functioning. The aerobic exercise training protocol consisted of 3- supervised exercise sessions per week. The 45-minute exercise sessions involved riding a bicycle ergometer; and the duration of the intervention period was 10 weeks. It was found that a time-limited aerobic exercise program appears to enhance cellular and humeral immune functioning as well as decreasing emotional distress which may produce further immunomodulatory effects. LaPerriere (in Boffard, 1993, p. 59) states that "...previously, someone who was HIV-positive would be told to get plenty of sleep, eat a healthy diet and get plenty of exercise- but no-one knew if exercise was beneficial or harmful." LaPerriere's study demonstrated his concern regarding excessive training or over-exertion. Participants in the exercise intervention were connected to heart monitors which alerted the research team to any over-exertion.

It therefore appears that an aerobic training intervention buffers the psychological impact of the news of seropositivity. HIV-seropositive control subjects showed marked increases in tension, anxiety, depression and confusion, whereas those involved in the aerobic exercise intervention showed virtually no changes on these psychological markers.
Thus, aerobic exercise is a behavioural intervention with both stress-attenuating and immunomodulatory effects. As an intervention, it has the ability to aid in the restoration of competence and in a retardation of HIV-1 disease progression (Antoni et al., 1990b).

1.8.6 Conclusion

Due to the diversities in ethnicity, exposure categories and gender in people infected with the virus, numerous difficulties have been confronted in developing intervention strategies which are equally suited and effective across these domains (Schopper & Walley, 1992). However, an exercise intervention has the potential to overcome these obstacles and the ability to neutralize the effects of ethnicity, gender and exposure category. Similarly, an aerobic exercise intervention is cost effective and thus more practical in countries where the drug AZT is unaffordable or unavailable for the majority. Schneiderman (1992) alleges that a moderate aerobic exercise training program is a safe and effective means of using a stress management intervention for secondary prevention in asymptomatic HIV-1 infected individuals. Research at the Centre for the Biopsychosocial Study of AIDS at the University of Miami has recently indicated that a combination of an aerobic exercise program and a cognitive behavioural intervention package led, not only to improvements in the immunologic status of subjects who tested positively for the HI-virus, but also to improvements in mood as well as decreases in anxiety and depression (Antoni et al., 1990a; Schneiderman, 1992).

Bolognone and Johnson (in Feldman & Johnson, 1986) suggest the convergence of health-related beliefs between patients and their practitioners. Professionals in the field as well as lay people all have their own understandings regarding symptoms or sickness. This includes personal beliefs about etiologies, prognosis, treatment and prevention. The convergence of such health beliefs is thought to increase the effectiveness and satisfaction of clinical health-care practices (Feldman & Johnson, 1986).
Steinberg and Abdool Karim (1993) stress that research is lacking concerning the evaluation of the quality of care provided and the appropriateness and cost-effectiveness of different dimensions of health-care services in meeting the needs of the epidemic. Given the heterogeneity of HIV-infected individuals; no single therapeutic strategy is likely to be universally effective (Kelly & Murphy, 1992). Ultimately, research is necessary to determine the impact of specific interventions on: (a) the medical status of HIV/AIDS sufferers; (b) the psychological status; and (c) on certain health-promoting and health-damaging behaviours (Coates et al., 1984). This implies integrating behavioural and biochemical conceptualizations and variables in the understanding of health and disease in order to achieve a multidisciplinary perspective. Kriel (1993, p.31) stresses that "...if the course of AIDS is not only the virus but also a pattern of behaviour, then the response to the epidemic cannot simply be a medical response." Thus, research, treatment, prevention and the control of AIDS must involve questions stemming from the fields of health psychology, behavioural medicine and psychoneuroimmunology (Coates et al., 1984), as well as incorporating community action (Kriel, 1993).

1.8 CONCLUSION

From the above, when looked at in the context of the basic problem statement that was addressed by means of an analysis of the literature, it would appear that there are two major sources of information as regards the interaction between psychosocial variables and certain immunological variables, specifically pertaining to people who are HIV-positive and have clinical AIDS. The two sources of information as regards the interaction of psychosocial variables and immunological factors are firstly, from the broader area of psychoneuroimmunology; and secondly, from the area of the effects of AIDS, the effects of been made aware that one is HIV-positive on certain psychosocial variables; and lastly, also subsumed under the second factor, the role of certain psychosocial variables in AIDS-preventive behaviour.
From the broad area of Psychoneuroimmunology, it would appear that all psychological variables that contribute to immunological functioning would also be important in the role of buffering or exacerbating immunologic responses in HIV-positive persons regardless of the presence or absence of clinical AIDS symptomatology (Glaser et al., 1987; Kiecolt-Glaser & Glaser, 1992; Schneiderman et al., 1992). It would appear that depression, anxiety and anger all contribute to the lowering of immune responsivity in normal as well as clinically ill people with a specific emphasis on those persons who have an illness which would compromise immune functioning such as cancer or the Acquired Immune Deficiency Syndrome (AIDS). It would therefore appear that increases in anxiety and depression as well as anger or overt aggressiveness would be associated with decreases in immune responsivity. Conversely, Kiecolt-Glaser and Glaser (1992) and Schneiderman and colleagues (1992) also indicated that positive mood would be associated with improvements in immune responsivity.

Based on the epidemiological research reported by Ironson and co-workers (1990), Ostrow (1990b) and Kiecolt-Glaser and Glaser (1992), it would also be important to note that exposure to long-term stress would lead to decrements in immune responsivity. Therefore stressors would be associated with decrements in immune responsivity, once they surpass a critical value as would be defined by the Yerkes-Dodson Law. In this regard, it should then also be noted that the literature above pointed out quite clearly, that coping with stressors would lead to a strengthening or improvement in immune responsivity (Pennebaker et al., 1988; Rundell & Brown, 1990; Kelly & Murphy, 1992; McCann & Wadsworth, 1992). The coping variable cannot be conceived within a very simplistic cognitive form. Herein, Reed and colleagues (1994) indicated that coping in the sense of realistic acceptance would lead to decreased survival time and therefore, could possibly be associated with decrements in immune responsivity.

The other facet of the coping response, in addition to cognitive and behavioural factors, would be the degree to which social support is available to the person at the time of the appearance of the stressor.
It would therefore appear that stress and its effect on the immune system is modulated in a complex fashion by cognitive coping skills as well as the degree to which social support is present.

The basic psychoneuroimmunological approach to the interaction of psychosocial and immunological variables in people who are HIV-positive is complemented by research pioneered by Antoni et al (1990), LaPerriere et al (1990) and Schneiderman et al (1992) at the University of Miami's Centre for the Biopsychosocial Study of AIDS. Herein, Antoni and colleagues (1990) found that the awareness of being HIV-positive lead to decrements in coping ability, increases in depression, as well as increases in anxiety and in aggressiveness. They also found that the degree to which social support was available to be a powerful predictor of immune responsivity to the stressful effects of being made aware of being HIV-positive.

It would appear from the above two major inputs into the present knowledge of the interaction between psychosocial variables and immune responsivity in people who are HIV-positive, that negative emotions as a whole, such as anxiety, aggressiveness and depression, would lead to a decrement in immune responsivity, while positive emotions such as the ability to cope with stress, therefore the availability of cognitive coping skills as well as the availability of social support as buffers to the stressful nature of becoming HIV-positive, would be associated with improvements in the immune responsiveness of an HIV-positive individual. The data analyzed in the literature survey above, however, has not been consistent enough to be able to formulate a predictive model of the effects of psychosocial variables on immune responsivity in the context of HIV-seropositivity which can be utilized in the psychosocial rehabilitational management of persons with the HIV-virus. Many reasons could be found for the discrepancies and the sometimes opposite findings in the literature. One of these, as is mostly the case in research of this nature, is the nature of the measures used, the validity and reliability of the measures used, as well as the research design in which this was applied and the data drawn.
A recent article by Reed and co-workers (1994) points to a totally different approach to the effect of positive and negative emotions on immune responsivity. In a study of the effects of psychosocial variables to survival time in AIDS, Reed et al (1994) found that the primary factor previously thought to be associated with improvements in health and therefore, improvements in immune responsivity, namely realistic acceptance or conceptualized as stoic acceptance by Greer et al (1979), Peetingale et al (1985) as well as Antoni and Goodkin (1988), was inversely related to morbidity and mortality in HIV-positive persons. It would appear that the absence of stoic acceptance or realistic acceptance would be associated with increased survival time. From this it can be deduced that immune responsivity is improved in the absence of realistic or stoic acceptance and is thus enhanced by denial and positive illusions of well-being in HIV-positive persons. It would therefore appear that coping with AIDS is different, on a psychological level, from coping with other illnesses with high morbidity and mortality on an immunological basis, namely cancer.

It would therefore seem that negative emotions such as anxiety, depression and aggressiveness would contribute to decrements in immune responsivity, whereas positive emotions such as hopefulness and coping with the stressor would probably directly predict immunological responses in HIV-positive persons. It is possible, and indeed probable, that positive and negative emotions are modulated by the presence and absence of psychosocial support in the form of buffering against the stress of the knowledge of having AIDS, but more so, moderated by the effects of non-realistic approaches to the eventual mortality in each individual. It would seem then that the presence of positive illusions or denial would act as a strong predictor of the effects of positive and negative emotions on immune responsivity.
It would therefore be important, in the context of determining the role of psychosocial variables in the prediction of immune responsivity in AIDS, to examine the interactions of contributors to immune response in HIV- persons. The specific hypotheses for this study are as follows:

1. A significant correlation will be found between selected psychosocial variables as assessed by psychometric indices and immunological variables as assessed by immuno-assay methods in HIV- infected patients.

2. Specific correlative patterns exist in psychosocial variables and immunological factors internally in persons who are HIV- infected.
CHAPTER TWO

METHODOLOGY

2.1 INTRODUCTION

Based on the alarming facts that the AIDS pandemic has now reached proportions where it effects the entire world's health- care systems and economies, and will soon exert an important political influence, as well as the fact that the medical prevention and treatment of AIDS has not shown itself to be as effective as had been hoped initially (Brown, 1991a; McMillan, 1992a; Kuhn, 1993); the world has turned to the psychosocial sciences for possible answers to this very severe health problem (Byrne, 1989; Miller, 1990; Kriel, 1993).

The psychosocial sciences have indeed provided viable alternatives to the prevention and management, if not, the treatment of the AIDS pandemic (Kelly et al., 1988). As far as preventative efforts are concerned, major inroads have been made by behaviour- change orientated preventative projects, programs and counselling (Kelly et al., 1988). However, the psychosocial treatment and management of AIDS has, up to the present, not provided any major breakthroughs or major impact on the management of the AIDS pandemic. Many reasons exist for this sad fact. Of those, it would appear, especially from the analyses of research conducted by LaPerriere et al (1990), Antoni et al (1990) and Schneiderman et al (1992), that although certain interactions between immunological response, immunological strength and psychosocial variables do occur in people who are HIV-infected or have AIDS, these interactions have not been fully explicated. It is a sad and unfortunate fact that the traditional psychosomatic model has been applied willy- nilly to the AIDS pandemic with similar willy- nilly effects.
A cursory analysis of the results of the traditional psychosomatic model shows a null-effect on the management and psychosocial treatment of the full epidemic or even components of the disease profile of AIDS.

It therefore appears imminently necessary to understand the nature of the relationships between psychosocial variables and immunological variables in people who are HIV-infected and have symptomatic AIDS. The purpose of this study was therefore to make an in-depth analysis of the interaction between selected psychosocial variables and immunological variables in a small number of HIV-infected individuals. The hypotheses were:

1. A significant correlation will be found between selected psychosocial variables as assessed by psychometric indices and immunological variables as assessed by immuno-assay methods in HIV-infected patients.

2. Specific correlative patterns exist in psychosocial variables and immunological factors internally in persons who are HIV-infected.

In order to evaluate these hypotheses, a small number of HIV-infected persons were assessed psychometrically and immunologically, and then subjected to a psychosocial and biophysical intervention program and reassessed. The focus of the present study in explicating the nature of the relationship between psychosocial and immunological variables focused primarily on the pre- and post-test psychological and immunological measures.

In this chapter, the methodology utilized for the study will be discussed. The selection of the subjects will be addressed firstly, followed by a description of the psychological and immunological measures utilized. Thirdly, the procedure used in the study will be discussed followed by a discussion of the experimental design and statistical analysis.
2.2 SUBJECTS

2.2.1 Sample group

The subjects were obtained from voluntary admissions to the HIV/AIDS management program at the Clinic and Centre for Behavioural Medicine at the Rand Afrikaans University. The HIV/AIDS management, run under the auspices of this Clinic and Centre, is a joint undertaking by the Rand Afrikaans University and the University of Miami Medical School.

This research was based on HIV-infected men and women chosen from the South African population, who were either asymptomatic or early symptomatic. Due to the wide diversity of psychosocial variables implicated in the biopsychosocial nature of individuals who are HIV-infected and have symptomatic AIDS, it was decided not to use a large sample group, but rather to use a smaller group, controlling more variables.

From admissions to the RAU/Miami HIV-project at the Clinic and Centre for Behavioural Medicine, the sample group of 26 subjects included males and females between the ages of 18 and 45 years of age, from any ethnic group, and similar socio-economic backgrounds. The subjects could have become infected via any means (i.e. homosexual, heterosexual, transfusion, open wound infection and intravenous drug transmission).

2.2.1.1 Inclusion criteria

The inclusion criteria consisted of the following:

1. HIV-positive as stipulated by the World Health Organization (WHO) criteria.
2. Asymptomatic or early symptomatic HIV-sufferers, whether they be male or female of any ethnic group.
3. 18 to 45 years of age.
4. Physically able to participate in the aerobic exercise component of the programme.

2.2.1.2 Exclusion criteria

The exclusion criteria consisted of the following:

1. Age less than 18 or greater than 45 years of age.
2. Any AIDS-related criteria as stipulated by the World Health Organization (WHO).
3. Any history of drug or alcohol abuse within 6 months prior to the intervention as stipulated by the DSM-IV.
4. Any current major psychiatric disorder as stipulated by the criteria in the DSM-IV.
5. The use of any medications within the 6 months prior to the intervention which may impact on immunologic functioning.

2.2.2 Subject recruitment

Several clinics and hospitals, as well as HIV/AIDS-support groups and laboratories that tested for the HI-virus and required pre- and post-test counselling were approached to participate in the programme. Knowledge concerning the programme was dispersed in various magazines and via word-of-mouth. A pamphlet was distributed to all interested parties (see appendix 3: recruitment form) which provided a brief outline of the programme and contact numbers.

The subjects were obtained from voluntary application to the AIDS-management program at the Rand Afrikaans University, Clinic and Centre for Behavioural Medicine, Johannesburg, South Africa.
The first 26 entrants to this project were utilized and therefore do not need the requirements for random subject selection or even representativeness of a certain universe or sub-universe of the population.

All subjects that lived in the Gauteng region and were unable to provide for their own transport, were provided with transport to and from the RAU Clinic and Centre for Behavioural Medicine in Crosby, Johannesburg.

2.2.3 Informed consent forms

Before subjects made a commitment to participate in the programme, the particulars of the intervention were clearly explained to them. Confidentiality of all data and test results was guaranteed. The prospective subjects were informed that they may withdraw from the study at any time. The informed consent form was reviewed in detail during the first session and subjects had to agree to abide and sign the form after agreeing to the terms specified. All risks and benefits as well as the structure of the study were clearly specified (see appendix 2: informed consent form).

2.3 MEASURES

The following measures were used in the psychosocial and immunological assay of an assessment of the subjects in this study. They included the Social Provisions Scale, the Coping Self-Efficacy Scale and the Profile of Mood States (POMS). The immunological tests consisted of the following: the total lymphocyte cell count, CD4 (T-helper/inducer) cell counts, CD8 (T-suppressor) cell counts and CD4:CD8 (helper: suppressor) cell ratio.
2.3.1 Psychological measures

2.3.1.1 The Social Provisions Scale (Russell et al., 1984)

The Social Provisions Scale measures the qualitative aspects of social support. This self-report measure consists of 24-items. The testee responds by revealing to what extent he or she agrees with each statement describing current relationships with friends, family members, co-workers, community members, and so on. The responses range from "strongly agree" to "strongly disagree". The total score is derived by adding the scores obtained for each respective item. High scores indicate a high level of social support, whereas low scores reveal a lack of supportive relationships.

The protective effects of social relationships have been hypothesized to include roles for intimacy, social integration through shared concerns, reassurance of worth, opportunities for nurturance, a sense of reliable alliance, and guidance (Schneiderman, 1992). Antoni and colleagues (1991) report adequate reliability and validity of these measures for the purposes of a study similar to this one; and preliminary analyses at the Clinic and Centre for Behavioural Medicine at the Rand Afrikaans University, attested to the reliability and validity of this instrument for South African conditions.

2.3.1.2 The Coping Self-Efficacy Scale (Schneiderman, 1988)

The Coping Self-Efficacy Scale was devised by Schneiderman (1988) with the purpose of assessing perceived self-efficacy effects on health-related behaviours. Fletcher and colleagues (1988) state that perceived self-efficacy effects on health-related behaviours are best identified by efficacy measures tailored to specific domains (e.g. specific stressors, symptoms etc.).
Self-efficacy will be assessed using the Coping Self-Efficacy Scale, a 6-item Likert-scaled inventory, which evaluates the subjects' perceived efficacy in being able to manage HIV-1 specific symptoms and stressors. The responses range from "not at all" to "all of the time", and the total score is derived by adding all the scores obtained for each item. The higher the score, the higher the perceived efficacy of the testee to cope with stressors and symptoms of HIV-seropositivity.

Intervention-associated changes in scores from this inventory were found to predict changes in high-risk sexual behaviour in HIV-1 seropositive individuals (Schneiderman, 1992). Antoni and colleagues (1991) report adequate reliability and validity of these measures for the purposes of a study similar to this one; and preliminary analyses at the Clinic and Centre for Behavioural Medicine at the Rand Afrikaans University, attested to the reliability and validity of this instrument for South African conditions.

2.3.1.3 The Profile of Mood States (POMS) (McNair et al., 1981)

The Profile of Mood States (POMS) is a 65-item self-report, pen and paper test which consists of sub-scales measuring several mood states. It can be self-administered by either individuals or in a group setting. Most subjects complete the POMS in 3-5 minutes and can be easily administered by research assistants or technicians.

The POMS total mood disturbance scale (Anxiety + Depression + Anger + Fatigue + Confusion - Vigour = Total Mood Disturbance) will be used to measure several mood states experienced over the past week. The sub-scale of interest will be the Tension-Anxiety, Depression-Dejection, Anger-Hostility, Vigour-Activity, Fatigue-Inertia and Confusion-Bewilderment scales. This measure was chosen because it was designed for and standardized on a non-psychiatric sample (McNair et al., 1981) and has previously been used in studies measuring the impact of notification of HIV-antibody status (Jacobsen et al., 1988; Antoni et al., 1991).
Thus, the mood scales have proved to be particularly useful descriptive measures for assessing psychiatric outpatients and highly sensitive to their responses to various therapeutic approaches. The POMS has also proven to be a sensitive measure of the effects of various experimental manipulations on normal subjects and other non-psychiatric populations (McNair et al., 1981).

The reliability of the POMS has been found to be particularly high. More specifically, the extent to which the 6- mood sub-scales measure the same factor are approximately 0.90 or above. The test- retest reliability is also significantly high with correlation coefficients of between 0.80 and 0.90. This indicates the rank ordering of scores to be approximately the same on repeated occasions (McNair et al., 1981).

The six factor analytic replications in the development of the POMS may further be taken as evidence of the factorial validity of the six mood factors. An examination of the individual items defining each mood scale supports the face or content validity of the factor scores. In addition, seven areas of research have provided evidence for the predictive and construct validity of the POMS. The areas include: brief psychotherapy studies, controlled outpatient drug trials, cancer research, drug abuse and addiction studies, studies of response to emotion- inducing conditions, research involving sports and athletes, and studies of concurrent validity coefficients and other POMS correlates (McNair et al., 1992).

2.3.2 Immunological measures

The immunologic measures for this study were phenotypic and functional markers previously shown to be affected by behavioural interventions as well as having clinical relevance for HIV- infected sufferers. They included the CD4 (helper/ inducer) cell count, the CD8 (suppressor) cell count, the CD4:CD8 (helper:suppressor) cell ratio, and the total lymphocyte (CD3) cell count.
2.3.2.1 CD4 cell count (T-helper/inducer cells)

The helper/inducer (CD4+) cell count is one of the best and most scientifically sound predictors of the strength of the immune system. In HIV-infected individuals, the CD4 cells are the major targets for damage by the HIV virus. The characteristic immunodeficiency associated with HIV and AIDS is caused by the destruction of the helper/inducer (CD4) cells. Some individuals develop an acute glandular fever-type illness soon after exposure to the virus; and before the antibodies are detected in the person's serum. Following seroconversion, there is a decline in CD4 cells. This is followed by an asymptomatic phase, during which the virus is highly contagious. The incubation or latent phase is of variable duration, sometimes only lasting a few months to as long as ten years. After this period, evidence of immune dysfunction begins to occur as indicated by laboratory findings, that is a falling CD4 cell count or clinical observations (see table 1). The drop in cell counts can be as high as 60% of the person's original levels within the first 12-18 months (Hestel & Brown, 1993).

2.3.2.2. CD4:CD8 cell ratio (helper:suppressor)

Hestel and Brown (1993) propose that when the body's T-cells begin to decrease, the immune system tries to compensate by bringing the overall T-cell count back to normal. However, the body fails to differentiate between CD4 (helper) and CD8 (suppressor) cells; and makes copies of both CD4 and CD8 cells. This would not usually create a problem, but due to the fact that the characteristic immunodeficiency associated with HIV and AIDS is caused by a destruction of T-helper (CD4) cells, the suppressor (CD8) cells are left intact, while the HIV virus kills the CD4 cells- resulting in the observed skewed CD4:CD8 ratio; as well as a possibly misleadingly 'high' total lymphocyte cell count. As the virus continues to kill CD4 cells, the body simply produces a greater amount of CD8 cells. The CD4:CD8 ratio is characteristically low in HIV-infected persons and is a less useful measure of immunosuppression than the number of CD4 cells in the blood (Hestel & Brown, 1993).
2.3.2.3 Total lymphocyte cell count (CD3)

Throughout the course of the infection, the total T-cell numbers tend to remain constant following an initial decline in total lymphocytes (CD3). This is mainly due to the expansion of the CD8 (suppressor) cell lymphocyte population. The helper:suppressor (CD4:CD8) ratio becomes reversed as the number of suppressor cells increase. The cell ratio falls to below 1:0. This results in deficiencies in CD4 cells to signal B-cells to respond with the production of an antibody. Instead, immunoglobulins are secreted by the B-cells which are undirected and non-specific in their functions (Hestel & Brown, 1993).

A blood sample analysis of CD4 (helper/inducer) and CD3 (total lymphocytes) cell counts can reveal to what degree the individual's immune system is intact or depleted; and these findings may serve as a predictor of the specific individual's immunological deterioration (see table 1).

2.3.2.4 CD8 cell count (suppressor cells)

In HIV-infected persons, the CD8 cell count (suppressor cells) increase. Thus, the total lymphocyte cell count tends to misleadingly remain constant as the CD4:CD8 ratio becomes reversed. The helper:suppressor cell ratio falls to below 1:0. Hestel and Brown (1993) propose that when the body's T-cells begin to decrease, the immune system tries to compensate by bringing the overall T-cell count back to normal. However, the body fails to differentiate between CD4 (helper) and CD8 (suppressor) cells; and makes copies of both CD4 and CD8 cells. This would not usually create a problem, but due to the fact that the characteristic immunodeficiency associated with HIV and AIDS is caused by a destruction of T-helper (CD4) cells, the suppressor (CD8) cells are left intact, while the HI-virus kills the CD4 cells- resulting in the observed skewed CD4:CD8 ratio.
Table 1: The significance of CD4 and Total Lymphocyte cell counts (*) (**)

<table>
<thead>
<tr>
<th>Clinical condition</th>
<th>CD4 cell count</th>
<th>Lymphocyte count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well with no symptoms</td>
<td>&gt;500-600 cells/cmm</td>
<td>&gt;2500 cells/cmm</td>
</tr>
<tr>
<td>Minor symptoms</td>
<td>350-500 cells/cmm</td>
<td>1000-2500 cells/cmm</td>
</tr>
<tr>
<td>Major symptoms</td>
<td>200-350 cells/cmm</td>
<td>500-1000 cells/cmm</td>
</tr>
<tr>
<td>AIDS</td>
<td>&lt;200 cells/cmm</td>
<td>500-1000 cells/cmm</td>
</tr>
</tbody>
</table>

* Table adapted from Evian (1993).

** Information supplied by Drs. Mauff, Zail, Skudowitz & Partners: Pathologists.

2.4 PROCEDURE

The subjects were obtained from voluntary admissions to the HIV/ AIDS- management program at the Clinic and Centre for Behavioural Medicine at the Rand Afrikaans University. The HIV/ AIDS- management, run under the auspices of this Clinic and Centre, is a joint undertaking by the Rand Afrikaans University and the University of Miami Medical School.
The program consists of an exercise program (see appendix 5) and a cognitive-behavioural group intervention (see appendix 4).

2.4.1 Exercise intervention

The aerobic exercise intervention consisted of improving the aerobic exercise capacity of subjects by means of bicycle exercise and bicycle ergometry. The aerobic exercise was composed of low to medium impact exercising. The main purpose of the aerobic exercise was to enhance cardiovascular fitness, the flexibility of the joints, muscular fitness and general improvement in work performance, energy levels, the strengthening of bones, ligaments and tendons; and more specifically, to enhance mood (see chapter 1.8.5 Aerobic Exercise). The exercise sessions were administered and supervised by qualified aerobic instructors.

The frequency of exercise training consists of 3-supervised exercise sessions per week at the Clinic and Centre for Behavioural Medicine. The duration of each exercise training session was 40-45 minutes, and comprised of 15 minutes stretching before and after each 45-minute cycling session. Both major and minor muscle groups were warmed up before the start of the aerobic session with controlled, brisk rhythmical movements, which did not serve to exhaust the participants but to increase blood flow and to stimulate the cardiovascular system. The subjects receive instructions on how to perform pre- and post-training stretching exercises for six separate muscle groups (see appendix 5).

The main phase of the aerobic exercise component involved the following objectives: to bring about an improvement in general health by enhancing immunocompetence and thereby decelerating HIV-progression (see chapter 1.8.5 Aerobic exercise intervention).
Each session consisted of alternating periods of training intensity and relief intervals, that is, repeated 3-minute bouts of exercise at approximately 80% of predicted maximum heart rate of each subject, alternated with 2-minute periods of less intense exercise. The higher intensity is termed the task period and is attained when heart rate is within the subjects target heart rate zone. The lower intensity period is termed the off-task period and is attained when heart rate is below the lower limit setting of the heart rate monitor. The objective of interval training is to maintain heart rate within the target heart rate zone during the task periods and for heart rate to be just below the target heart rate zone during the off-task periods (see appendix 5: Protocol for aerobic exercise intervention).

Each aerobic exercise sessions was followed by a group therapy session for the entire 10-weeks of the study.

2.4.2 Cognitive-behavioural group intervention

The psychosocial or lifeskills program, utilizing a cognitive-behavioural paradigm (see chapter 1.8.4: Cognitive behavioural treatment packages) consisted of group meetings of 45-minutes duration, held three times weekly in groups of approximately 6-8 individuals. The groups are lead by a therapist and a co-therapist, and constitute a primarily cognitive-behavioural-orientated approach. Each 45-minute session followed a protocol (see appendix 4: Cognitive-behavioural group intervention) designed to deal with the stressors associated with HIV-illness as well as aiding in exercise attrition. The sessions involved relaxation training, cognitive restructuring, assertiveness training, role-play practice as well as social skills training, problem-solving techniques and behaviour-change strategies. In addition, instruction and basic information was provided regarding various aspects of stress responses, HIV-transmission, risk behaviours and health-promoting behaviours. Issues such as coping with uncontrollable stressors arising in the course of HIV-infection, dealing with the discomforts of exercise training as well as coping with significant others, were addressed (see appendix 4 for detailed sessions).
2.4.3 The administration of psychological and immunologic tests

Pre-tests were administered prior to the intervention, and post-tests, following the 10-week intervention program. For the purpose of this study, the questionnaires were administered by clinical psychology trainees and intern psychologists, working under the supervision of a senior clinical psychologist. All the psychometric tests were administered on the same day. The immunological assays were done by pathology laboratories. The blood was drawn before 11h00 on the day of testing to ensure accurate results.

2.5 EXPERIMENTAL DESIGN AND STATISTICAL PROCEDURE

The experimental design used in this study was based on the need to examine the interrelationships between psychological and immunological variables in HIV-infected sufferers. In order to control for spuriously significant correlations, intercorrelations between immunological and psychological variables were assessed prior to, and after, the interventions in the experimental group. Intercorrelation matrices were then performed for relationships between immunological and psychological variables on both pre-test and post-test data. In order to assess the significance of changes in the variables due to the intervention, t-tests were conducted on differences between pre- and post-test data.
CHAPTER THREE

RESULTS

3.1 INTRODUCTION

The Acquired Immunodeficiency Syndrome (AIDS) has now reached pandemic proportions worldwide, effecting the entire world's health-care systems; as well as the socio-political and socio-economical climate of the world (Hulley & Hurst in Mays et al., 1992). It is estimated that at least one person, somewhere in the world, contracts HIV, the virus that leads to AIDS (Mays & Moscoso, 1995). The frightening fact, is that the medical prevention and treatment of HIV and AIDS has not shown itself to be as effective as had been hoped initially (Brown, 1991a; McMillan, 1992a; Kuhn, 1993). The world is now turning to the psychosocial sciences for possible answers to this very severe health problem (Byrne, 1989; Miller, 1990; Kriel, 1993).

The World Health Organization (WHO) estimates that there are now 14 to 18 million people worldwide who are either HIV-positive or have symptomatic AIDS (Mays & Moscoso, 1995). This is expected to rise to 40 to 100 million people by the 21st century. The WHO continues to speculate that of those infected, approximately 85 percent of HIV-infections are to be found in the developing world.

Of importance is not only the amount of people who are actually symptomatically positive in terms of AIDS, and are therefore showing signs of AIDS-related dementia, and other opportunistic diseases, but more specifically, those persons who are HIV-positive but do not yet have clinical AIDS (Leukefeld, 1990; Schneiderman et al., 1992).

The noteworthy and frightening fact is that for every symptomatic AIDS-sufferer, there are numerous asymptomatic HIV-positive persons. Herein, it is even more frightening to
realize that retroviral treatments of this condition would seem ineffective in forestalling or improving this condition significantly (Brown, 1991a; Schopper & Walley, 1992).

The psychosocial sciences have indeed provided viable alternatives to the prevention and management of the AIDS pandemic (Kelly et al., 1988). As far as preventative efforts are concerned, major inroads have been made via behaviour-change orientated preventative projects, programmes and counselling (Kelly et al., 1988). However, the psychosocial treatment and management of HIV and AIDS has, up to the present, not provided any major breakthroughs on the management of the AIDS pandemic. It is only in isolated research studies that a biopsychosocial approach, notably, focusing on exercise and psychological lifestyle interventions, would have any effect on the course and the change of the immunological events leading up to full-blown AIDS. Herein, Antoni et al (1990a), LaPerriere et al (1990) and Schneiderman et al (1992) have noted that a cognitive behavioural intervention along with an exercise component would seem to have a strengthening effect on the immune system. However, although certain interactions between immunological response, immunocompetence and psychosocial variables do exist in people who are HIV-infected, the precise interactions are not known (Antoni et al., 1990b). What is important, even at an early stage, is to develop a model of the predictive interrelationships and intercorrelations of the various psychosocial and immunological variables, so that based on this, a more efficient and efficacious treatment method for HIV and AIDS can be developed.

The purpose of this study was therefore to make an in-depth analysis of the interaction between selected psychosocial variables and immunological measures in a sample of 26 asymptomatic or early symptomatic HIV-sufferers within the South African setting.
The specific hypotheses for this study were:

1. A significant correlation will be found between selected psychosocial variables as assessed by psychometric indices and immunological variables as assessed by immuno-assay methods in asymptomatic or early symptomatic HIV-sufferers.

2. Specific correlative patterns exist in psychosocial variables and immunological factors internally, in persons who are HIV-infected.

In this chapter, the results of the intervention, in terms of differences between pre- and post-test measures of selected psychological variables and immunocompetence, will be discussed.

3.2 DIFFERENCES BETWEEN MEASURES OF IMMUNOCOMPETENCE DUE TO EXERCISE AND COGNITIVE-BEHAVIOURAL INTERVENTION

In order to determine whether changes occurred in immunocompetence due to the exercise and cognitive-behavioural intervention, a number of t-tests were conducted on measures of total T-lymphocytes (CD3), CD8 (suppressor cells), CD4 (helper/inducer cells) and the CD4:CD8 cell ratio (helper:suppressor ratio).

A t-test conducted in order to determine whether the exercise and cognitive-behavioural intervention produced significant differences between pre- and post-test measures of the CD3 cells (total number of lymphocytes) indicated no significant differences (p > 0.05) (see table 2). A t-test conducted in order to determine the significance of differences in the number of CD4 (helper/inducer) cells prior to, and subsequent to the exercise and cognitive-behavioural intervention, indicated no statistically significant differences (p > 0.05) (see table 2), but did reveal clinically significant differences (see chapter 4: Discussion).
### TABLE 2: Significance of differences in immune measures in experimental group due to the intervention

<table>
<thead>
<tr>
<th>Tests</th>
<th>Average pre-test</th>
<th>Average post-test</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD3</td>
<td>1 995</td>
<td>1 802</td>
<td>-1.30</td>
<td>9</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>CD4 (*)</td>
<td>482</td>
<td>496</td>
<td>0.39</td>
<td>9</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>CD8</td>
<td>935</td>
<td>818</td>
<td>-0.33</td>
<td>9</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>CD4:CD8 ratio</td>
<td>0.598</td>
<td>0.643</td>
<td>0.20</td>
<td>9</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

* Not statistically, but clinically significant

CD4 T-cells = T-helper/inducer cells  
CD8 T-cells = T-suppressor cells  
CD4:CD8 ratio = helper:suppressor cell ratio  
CD3 T-cells = total T-lymphocytes

### TABLE 3: Comparison of mean scores of the experimental groups immunological data

<table>
<thead>
<tr>
<th>Tests</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD3 cell count</td>
<td>1 995</td>
<td>1 802</td>
</tr>
<tr>
<td>CD4 cell count</td>
<td>482</td>
<td>496</td>
</tr>
<tr>
<td>CD8 cell count</td>
<td>935</td>
<td>818</td>
</tr>
<tr>
<td>CD4:CD8 ratio</td>
<td>0.598</td>
<td>0.643</td>
</tr>
</tbody>
</table>

CD4 T-cells = T-helper/inducer cells  
CD8 T-cells = T-suppressor cells  
CD4:CD8 ratio = helper:suppressor ratio  
CD3 T-cells = total T-lymphocytes
Graph 1: Comparison of mean scores of the experimental groups immunological data
Subjects revealed clinically significant differences in the number of CD4 cell counts after the intervention ($x=0.496$) as opposed to before the intervention ($x=0.482$) (see table 3).

A t-test conducted in order to determine the significance of differences between pre- and post-test measures of CD8 (suppressor) cells, indicated no significant differences ($p>0.05$) (see table 2).

A t-test conducted to determine whether the exercise and cognitive-behavioural intervention produced significant changes in the CD4:CD8 (helper:suppressor) ratio indicated no significant differences ($p>0.05$) (see table 2).

In conclusion, there were no significant differences between pre-test and post-test values on all the measures of immunocompetence ($p>0.05$) (see tables 2 & 3).

### 3.3 Differences Between Measures of Psychological Functioning Due to Exercise and Cognitive-Behavioural Intervention

In order to determine whether changes occurred in psychological functioning due to the exercise and cognitive-behavioural intervention, a number of t-tests were conducted on the Coping Self Efficacy Scale (CSES), the Social Provisions Scale (SPS), and the Profile of Mood States (POMS), including the following factors: Tension-Anxiety (POMST), Depression-Dejection (POMSD), Anger-Hostility (POMSA), Vigour-Activity (POMSV), Fatigue-Inertia (POMSF), and Confusion-Bewilderment (POMSC).

A t-test conducted to determine whether the exercise and cognitive-behavioural intervention produced significant changes in coping self-efficacy, as measured by the Coping Self Efficacy Scale (CSES), indicated significant differences ($p<0.001$) (see table 4). Patients showed significantly greater coping self-efficacy skills after the intervention ($x=30.3$) than before the intervention ($x=21.5$) (see table 5).
Table 4: Significance of differences in psychological measures in the experimental group due to the intervention

<table>
<thead>
<tr>
<th>Test</th>
<th>Average pre-test</th>
<th>Average post-test</th>
<th>t</th>
<th>df</th>
<th>p&lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSES</td>
<td>21.5</td>
<td>30.3</td>
<td>4.63</td>
<td>9</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SPS</td>
<td>66.5</td>
<td>78.0</td>
<td>2.35</td>
<td>9</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>POMST</td>
<td>17.6</td>
<td>9.8</td>
<td>-4.10</td>
<td>9</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>POMSD</td>
<td>18.8</td>
<td>14.7</td>
<td>-1.09</td>
<td>9</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>POMSA</td>
<td>20.6</td>
<td>17.3</td>
<td>-1.72</td>
<td>9</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>POMSV</td>
<td>16.8</td>
<td>24.9</td>
<td>2.59</td>
<td>9</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>POMSF</td>
<td>14.0</td>
<td>8.5</td>
<td>-2.51</td>
<td>9</td>
<td>&lt; 0.05</td>
</tr>
<tr>
<td>POMSC</td>
<td>12.2</td>
<td>8.6</td>
<td>-1.73</td>
<td>9</td>
<td>&gt; 0.05</td>
</tr>
<tr>
<td>POMSTOT</td>
<td>67.3</td>
<td>37.7</td>
<td>-2.94</td>
<td>9</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>

CSES = Coping Self Efficacy Scale  
SPS = Social Provisions Scale  
POMST = Profile of Mood States factor Tension-Anxiety  
POMSD = Profile of Mood States factor Depression-Dejection  
POMSA = Profile of Mood States factor Anger-Hostility  
POMSV = Profile of Mood States factor Vigour-Activity  
POMSF = Profile of Mood States factor Fatigue-Inertia  
POMSC = Profile of Mood States factor Confusion-Bewilderment  
POMSTOT = Profile of Mood States Total Mood Disturbance

The intervention produced significant changes in social support, as measured by the Social Provisions Scale (p < 0.05) (see table 4). Subjects showed increases in social support following the intervention (x = 78.00) as opposed to the levels of social support prior to the intervention (x = 66.5) (see table 4).
Table 5: Comparison of mean scores of the experimental groups psychological data

<table>
<thead>
<tr>
<th>Psychological tests</th>
<th>Pre-intervention</th>
<th>Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSES</td>
<td>21.5</td>
<td>30.3</td>
</tr>
<tr>
<td>SPS</td>
<td>66.5</td>
<td>78.0</td>
</tr>
<tr>
<td>POMST</td>
<td>17.6</td>
<td>9.8</td>
</tr>
<tr>
<td>POMSD</td>
<td>18.8</td>
<td>14.7</td>
</tr>
<tr>
<td>POMSA</td>
<td>20.6</td>
<td>17.3</td>
</tr>
<tr>
<td>POMSV</td>
<td>16.8</td>
<td>24.9</td>
</tr>
<tr>
<td>POMSF</td>
<td>14.0</td>
<td>8.5</td>
</tr>
<tr>
<td>POMSC</td>
<td>12.2</td>
<td>8.6</td>
</tr>
<tr>
<td>POMSTOT</td>
<td>67.3</td>
<td>37.7</td>
</tr>
</tbody>
</table>

CSES = Coping Self Efficacy Scale
SPS = Social Provisions Scale
POMST = Profile of Mood States factor Tension-Anxiety
POMSD = Profile of Mood States factor Depression-Dejection
POMSA = Profile of Mood States factor Anger-Hostility
POMSV = Profile of Mood States factor Vigour-Activity
POMSF = Profile of Mood States factor Fatigue-Inertia
POMSC = Profile of Mood States factor Confusion-Bewilderment
POMSTOT = Profile of Mood States Total Mood Disturbance

The exercise and cognitive-behavioural intervention produced significant changes in the amount of tension and anxiety experienced by the subjects, as measured by the Profile of Mood States (POMST) (p < 0.01) (see table 4). Subjects revealed less tension and anxiety after the intervention (x = 9.80) than before the intervention (x = 17.6) (see table 5).
Graph 2: Comparison of mean scores of the experimental groups' psychological data

CSES
SPS
POMST
POMSD
POMSA
POMSV
POMSF
POMSC
POMSTOT

Pre-intervention | Post-intervention
A t-test revealed significant changes in vigour and energy (POMSV) following the intervention \((p < 0.05)\) (see table 4). Patients showed greater levels of energy and vigour following the intervention \((x = 24.9)\) than before the intervention \((x = 16.8)\) (see table 5). In addition, less fatigue (POMSF) was experienced after the intervention \((x = 8.5)\) as opposed to prior to the intervention \((x = 14.0)\) (see table 5). The differences produced by the intervention were found to be significant \((p < 0.05)\) (see table 4).

Significant differences in overall mood as measured by the Profile of Mood States were revealed following the intervention \((p < 0.05)\) (see table 4). Subjects showed an improvement in their overall mood after the intervention \((x = 37.7)\) as opposed to before the intervention \((x = 67.3)\) (see table 5).

No significant differences were found on measures of depression, as measured by the Profile of Mood States (POMSD) \((p > 0.05)\) (see table 4), as well as measures of anger and hostility (POMSA) \((p > 0.05)\) (see table 4), and indices of confusion and bewilderment (POMSC) \((p > 0.05)\) (see table 4).

### 3.4 PRE-INTERVENTION RELATIONSHIPS BETWEEN PSYCHOLOGICAL VARIABLES AND MEASURES OF IMMUNOCOMPETENCE

In order to determine the significance of interrelationships between measures of immunocompetence and psychological functioning prior to the intervention, an intercorrelation matrix was constructed.

Total lymphocytes (CD3) correlated significantly and positively with the perceived self-efficacy of the subjects on health-related behaviours as assessed by the Coping Self-Efficacy Scale \((r = 0.616; p < 0.05)\) (see table 5). Total lymphocyte (CD3) cell counts correlated significantly and negatively with the Social Support Scale \((r = -0.642; p < 0.05)\) (see table 5).
Table 6: Interrelationships between immunologic and psychological variables in the experimental group prior to the intervention

<table>
<thead>
<tr>
<th>Psychological tests</th>
<th>CD3 cell count</th>
<th>CD4 cell count</th>
<th>CD8 cell count</th>
<th>CD4:CD8 cell ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSES</td>
<td>0.616*</td>
<td>-0.653*</td>
<td>-0.581*</td>
<td>0.025</td>
</tr>
<tr>
<td>SPS</td>
<td>-0.642*</td>
<td>-0.619*</td>
<td>-0.515*</td>
<td>-0.103</td>
</tr>
<tr>
<td>POMST</td>
<td>0.387</td>
<td>0.491</td>
<td>0.249</td>
<td>0.206</td>
</tr>
<tr>
<td>POMSD</td>
<td>0.352</td>
<td>0.638*</td>
<td>-0.06</td>
<td>0.596*</td>
</tr>
<tr>
<td>POMSA</td>
<td>0.086</td>
<td>0.375</td>
<td>-0.139</td>
<td>0.493</td>
</tr>
<tr>
<td>POMSV</td>
<td>-0.596*</td>
<td>-0.694*</td>
<td>-0.372</td>
<td>-0.306</td>
</tr>
<tr>
<td>POMSF</td>
<td>0.235</td>
<td>0.451</td>
<td>0.017</td>
<td>0.491</td>
</tr>
<tr>
<td>POMSC</td>
<td>0.336</td>
<td>0.459</td>
<td>0.238</td>
<td>0.306</td>
</tr>
<tr>
<td>POMSTOT</td>
<td>0.392</td>
<td>-0.642*</td>
<td>0.101</td>
<td>0.505</td>
</tr>
</tbody>
</table>

* P<0.05
** p<0.01
*** p<0.001

CD4 T- cells = T- helper/inducer cells
CD8 T- cells = T- suppressor cells
CD4:CD8 ratio = helper:suppressor cell ratio
CD3 T- cells = total T-lymphocyte cells

CSES = Coping Self Efficacy Scale
SPS = Social Provisions Scale
POMST = Profile of Mood States factor Tension-Anxiety
POMSD = Profile of Mood States factor Depression-Dejection
POMSA = Profile of Mood States factor Anger-Hostility
POMSV = Profile of Mood States factor Vigour-Activity
POMSF = Profile of Mood States factor Fatigue-Inertia
POMSC = Profile of Mood States factor Confusion-Bewilderment
POMSTOT = Profile of Mood States Total Mood Disturbance
CD4 (helper/inducer) cell counts correlated significantly and negatively with perceived coping abilities (CSES) \( (r = -0.653; p < 0.05) \) (see table 5), the Social Provisions Scale \( (r = -0.619; p < 0.05) \), the Vigour-Activity factor of the POMS \( (r = -0.694; p < 0.05) \) (see table 5) and the Total Mood Disturbance as assessed by the Profile of Mood States \( (r = -0.642; p < 0.05) \) (see table 5).

CD4 (helper/inducer) cells correlated significantly and positively with the Depression-Dejection factor of the POMS \( (r = 0.638; p < 0.05) \) (see table 5).

CD8 (suppressor) cells correlated significantly and negatively with perceived coping abilities \( (r = -0.581; p < 0.05) \) (see table 5) and the Social Provisions Scale \( (r = -0.515; p < 0.05) \) (see table 5).

The CD4:CD8 (helper:suppressor) cell ratio correlated significantly and positively with the Depression-Dejection factor of the Profile of Mood States \( (r = 0.596; p < 0.05) \) (see table 5).

There were no other significant correlations found between the psychological measures and immunological variables in subjects prior to the intervention in the experimental group.

Figure 7 provides a summary of the significant interrelationships identified between immunological variables and psychological measures prior to the intervention in the experimental group.

From the figure below (figure 7), it can be seen that CD3 cell counts (total lymphocytes) correlated significantly and positively with perceived self-efficacy as assessed by the Coping Self-Efficacy Scale \( (r = 0.618) \), whereas the degree of social support as assessed by the Social Provisions Scale, correlated negatively and significantly with CD3 (total lymphocyte) cell count \( (r = -0.642) \), as did the Vigour-Activity factor of the POMS \( (r = -0.596) \).

CD8 (suppressor) cell counts correlated negatively and significantly with both the Social Support Scale \( (r = -0.515) \) and with perceived self-efficacy (SPS) \( (r = -0.581) \).
Figure 7: **Interrelationships between immunologic and psychological variables in the experimental group prior to the intervention**

- CSES = Coping Self Efficacy Scale
- POMSTOT = Profile of Mood States Total Mood Disturbance
- SPS = Social Provisions Scale
- POMSD = Profile of Mood States factor Depression-Dejection
- POMSV = Profile of Mood States factor Vigour-Activity
- CD4 = T-helper/inducer cells
- CD3 = Total lymphocytes
- CD4:CD8 = helper: suppressor cell ratio
CD4 (helper/inducer) cell counts correlated negatively and significantly with the Vigour-Activity factor of the POMS ($r = -0.694$), with the Coping Self Efficacy Scale ($r = -0.653$), the Social Support Scale ($r = -0.619$), and the Total Mood Disturbance as assessed by the Profile of Mood States ($r = -0.642$).

A significant positive correlation emerged between the Depression-Dejection factor of the POMS and the CD4 (helper/inducer) cell count ($r = 0.638$), as well as the CD4: CD8 (helper:inducer) cell ratio in correlation with the Depression-Dejection factor of the POMS ($r = 0.596$).

### 3.5 POST-INTERVENTION RELATIONSHIPS BETWEEN PSYCHOLOGICAL VARIABLES AND MEASURES OF IMMUNOCOMPETENCE

In order to determine the significance of interrelationships between measures of immunocompetence and psychological functioning following the intervention, an intercorrelation matrix was constructed.

The total lymphocyte cell count (CD3) correlated significantly and positively with the Anger-Hostility factor of the POMS ($r = 0.665$; $p < 0.05$) (see table 6).

The CD8 (suppressor) cell count correlated significantly and positively with the Tension-Anxiety factor of the POMS ($r = 0.705$; $p < 0.05$) (see table 6), the Anger-Hostility factor ($r = 0.798$; $p < 0.01$) (see table 6), the Confusion-Bewilderment factor ($r = 0.628$; $p < 0.05$) (see table 6) and the Total Mood Disturbance of the individual ($r = 0.666$; $p < 0.05$) (see table 6).

There were no other significant correlations found between the psychological measures and immunological variables in subjects subsequent to the exercise and cognitive-behavioural intervention in the experimental group.
**Table 7: Interrelationships between immunologic and psychological variables in the experimental group subsequent to the intervention**

<table>
<thead>
<tr>
<th>Psychological tests</th>
<th>CD3 cell count</th>
<th>CD4 cell count</th>
<th>CD8 cell count</th>
<th>CD4:CD8 cell ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSES</td>
<td>-0.153</td>
<td>-0.163</td>
<td>-0.473</td>
<td>0.235</td>
</tr>
<tr>
<td>SPS</td>
<td>0.439</td>
<td>0.063</td>
<td>0.264</td>
<td>0.152</td>
</tr>
<tr>
<td>POMST</td>
<td>0.431</td>
<td>0.338</td>
<td>0.705</td>
<td>0.003</td>
</tr>
<tr>
<td>POMSD</td>
<td>0.159</td>
<td>0.262</td>
<td>0.41</td>
<td>0.049</td>
</tr>
<tr>
<td>POMSA</td>
<td>0.665         *</td>
<td>0.459</td>
<td>0.798         **</td>
<td>0.121</td>
</tr>
<tr>
<td>POMSV</td>
<td>0.123</td>
<td>-0.034</td>
<td>-0.119</td>
<td>0.055</td>
</tr>
<tr>
<td>POMSF</td>
<td>0.059</td>
<td>0.298</td>
<td>0.331</td>
<td>0.293</td>
</tr>
<tr>
<td>POMSC</td>
<td>0.308</td>
<td>0.221</td>
<td>0.626         *</td>
<td>-0.106</td>
</tr>
<tr>
<td>POMSTOT</td>
<td>0.418</td>
<td>0.376</td>
<td>0.666         *</td>
<td>0.039</td>
</tr>
</tbody>
</table>

* P<0.05  
** p<0.01  
*** p<0.001

CD4 T-cells = T-helper/inducer cells  
CD8 T-cells = T-suppressor cells  
CD4:CD8 ratio = helper:suppressor cell ratio  
CD3 T-cells = total T-lymphocytes

CSES = Coping Self Efficacy Scale  
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POMST = Profile of Mood States factor Tension-Anxiety  
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POMSV = Profile of Mood States factor Vigour-Activity  
POMSF = Profile of Mood States factor Fatigue-Inertia  
POMSC = Profile of Mood States factor Confusion-Bewilderment  
POMSTOT = Profile of Mood States Total Mood Disturbance
Figure 8 provides a summary of the significant interrelationships identified between immunological variables and psychological measures subsequent to the intervention in the experimental group.

In determining the significance of differences between measures of immunocompetence and psychological functioning following the intervention, it was found that a significant positive correlation existed between the CD3 (total lymphocyte) cell count and the Anger-Hostility factor of the POMS ($r = 0.665$).

The Anger-Hostility factor correlated significantly and positively to CD8 (suppressor) cell counts ($r = 0.798$).

CD8 (suppressor) cell counts correlated positively and significantly to the Tension-Anxiety factor of the POMS ($r = 0.705$), the Confusion-Bewilderment factor ($r = 0.626$), and the Total Mood Disturbance of the POMS ($r = 0.666$) following the intervention.

### 3.6 PRE- AND POST-INTERVENTION RELATIONSHIPS BETWEEN MEASURES OF IMMUNOCOMPETENCE AND PSYCHOLOGICAL VARIABLES

In order to determine the significance of the differences of the interrelationships between immunological variables prior to and following the intervention, an intercorrelation matrix was constructed.

Total lymphocyte (CD3) cell counts correlated significantly pre-test to post-test ($r = 0.867; p < 0.0001$) (see Table 8). The CD4 (helper/inducer) cell count measures prior to the intervention, correlated significantly to the CD4 cell counts subsequent to the intervention ($r = 0.919; p < 0.0001$) (see Table 8). CD8 (suppressor) cell counts correlated significantly pre- to post-test ($r = 0.764; p < 0.05$) (see Table 8).
Figure 8: Interrelationships between immunologic and psychological variables in the experimental group subsequent to the intervention

\[ \text{POMSA} = \text{Profile of Mood States factor Anger-Hostility} \]
\[ \text{POMST} = \text{Profile of Mood States factor Tension-Anxiety} \]
\[ \text{POMSTOT} = \text{Profile of Mood States Total Mood Disturbance} \]
\[ \text{POMSC} = \text{Profile of Mood States factor Confusion-Bewilderment} \]
\[ \text{CD8} = \text{T-suppressor cells} \]
\[ \text{CD3} = \text{total T-lymphocytes} \]
Table 8: Correlations between pre- and post- test immunological findings

<table>
<thead>
<tr>
<th></th>
<th>Pre-test CD3 cells</th>
<th>Pre-test CD4 cells</th>
<th>Pre-test CD8 cells</th>
<th>Pre-test CD4:CD8 ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-test CD3 cells</td>
<td></td>
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<tr>
<td></td>
<td>0.867 ***</td>
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<td>Post-test CD4 cells</td>
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<tr>
<td></td>
<td></td>
<td>0.918 ***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test CD8 cells</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>0.746 *</td>
<td></td>
</tr>
<tr>
<td>Post-test CD4:CD8 ratio</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.866 **</td>
</tr>
</tbody>
</table>

* p < 0.05
** p < 0.01
*** p < 0.001

CD3 T-cells = total T-lymphocytes
CD4 T-cells = helper/inducer T-cells
CD8 T-cells = suppressor T-cells
CD4:CD8 T-cells = helper:inducer cell ratio

The CD4:CD8 (helper:suppressor) cell ratio prior to the intervention, correlated significantly to measures obtained subsequent to the intervention (r= 0.866; p< 0.01) (see Table 8).

The theoretical and clinical significance of these results will be discussed in the final chapter.
CHAPTER FOUR

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

4.1 INTRODUCTION

The Acquired Immunodeficiency Syndrome (AIDS) has assumed pandemic proportions worldwide, posing tremendous challenges to medical and mental health professionals. AIDS is, at present, incurable, fatal and dangerously contagious, influencing the health of the public as well as exerting profound effects on the social, political and economic circumstances of the world (Hulley & Hurst in Mays et al., 1992). It is estimated that at least one person, somewhere in the world, contracts HIV, the virus that leads to AIDS (Mays & Moscoso, 1995).

Those who have symptomatic AIDS are, to some extent, been treated either by retroviral interventions such as Zidovudine (AZT) and Retrovir, or symptomatically, by managing the opportunistic infective conditions and the opportunistic cancerous conditions, of which Kaposi's sarcoma would probably be the main exponent (Busch & Maxwell, 1990). Until an effective vaccine is developed to suppress the reproduction of the virus, it is imperative to generate alternate treatments to cope with the complex and multiple psychosocial and physical demands of HIV/AIDS- sufferers (Leukefeld, 1990; Schneiderman, 1992). Although AZT has the ability to prolong life for several months, its usefulness is limited due to the high cost involved, the need for elaborate patient monitoring due to drug toxicity and it's limited accessibility, especially in developing countries (Schopper & Walley, 1992). South Africa poses a unique challenge to health-care workers in their pursuit to curtail the HIV/AIDS epidemic.
Numerous difficulties are confronted as the epidemic spreads in a society experiencing rapid political change against a background of apartheid (Barnett & Blaikie, 1992). Although it is impossible to accurately predict the current scale of the epidemic, it is known that the number of AIDS cases tends to double every 8.5 months. The World Health Organization (WHO) estimate that there are currently 14 to 18 million people worldwide who are either HIV-positive or have symptomatic AIDS, and it is further speculated that of those infected, approximately 85 percent are to be found in the developing world (Mays & Moscoso, 1995). Thus, the expected personal, social and economic implications of the epidemic will be enormous.

In South Africa especially, the management of the disease and the curbing of the epidemic are complicated by a number of social and economic factors intrinsic to South African society. This makes it almost impossible to control the spread of the disease without taking into consideration the wider socio-political context. In addition, large-scale community-based interventions need to be validated cross-culturally and be versatile to allow for adaptation to a wide variety of contexts.

The recent advances in the field of psychoneuroimmunology have given firm support to the original theoretical position of a rather close correlation between certain psychological variables and immunologic measures (Jemmott & Locke, 1984; Weisse, 1992). This stresses the importance of early immunomodulatory interventions that may help restore competence and halt HIV-1 disease progression at an early point in the HIV-1 infectious continuum.

Due to the heterogeneity of HIV-infected individuals, no single therapeutic strategy is likely to be universally effective (Kelly & Murphy, 1992). Ultimately, a multidisciplinary perspective is required which involves research stemming from the fields of health psychology, behavioural medicine and psychoneuroimmunology (Coates et al., 1984).
Due to the diversities in ethnicity, exposure categories and gender in people infected with the HI-virus, numerous difficulties have been confronted in developing intervention strategies which are equally suited and effective across these domains (Kelly & Murphy, 1992). Research at the Centre for the Biopsychosocial Study of AIDS at the University of Miami recently indicated that a combination of an aerobic exercise programme and a cognitive behavioural intervention package led, not only to improvements in the immunologic status of subjects who tested positively for the HI-virus; but also to improvements in mood, that is decreases in anxiety and depression (Antoni et al., 1990a; LaPerriere et al., 1990; Schneiderman, 1992). In addition, the intervention has the ability to neutralize the effects of ethnicity, gender and exposure categories. However, the effectiveness of the intervention requires validation within a cross-cultural context like South Africa where it requires adaptation to a wide variety of contexts.

Of further importance is the fact that, although certain interactions have been noted between immunocompetence and psychological functioning in people who are HIV-infected, these interactions have not been fully explicated. The precise nature of the interrelationships between immunological measures and psychological variables is not known (Antoni et al., 1990b). Thus, what is of importance, even at an early stage, is to develop a heuristic model of the predictive interactions of the various psychosocial and immunological factors; so that based upon this, a more efficient and efficacious treatment method can be developed.

The purpose of this study was to examine the interrelationships between various psychological variables and immunological measures in asymptomatic or early symptomatic HIV-infected persons following an exercise and cognitive-behavioural intervention.

The specific hypotheses for this study were:
1. A significant correlation will be found between selected psychosocial variables as assessed by psychometric indices and immunological measures as assessed by immuno-assay methods in asymptomatic or early symptomatic HIV-sufferers.

2. Specific correlative patterns exist in psychosocial variables and immunological factors in persons who are HIV-infected.

In order to evaluate these hypotheses, 26 asymptomatic or early symptomatic HIV-sufferers were assessed psychometrically and immunologically; and then subjected to an exercise and cognitive-behavioural intervention, and reassessed after a 10-week period.

In this chapter, the results of the study will be discussed and will be presented firstly, by discussing the effects of the intervention, after which the immunological effects of the intervention will be addressed, followed by a discussion regarding the psychological effects of the exercise and cognitive-behavioural intervention. The major part of the chapter will be devoted to a discussion on the interrelationships between the psychological and immunological variables.

4.2 THE EFFECTS OF THE EXERCISE AND COGNITIVE-BEHAVIOURAL INTERVENTION

The effects of the intervention will be discussed concerning how the intervention effected the immune system as well as how it effected psychological factors.

4.2.1 The immunologic effects of the intervention

There were no statistically significant effects found due to the intervention. Of importance, however, is the fact that there were changes observed.
The most important changes observed included a decrease in the total number of lymphocytes (CD3), along with an increase in CD4 (helper/inducer) cell counts. It is important to note that, although the CD4 (helper/inducer) cell count changes observed were not statistically significant, a clinically significant change was observed. Pre-intervention levels of CD4 cells were indicative of HIV-seropositivity with minor symptoms (see Table 1). Following the exercise and cognitive-behavioural intervention, CD4 cell count levels were associated with wellness and no symptoms (see Table 1). Although these results were found not to be statistically significant, this could be attributed to the number of subjects used and the wide variability between the subjects which could have obviated the effects of the intervention. Of importance is that the CD4 (helper/inducer) cell counts showed a clinical improvement which would be more important in the context of an AIDS-survivor than a statistical improvement.

In addition, CD8 (suppressor) cell counts dropped from 935 cells/cmm to 818 cells/cmm subsequent to the intervention. This would be indicative of a decreased amount of the suppressor cytotoxic T-lymphocyte cells. Combined with the increase in the CD4 cell counts, namely the helper/inducer subset of T-lymphocytes, and the change in the CD4:CD8 (helper:suppressor) cell ratio; this could be construed as an improvement in the immunologic status of the individual (Antoni et al., 1990b; Antoni et al., 1991; Schneiderman, 1992).

When noting this change within the context of methodological issues in behavioural immunology, Cohen (1987) stated that in the very vague science of behavioural immunology, and the lack of definitiveness in the relationships between immunological variables and actual physical illness, it's important to note- within this context- that the changes in the immunological status of the subjects in this project were significant and clinically important given the relationship of the cell counts to actual physical illness. In this context, the changes do not only reflect a more positive immunologic scenario, but also an improvement in the actual physical health of the person.
It needs to be noted, however, that the variability in CD4 (helper/inducer) cells from pre­to post- test was very little, while the variability from pre- to post- test of CD8 (suppressor) cells was quite significant. This would mean that the effect of the intervention from pre­to post- test caused a significant increase in the variability of CD8 cells. It needs to be noted that Bachen and colleagues (1991) indicated that the CD8 (suppressor) cells tend to vary indirectly according to the variability in CD4 (helper/inducer) cells. The total effect, therefore, on cellular immunity in the context of HIV- disease would appear to be attributable to variability in the CD8 (suppressor) cells.

Given the improvement in the general status of the individuals immune system, this could be an indication that a combination of an exercise and a cognitive- behavioural intervention led to improvements in the persons overall condition, and an improvement in the presence of the HI- virus and/ or AIDS.

4.2.2 The psychological effects of the intervention

Significant psychological effects were obtained following the intervention. There were increases in personal coping as measured by the Coping Self Efficacy Scale, as well as an improvement in the perception of the availability of social support assessed by the Social Support Scale. In addition, decreases were found in tension and fatigue as well as the Profile of Mood States total score which is indicative of emotional disturbance. There were increases in vigour and activity due to the experimental intervention. Research conducted at the University of Miami’s Medical School by Ironson and colleagues (1990), Antoni and colleagues (1991) and Schneiderman (1992), reported similar findings. This would indicate that the intervention designed at the University of Miami’s Medical School has cross- cultural applicability and validity, as similar improvements in the psychological functioning were identified in subjects.
This would mean that the exercise and cognitive-behavioural intervention led to persons infected with the HI-virus or AIDS, to coping better with the illness, experiencing more social support, feeling less fatigued, and showing less tension and anxiety. In addition, a decrease in overall mood disturbance was found together with individuals feeling more vigourous and more able to manage the condition.

The above would indicate that, given the biopsychosocial nature of AIDS and the HI-virus, the intervention proves itself to be an efficacious intervention for the management of the HI-virus and AIDS as an adjunct to the medical management.

Of importance now, is the need to look at the interaction between the psychological and immunological factors in this study.

4.3 INTERRELATIONSHIPS BETWEEN PSYCHOLOGICAL AND IMMUNOLOGICAL VARIABLES

The discussion of the interaction between psychological and immunological factors in this condition, needs to be discussed against the caveat made by Cohen (1987). Cohen (1987) warns that the impact of behavioural parameters and the relationship of behavioural parameters to immune functioning is a very complex procedure. Cohen (1987) mentions that the basic premise of the interaction between psychological and immunological factors within the biopsychosocial model is based on the premise that the nature of the interaction between the central nervous system and behaviour has been delineated. In addition, the interaction between the central nervous system and the immune system has been delineated. Herein, Cohen (1987) mentions that none of these premises have as yet been shown to be immunologically acceptable.
It could be that a double-faulting process is taking place by relating Psychoneuroimmunology to psychosocial factors on the one hand, and to immunological factors on the other hand in a direct and causal model.

Given this caveat, it would be important to note that if a start is not made in describing, delineating and depicting the interactions between psychological and immunological variables - the state-of-the-art of Psychoneuroimmunology and how psychosocial and immunological variables interact - then science will not proceed as science normally proceeds. It would therefore be important to discuss most carefully the interactions found.

Of specific importance in this study, is the fact that the hypotheses were indeed substantiated. Specific patterns of intercorrelations between the psychological variables on the one hand and immunological variables on the other hand were found. Of greater importance is the fact that differences existed in the interrelationship between psychological and immunological variables between pre- and post-test scores.

In both cases, psychological variables were associated with total lymphocyte (CD3) cell counts. It would thus be important to note that from pre- to post-test, the CD3 (total) lymphocytes did have an effect, or was found to correlate with psychological measures.

Herein, it was found that vigour and social support were negatively correlated with total lymphocyte (CD3 t-lymphocyte) cell counts. The more social support and the more vigour the person experienced, the lower the number of total lymphocytes (CD3 t-lymphocytes).

Vigour and social support could be seen as active ways of dealing with HIV/AIDS; thus not allowing the person to deny that he or she indeed has the virus.
Of importance here is the study by Reed and colleagues (1994) wherein it was shown that denial would play a significant role in both mortality and morbidity due to a longer continuation of higher amounts of total lymphocytes (CD3) functioning in the system. This is at variance with the findings where a person's coping was positively related to the total number of lymphocytes present (Carver in Antoni et al., 1990a; Bachen et al., 1991).

The discrepancies found here are difficult to explain as in one instance coping was related to increases in immune functioning (Carver in Antoni et al., 1990a; Bachen et al., 1991); as opposed to research conducted by Reed and colleagues (1994) whereby personal expressions and interpersonal expressions of coping was found to be negatively related to the immunological findings.

It could very well be that the relationship is not direct but rather moderated by a moderator. Such a moderator variable could be ascertained when the CD3 (total lymphocyte) cell counts were evaluated against the CD4 (helper/inducer cells) and CD8 (suppressor cells); and also on the basis of the pre- to post-test changes. Herein, it was found that social support was not statistically significant, but approaching statistical significance in a positive correlation with the availability of total lymphocytes.

Post-test measures of vigour as well as coping became unrelated to the total t-lymphocytes (CD3 cells), which could mean that the moderator variable leading to the improvement of immunological status mentioned above, would render the effects of coping and vigour unrelated to the total lymphocytes (CD3 cells) present.

Post-test scores showed anger to be positively related to CD4 (helper/inducer) cell counts. Similar scores revealed the same in tension, and to a minor degree, social support. This might indicate a mobilization of the resources that could effect the moderator variable; as it was noted that the total t-lymphocyte (CD3) cell counts were
also inversely related to the presence of mood disturbance, as well as pre- to post- test measures of social support. Social support was inversely correlated with CD3 (total lymphocyte), CD4 (helper/inducer) as well as CD8 (suppressor) cell counts. It would therefore appear that the moderator variable would involve social support in an important and strenuous manner. Herein, it should be considered, that at the onset of the study, a 'natural sequence of response to HIV- infection' had been taking place, causing a 'natural reaction' to the HIV- infection as a stressor variable.

Noting Cohen's (1987) caveats, that is, the relationships being difficult to interpret, it would appear that social support is important in the sense that the more social support, the lower the immunologic responsivity to HIV- infection in a 'natural state'. Of importance in this so-called 'natural state' is that total lymphocytes (CD3) and CD4 (helper/inducer) cell counts were also negatively correlated with vigour. In addition, it could be noted that fatigue was positively correlated with CD4 (helper/inducer) cell counts in the sense that the more fatigue, the more CD4 cell counts were available. It was also found that the more depression in the subjects, the higher the CD4 cell counts were.

In this regard, the study conducted by Reed and co-workers (1994) found a similar initially inexplicable interrelationship between psychological and immunological variables. They found that 'realistic acceptance' correlated with 'stoic acceptance' and referred to a person accepting having AIDS as a highly morbid disease. Herein, Reed and colleagues (1994) indicate that 'realistic acceptance' would appear to represent a fundamentally cognitive phenomenon and to be a function of negative disease-specific expectancies within the context of AIDS. Such outcomes are likely to include the probability of increasing debilitation and eventual death. The individual prepares him or herself for the worst, for death, for total disablement. These would appear to be the major cognitive and behavioural components. Although Reed and colleagues (1994) indicate that this 'realistic acceptance' is not the only possible characterization of this pattern of response, it does provide an explanatory model for the inexplicable 'natural state of events' found in the pre-test variables.
Herein, it would be possible, and very likely probable, that higher degrees of social support- therefore support of real or stoic acceptance- would be associated with lowered total lymphocyte (CD3) cell counts and lowered helper/ inducer (CD4) cell counts. Reed and colleagues (1994) indicated denial to be associated with decreased morbidity and mortality, and to be the opposite of coping. The immunologic findings in the pre- tests of this study appear to be consistent with a model of realistic acceptance being adversely related to survival time and mortality.

This is further supported by the fact that coping skills were negatively associated with helper/ inducer (CD4) lymphocytes, and depression was associated with increased CD4 cell counts. It would also explain why increased vigour would be associated with fewer total lymphocytes (CD3 cells). In addition, it would indicate why fatigue and confusion approached significance in relation to CD4 lymphocytes, wherein the more fatigued and confused the individual was, the better the helper/ inducer (CD4) subsets of lymphocytes appeared.

The post- test interrelationships between immunological and psychological variables would appear to conform to a changed psychoneuroimmunological scenario within the person. Herein, increased coping was associated with decreased suppressor (CD8) cytotoxic cells; and social support was positively related to increased total lymphocyte (CD3) cell counts. It would also now be logical, and probable, that increased tension, depression anger and confusion, as well as the total degree of emotional disturbance, would be associated with increased suppressor (CD8) cytotoxic t- lymphocytes. Herein, the increased variability from pre- to post- test noted in suppressor cytotoxic cells would now be strongly and significantly associated with negative emotional states such as anger, depression, tension, confusion and total mood disturbance.

It would appear that on post- test variables, only social support, tension and anger related positively to helper/ inducer (CD4) and total (CD3) lymphocyte cell counts.
Given the constellation of a psychological scenario following the psychological interventions, it would appear that increased tension associated with anger and social support could indicate that the person had renewed an intention to succumb to the virus and its correlated illness symptoms.

In the landmark overview article on the present status of psychoneuroimmunology focused on the effects of psychological interventions in modulating immunity, Kiecolt-Glaser and Glaser (1992) commented on the disarray of findings of psychological variables relating to immunological variables. Herein, Kiecolt-Glaser and Glaser (1992) mention that as many studies indicate positive psychological changes to be correlated to positive immunologic changes, as do studies that suggest the opposite. Thus, it would appear that the interventions can be divided into two kinds. The first type included those studies which applied standard 'technology' to HIV-positive persons not organizing their experiences into a meaningful whole. These interventions would either have no effect on psychological and immunological variables, or could lead to detrimental effects. The second type of intervention, as reported in the Kiecolt-Glaser and Glaser (1992) article, revealed interventions which focused on producing an organizing principle of relating the individuals' personal life to his or her health status. These interventions revealed significant improvements in the individuals' condition, both on psychological measures as well as immunological fronts. In this context, the findings in the present study, where the 'natural state' of affairs in the pre-intervention scenario were of a psychological and immunological condition in disarray, the post-intervention assessments indicated an integrated psychoneuroimmunological response. This response was consistent with the 'state-of-the-art' findings within the field of psychoneuroimmunology. This would mean that the intervention for HIV-positive persons should focus - not only on the management of the psychological symptoms - but focusing on providing meaning and a meaningful context within which the individual may understand the psychoneuroimmunological nature of his or her disease. It would appear that 'health information' would play the most important role of all in understanding the psychoneuroimmunological nature of the disease.
This could, and would, lead to the individual adopting, not just a 'realistic acceptance' or 'stoic acceptance' of his or her condition, but would facilitate the individual in relating given psychological skills provided in an individual or group context, to improving his or her functionality, life-style and adaptability to a condition with a certain morbidity and mortality.

Given these findings, it would appear that predicted patterns of psychoneuroimmunological responses - wherein negative moods would be associated with decrements in CD3 (total lymphocytes) and CD4 (helper/inducer) cells counts, and increments in CD8 (suppressor) cells; and the obverse for positive psychological conditions - the moderator would be a well-structured psychological intervention. The 'well-structured psychological intervention' would allow the individual to integrate skills, knowledge and lifestyle into a consistent whole within which to relate social, personal, biological and helper contexts into a multi-systems approach to the management of HIV-seropositivity.

4.4 CONCLUSIONS

From the above, it would appear that a systems approach in the management and treatment of HIV-seropositivity is not only viable, but a dire necessity. Herein, it could be stated that if HIV-seropositivity is approached from a systems, and more specifically, a contextualist approach, that the 'natural course' of events in the biomedical treatment of AIDS would be dealing with an immune, psychological and social system in total disarray and non-integrated with each other. This total state of confusion in physiological, psychological and social contexts, could then contribute to increased morbidity and mortality. However, if viewed within a contextualist - utilizing a systems approach - therapeutic endeavours, based on the research reported above, should focus firstly on providing the individual with a biopsychosocial context within
which this individual would understand and view his illness from a biological-, psychological- and social- systems point of view, and would enable the individual to integrate all forms of help-dealing; be it biological or psychological or social, into an integrated whole. In this sense, the individual would be allowed to lead as normal a life as possible, in a new context, a new lifestyle within which to continue a meaningful and substantially fulfilling life.
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Pregnancy and AIDS. The Department of National Health and Population Development.


Teenagers and AIDS. The Department of National Health and Population Development.


Women and AIDS, The Department of National Health and Population Development.

APPENDIX 1

Randy Shilts is the only American journalist to have covered the AIDS epidemic full-time. His book *And the band played on*, was written after years of extensive research. It is a story of a disease and a society's response to this disease. It is also a tragedy and a portrait of hideous suffering. *And the band played on* is a book which takes us through the first years of the unfolding epidemic in America; including fiction and fact. It also includes the most intimate and deepest emotions and thoughts of those suffering from HIV/AIDS - the people Randy Shilts believe emerge as the heroes in his story.
APPENDIX 2

INFORMED CONSENT FORM

COGNITIVE THERAPY AND AEROBIC EXERCISE
IN A SOUTH AFRICAN SAMPLE OF
ASYMPTOMATIC AND EARLY
SYMPTOMATIC HIV-INFECTED
MEN AND WOMEN
PURPOSE: The purpose of this study is to evaluate the effects of an exercise intervention combined with group support therapy, on certain psychological and social variables related to early symptoms in HIV-1 (the virus responsible for AIDS).

You are invited to participate, if you fulfill admission criteria, and if you are willing and able to comply with the necessary requirements of the programme. This form serves as a request for your participation in this programme.

PROCEDURES: This intervention will span over a ten-week period and will take place at the Clinic and Centre for Behavioural Medicine at the Rand Afrikaans University. If you agree to participate in this intervention, you will be asked to report to the Clinic, affiliated to RAU and be required to complete several psychological questionnaires covering aspects related to your physical and psychological health, and more specifically; how you relate to stress, anxiety and social coping. Questions regarding your sexual and medical history may be asked as well as whether you make use of any substances, that is any drugs or alcohol use.

A physical examination including a maximum graded bicycle exercise test will form part of the procedures. If you are selected to participate in this programme, you will be required to repeat the above procedures after a 10-week period. You will be required to attend three meetings a week over the ten week period and the exact days will be allocated to you at the first meeting.

The duration for each meeting will be approximately 1.5 to 2 hours. Group therapy sessions (approximately 4 - 6 individuals per group) will be followed by an exercise session.

RISKS: Subjects will incur no appreciable physical risks through participation in this study though they may undergo psychological and physical discomforts at some time points. You may experience some physical discomfort related to venipuncture for blood samples. These include: discomfort and/ or bruising at the site of the venipuncture; and less commonly, infection or the formation of a small blood clot or swelling of the vein and surrounding tissue, or bleeding at the needle puncture site.
Due to the physical nature of the programme, involving aerobic exercise components, certain potential risks may be experienced. Pertaining to the maximum graded exercise test, the potential risks involved include: abnormal blood pressure, fainting, elevations in heart and respiratory rates as natural consequences of exercise. Resistance exercise may cause some muscle soreness, however these physical discomforts are normally temporary, although some subjects may report prolonged discomfort. In such cases, attempts will be made to provide relief.

**BENEFITS:** The potential benefits include physiologic and immunologic information which might optimize future health status. Information regarding personal testing will be provided on your request. Such requests must be made officially by signing a release of information form provided on your request. Furthermore, it is important to note that your participation in this program will involve no expense in terms of fees. A major benefit is the potential an exercise and cognitive- behavioural programme has for improving your quality of life and your personal well-being; and to help mental health professionals to formulate a therapeutic intervention specifically geared to alleviating the distress associated to HIV/ AIDS-related symptoms.

**CONFIDENTIALITY:** Your consent to participate in this programme, includes consent for the investigator and the research assistants to review all your medical records as may be necessary for the purpose of this program. All your records will be considered confidential to the extent permitted by the law. The results of the programme may be published anonymously for scientific purposes, and your signature includes your agreement to this.

Your records and results will not be identified or connected to you in any way, and no other publication will be done without your expressed permission. All results and identities will remain anonymous. Each subject will receive a code number and all files and records will be identified by this number. Any necessary contact numbers or contact people will be kept separately.

**RIGHT TO WITHDRAW:** Participation in the programme is voluntary and you are free to withdraw your participation or consent and discontinue your participation at any time. You are assured that no current or future care will be influenced by withdrawing from the programme. You should also understand that the investigators in charge of the programme can remove you from the study without your consent if he or she feels that it is in your best medical interest.
PARTICIPATION: In committing to this programme you will be expected to attend all scheduled meetings, as these will have beneficial implications for your personal health and the development of this therapeutic intervention.

Signing this Consent Form, I ____________________________, confirm having read it and agree to participate in the therapeutic intervention as specified.

.........................................................  ..............
Signature of participant                     Date

.........................................................  ..............
Signature of witness                         Date

.........................................................  ..............
Signature of witness                         Date

.........................................................  ..............
Signature of group facilitator               Date

PRINCIPAL INVESTIGATORS:
Prof. Edward Wolff, PhD                      Dr. A. LaPerriere, PhD
Clinic and Centre for Behavioural Medicine   Miami Medical School
Rand Afrikaans University                    University of Miami

Co-ordinating therapist:
Mandy Jacqueline Riekstins
Clinic and Centre of Behavioural Medicine
Rand Afrikaans University
Tel: (011) 837-0543
APPENDIX 3

RECRUITMENT FORM
RAU UNIVERSITY OF MIAMI HIV-PROJECT

It is well-known that people who have been tested positive for HIV or have AIDS face a life full of hardship. Many times they lose the will to fight, become helpless, lonely and isolated. They become sickly, depressed, anxious and lose all self-esteem.

The Rand Afrikaans University in conjunction with the University of Miami Medical School is proud to announce an exercise and cognitive-behavioural programme to improve the quality of life and well-being of those who are HIV-positive or have AIDS.

The programme focuses on exercise and group discussions, and will improve your immunity, self-esteem and quality of life. It is free of charge, and ABSOLUTE CONFIDENTIALITY is guaranteed.

If you are interested, please fill in your name, address and/or telephone numbers below, and we will contact you to start in the programme.

NAME: ______________________

TELEPHONE NUMBERS: (h) ________________
(w) ________________

ADDRESS: ______________________

______________________________

If you would like to speak to us first, please call during weekdays at (011) 837-0543.

Yours sincerely

PROF. EDWARD WOLFF, PHD
DEPARTMENT OF PSYCHOLOGY
RAND AFRIKAANS UNIVERSITY
APPENDIX 4

PROTOCOL FOR COGNITIVE-BEHAVIOURAL INTERVENTION
## Contents of Cognitive-Behavioural Intervention

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<td>17, 18, 19, 20</td>
<td>Assertion training via role-playing and behaviour rehearsal</td>
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</table>
COGNITIVE-BEHAVIOURAL GROUP THERAPY: As this intervention is specifically aimed at improving and assisting the psychological and social coping of HIV sufferers, which in turn will enhance immunologic functioning; each session will have an umbrella topic which will be the focus of that specific session. The themes covered will guide the group process into specific domains assisting in improving mood, decreasing helplessness, anxiety and depression; which will further facilitate in enhancing immunocompetence along with the exercise component of the intervention.

COGNITIVE THERAPY SESSION: According to Freeman and co-authors (1989), each cognitive therapy session should compromise of the following:

1. AGENDA SETTING
   Briefly list the objectives of the current session.

2. REVIEW CURRENT STATUS AND EVENTS OF THE LAST WEEK/DAY
   This aids in identifying any presenting problems and in evaluating the progress of the group.

3. SOLICIT FEEDBACK REGARDING THE PREVIOUS SESSION

4. REVIEW ANY HOMEWORK ASSIGNMENTS

5. FOCUS ON THE SESSION FOR TODAY
   All the above should be brief in order to spend the maximum time and effort on the objective for the current session.

6. DEVELOP HOMEWORK ASSIGNMENT, IF ANY

7. SOLICIT FEEDBACK REGARDING CURRENT SESSION

In all cognitive sessions, the focus is on acceptance, reflection and restructuring utilizing group feedback. The group facilitator should continuously provide verbal reinforcement for appropriate responses.
SESSION 1:

| Main Objective: | Introductory session |

1. Welcome subjects to the clinic
2. Briefly discuss agenda for session 1
3. Main agenda for session 1:
   3.1 Briefly introduce the self, the group and the project staff
   3.2 Information regarding HIV and AIDS
   3.3 Structure of the course
   3.4 Distribute informed consent forms
   3.5 Read the informed consent form together with the group
   3.6 Note which subjects require copies of their signed informed consent forms
   3.7 Provide times and dates of subsequent sessions
4. Briefly explain the procedures to follow:
   4.1 Initial exposure to the bicycle
   4.2 Structured interviews and psychological tests
   4.3 VO2max and medical/ immunological tests
5. Solicit feedback regarding the above session
6. Conclude session 1

1. Welcome:

Subjects are seated and the group facilitator requests their attention.

Good morning/ afternoon. I am ...... and I will be your group facilitator for the duration of this study, that is, the next ten weeks. We will be meeting at the Clinic and Centre for Behavioural Medicine for the duration of the proposed intervention. As of next week, we will be meeting three times weekly for the next ten weeks.

2. Agenda for session 1:
Today is going to be a relatively long session of approximately 2.5 hours. However, we will only have one session this week. We are hoping to complete as much testing as possible in the session today, as well as to introduce you to each other and to the clinic staff working on the project. We also intend to introduce you to the bicycles today, depending on our allotted time. Today's session will include a brief informational component regarding HIV and AIDS, and an introduction to the structure of the course. Thereafter, I will distribute informed consent forms to those who do not already possess these. We will read through them together and I will clarify, and answer, any questions you may have. Thereafter, we will require your signature on the forms if you consent to participate in the project.

3. Main agenda for session 1:

3.1 Briefly introduce the self, the group members to each other and the staff involved in the project

This is a very brief introduction. Group members need only be introduced on a first-name basis. More in-depth introductions will be reserved for the following session, that is, session 2.

3.2 Information regarding HIV and AIDS

This is a brief and simplistic, non-jargon description about HIV and AIDS supplied by the Department of National Health and Population Development. Subjects may request elaboration. Be prepared for questions elicited during the discussion. It may be wise to bring along a few references in order to refer to, if necessary.

AIDS is an incurable disease which is passed on by unprotected sexual intercourse and by infected mothers to their unborn babies. In countries where blood is not screened, infection can also take place through blood transfusions. In South Africa, however, all blood is screened. Sharing needles during the abuse of drugs can also infect you with AIDS. The illness is caused by a germ, the Human Immunodeficiency Virus (HIV), which enters the body's white blood cells and makes it impossible for the body to defend itself against illness. The HI-virus does not kill people directly.
It does, however, weaken the body to such an extent that tuberculosis, cancer, illness of the lungs or other infections will kill the person.

A person may become infected and not know it for a very long time (for as long as 10 years). During this time, the person looks and feels healthy, but can infect others. Once the person becomes ill, he or she may lose a lot of weight in a short space of time, have swollen glands and many other symptoms.

3.3 Structure of the course

Most of the information will be provided with the informed consent forms.

The purpose of this study is to see how exercise training affects your mood, emotion and psychological well-being, as well as physical symptoms related to the HIV-infection. Our most important goal is to improve your health and your quality of life and to delay the deterioration of your health. Your participation in this programme will involve no expense to you as a study subject. Unfortunately, we cannot compensate for such things as lost wages, disability or discomfort due to any injury.

3.4 - 3.6 Informed consent forms

This form is going to be used to explain to you what the study is all about. I will read through it with you and answer any questions you may have. You will be required to sign the form to indicate that you will be participating and that you understand what will be done and what will be required from you. Should you wish, you will be provided with a copy of the signed informed consent form.

3.7 Provide dates and times of subsequent sessions

4. Procedures to follow:

Briefly explain the procedures to follow. If the procedures are taking place on a rotational basis, give venues, times and amount of time taken at each venue.
4.1 Initial exposure to bicycle
4.2 Structured interviews
4.3 VO2max and other medical/immunological tests

5. Solicit feedback regarding current session, if any

6. Conclusion

Before we leave, are there any questions? When we meet again, we will be administering a number of psychological questionnaires as well as starting with the exercise intervention. But I will discuss that in more detail when we meet again.

Now continue with the structured interviews and the medical/immunological testing scheduled for today.

SESSION 2

Main objective: Introducing group members and psychological testing

I know that you have already briefly introduced yourselves to one another, so today we will spend a little time telling the group a bit more about ourselves... just something brief, as today will be a relatively short session. We intend to introduce you to the exercise intervention as well as to get you to answer a few psychological questionnaires which ask you to evaluate how much stress there is in your life, your mood and so on.

The group may ask for feedback regarding the medical and immunological testing done in the previous session.

The facilitator should introduce him or herself first, then allow 2-3 minutes for each member to do the same.
The group may be slightly apprehensive and withdrawn at this stage and reluctant to speak out. By allowing them to introduce themselves to one another in an informal manner, a more relaxed atmosphere is hoped to be achieved. Stress to the group that you are the facilitator and not there to be in absolute control of the group process. The members should attempt to look at one another and to address each other directly. This initial session is also aimed at creating a certain rapport within the group. Members who introduce themselves with negative self-disparaging comments should be gently but firmly discouraged. Good eye contact, warmth and an assertive audible tone of voice should be rewarded and reinforced. This is achieved by the facilitator providing verbal reinforcement for appropriate responses.

**Homework task:**

*In the next session, we will be discussing what we expect from one another as a group. In any group there must be an acceptance of certain rules and regulations so that the allotted time can be most beneficial to all. I would like you to think about what you each expect from the group and we will draw up a group contract.*

---

**SESSION 3**

| Main objective: | Mentioning and discussing the group contract |

The rationale of a group contract: In any group there must be an acceptance of certain rules and regulations so that the allotted time can be most beneficial to all. These rules might be determined by the facilitator and affirmed by the group, or determined through group decision making. In whichever way they are determined, it is important that they be clearly understood, followed and accepted. Although it is impossible to anticipate all the rules needed by a group, certain issues need to be addressed in formulating guidelines for group direction. The group contract must not be confused with a behavioural contract which specifies the goals of the intervention, including benefits, risks, rewards, responsibilities and so on (Walker et al., 1981).
After addressing the guidelines to follow, the group discussion should focus on the validity and the effectiveness of the proposed contract as well as considering certain problem areas that could be encountered like absenteeism, failure to do homework, non-participation etc.

**Homework task:**

Conclude the session by assigning the homework task which will entail each member compiling a list of goals and expectations (needs) to the next session. Stress that the list should be written.

>I would like you to think about what you expect from the intervention as a whole. We are going to compile a list of general goals and objectives that we as a group are hoping to achieve in our ten weeks together. In the next session, we will discuss each objective and decide whether it is valid and realistic given our time together as well as the objectives as specified in the informed consent forms.

**GROUP CONTRACT**

1. **CONFIDENTIALITY:**

An important commitment to one another. Please contract to keep everything that is kept within the group confidential. You may share your personal experience with others as long as the identity and confidences of the other group members are respected.

2. **ATTENDANCE:**

For your group to develop a sense of identity, it is vital that each member contracts to attend as many sessions as possible. The absence of one member can be a significant loss to the group.
3. RESPECT AND CONSTRUCTIVE FEEDBACK:

Each member has the freedom to spontaneously provide feedback as appropriate. Feedback is most constructive when there is an emphasis on positive reinforcement and mutual respect. This does not mean that you may never disagree or experience differences, but that these should be explored respectfully and honestly, rather than judgementally.

4. RESPONSIBILITY:

Each of us, including myself as the facilitator of this group, has a responsibility and a commitment to the group and the intervention as specified in the informed consent forms.

5. GROUP INTERACTION/ SELF-DISCLOSURE

Try to interact with your fellow group members by taking risks, being spontaneous and adventurous. The more interest you invest in your group, the more you are likely to gain.

6. COLLABORATIVE EFFORT:

Although I have been appointed as facilitator of the group, you have the freedom to make suggestions, ask questions etc. As a group, we will negotiate the process of the intervention in a collaborative fashion.

I, ________________________, agree to abide by the suggestions and guidelines specified in the Group Contract, being fully aware that they serve to enhance my own as well as the other members of the groups' success and well-being in the therapeutic intervention.

_________________________  ______________
Signature of participant     Date
SESSION 4

Main objective: To create a goal/objective list

This session will entail discussing the homework task of the previous session. It might be necessary for the group to discuss how to deal with those who did not complete the task. In discussing the task, a mutual list should be compiled, with all unrealistic and secondary goals to be put aside. The objectives of the intervention as a whole should be kept in mind when drawing up the final draft. It is important to see if there is much conflict or misunderstanding between the goals of the intervention and the expected goals of the group.

Homework task:

The following session will discuss the groups' expectations of the exercise intervention specifically. The task should address what each member expects from the bicycle intervention.

SESSION 5

Main objective: Analyze whether the probable outcomes of the exercise intervention are consistent with the groups expected needs and expectations

It's obvious that you all have a concern for your health or you would not have volunteered for the study. Often, however, people have misconceptions of what exercise can do for them. What are your expectations as regards the exercise? That is, what do you expect to change as a result of your involvement in the exercise programme?
Compile a list of expectations within the group. Discuss the realistic and expected expectations of the exercise intervention. Schneiderman (1992) may be used as a reference during this session. It is important to address the potential conflicts between what the group expects from the fitness intervention as opposed to the realistic objectives as specified by Schneiderman (1992). Thus, aim to establish realistic levels of goal attainment. Then attempt to shape these beliefs so they are consistent with the exercise intervention. You should try to ensure that the group believes that the prescribed fitness activities will produce the desired effects and that they have confidence that these effects will be achieved if they behave as directed.

**Homework task:**

*In the next session, we are going to construct a decision-balance sheet. This involves a list of the costs and benefits of your participation in the exercise and group intervention. I would like you to compile a short list of the costs and benefits of the following:*

(a) participation and
(b) non-participation in the intervention.

**SESSION 6**

| Main objective: | To construct a decision-balance sheet |

This entails that the group re-evaluate, either verbally or in writing, the benefits and costs of their participation in the intervention. Often, simply asking individuals to rethink why they are trying to establish a certain goal or goals in the first place, is sufficient motivation to trigger a healthy restart. Schneiderman (1992) alleges that the decision-balance sheet provides a simple method for implementing cognitive behavioural modification techniques. The group facilitator, along with the group members, carefully evaluate expectations of the intervention. In this way positive outcome expectations can be actively reinforced, while negative ones can be diminished.
Schneiderman (1992) identifies the following components as important: planning strategies for overcoming real or perceived barriers, examining the role of significant others in the process and so on. The decision-balance sheet may be periodically reviewed.

Example:

**Decision-balance sheet: Participation**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relaxation</td>
<td>Loss of time with family</td>
</tr>
<tr>
<td>Healthy attitude</td>
<td>Inconvenience</td>
</tr>
<tr>
<td>Group support</td>
<td>Sore muscles</td>
</tr>
</tbody>
</table>

**Decision-balance sheet: Non-participation**

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of discomfort</td>
<td>Stress at end of day</td>
</tr>
<tr>
<td>More time with family</td>
<td>Deterioration of health</td>
</tr>
</tbody>
</table>

**Homework task:**

*For the next session, I would like you to think about ways we may be able to achieve our goals of exercise adherence and maintenance. That is, how do we reinforce the benefits and reduce the costs of participation in the intervention?*
MAIN OBJECTIVES OF EXERCISE ADHERENCE AND MAINTENANCE (*)

1. Analyze whether probable outcomes of an exercise prescription are consistent with the groups' personal needs. It is also important to establish realistic levels of goal attainment, to question whether these are in fact reinforcing, and to counter problems associated with the delayed rewards of physical conditioning.

2. Always consider the role of outcome expectancies and self-confidence in determining behaviour. An individual's decision to participate in a fitness programme can be compared to a cost-benefit analysis. Beliefs in specific costs and benefits become more influential depending on their worth to the individual.

3. Closely examine what individuals believe they have to do to attain certain desired goals. It is important to shape these beliefs and subsequent behaviours so they are considered consistent with constructive exercise prescriptions.

4. You should ensure that individuals believe that the prescribed fitness activities will produce the desired effects and that they have confidence that these effects will be achieved if they behave as directed.

5. Clients will begin and maintain exercise only if the outcomes of the behaviour are valued. It is important to consider how exercise might compete with other interests and/or responsibilities of daily life.

6. You should learn how to build on positive and to counter negative social influence. Consideration must be given to significant others.

7. You should address the potential conflict between what the individual thinks or feels about exercise prior to a fitness programme and their reactions following the adoption of the behaviour.

8. You should be aware that the passage of time is always a threat to the value of a given behaviour or to established priorities.
SESSION 7

<table>
<thead>
<tr>
<th>Main objective:</th>
<th>Methods to maintain exercise adherence and maintenance</th>
</tr>
</thead>
</table>

Discuss methods which would reinforce the benefits of participation and adherence to the exercise intervention; and counter the problems associated with participation. It is imperative to keep in mind that the rewards of physical conditioning do not suddenly occur, they are delayed and gradual. The passage of time is always a threat to the value of a given behaviour.

Discuss the possibility of a chart with each participants' name as well as the distance covered in kilometres at each exercise session. Perhaps the group has other useful suggestions which would enhance their motivation and prevent participation dropout.

SESSION 8

<table>
<thead>
<tr>
<th>Main objective:</th>
<th>Ways to discounter the discomforts of exercise: dissociation</th>
</tr>
</thead>
</table>

At this stage, the exercise intervention may be associated with discomfort, especially for those individuals who are not physically conditioned. Thus, one way to improve compliance is to reduce or attempt to eliminate unpleasant cues associated with the discomforts of exercise. Rejeski and Kenney (1988) suggest three valuable methods to accomplish this objective:

1. dissociation
2. relaxation
3. reinterpretation.

Dissociation is based on the principle that one can attend to only a number of stimuli at any given moment. Thus, dissociative tasks are designed to distract the individual's attention away from the unpleasant sensations produced by exercise.
In designing and implementing dissociative tasks, consider the following:

1. The task must be relevant and enjoyable. For example, the use of head-phones makes the task enjoyable and serves a dual purpose. Aside from delivering the music, they keep the individual locked into the dissociative mode by shutting and distracting.

2. The more involved the individual is in the task, the better. Thus, the level of involvement abstracts you from any other considerations.

3. It is best to keep dissociative tasks constructive in nature in order to support a commitment to positive thinking.

4. The use of distraction as a form of coping only requires common sense. Thus, tasks may even involve daydreams, music, compiling a letter and so on.

SESSION 9

Main objective: Ways to counter the discomforts of exercise: relaxation

Muscular tension in the working muscles is a natural by-product of exercise. However, it is also true that many novice exercisers tend to have unwanted tension in non-working muscles. Thus, excess muscle activity can actually work against desired exercise movement patterns, which reduces efficiency and intensifies feelings of exertion. To counter these effects:

1. Educate the group on proper exercise techniques.
2. Incorporate a modified relaxation training session into the daily exercise routines.

Use this session to stress to the group to use their relaxation time period to establish positive pre-exercise mindsets. For example, they can reflect on the importance of their own physical health and well-being.
Suggest that they think of something pleasant which they can then focus on while exercising. Stress that the relaxation period is important as it allows the individual a brief opportunity to appreciate the calming influence of exercise.

SESSION 10

| Main objective: | Ways to counter the discomforts of exercise: reinterpretation |

This involves taking the unpleasant symptoms of exercise and converting them to cues that signify something pleasant. However, this method does not work with everyone. It seems to be most effective if the individual feels either neutral or somewhat positive about the discomforts at the start. Thus, it may be limited to situations in which you are trying to enhance the performance of someone who is already doing fairly well. Beware of encouraging subjects to push too far, as the possibility of injury increases.

SESSION 11, 12 & 13

| Main objective: | Helping the group to plan social influence |

It is important to consider how the intervention might compete with other interests and/or responsibilities of daily life. Also, consideration needs to be given to significant others in the individuals' life. Unless significant others know about, and support the arrangements necessary to accommodate the intervention, conflicts are bound to arise. Lack of social support is a frequently cited precursor to non-compliance. Thus, communication between the individual and significant others is essential if social influence is to work for rather than against a lifestyle that includes an intervention such as this; which involves a thrice weekly commitment. Helping subjects identify those people who may be a hindrance may enable you to plan strategies to prevent problems before they occur. You could begin the session by asking:
Has your family/ friends/ employer ever commented on your involvement in this intervention?

If the answer is yes, ask what was said.
If the answer is no:

Well, what do you feel about it?

SESSION 12 could be initiated with the question:

Do you feel there are any people in your life who have a problem with you being occupied at the Clinic three times a week?

SESSION 12 and SESSION 13 may be used to help the group to deal with any social influence.

SESSION 14

| Main objective: | Presenting the concept of assertion training |

Walker and colleagues (1981) state that assertion training refers to the procedure in which the individual is instructed, coached, trained and supported in taking positive assertive action in a situation. This is done as a means of coping with problematic situations in a way that promotes more effective outcomes and less anxiety. Thus, it is aimed at increasing the individuals' ability to engage in assertive behaviour in a socially appropriate manner.

Rationale:

1. Taking appropriate positive action in a situation produces adaptive coping which yields results in terms of problem resolution, thus defusing situations that could potentially become highly anxiety-provoking and traumatic.

2. Successful coping with stressful situations develops self-confidence leading to an optimistic outlook on life and feelings of well-being.
3. Very crucial is the difference between assertion and aggression. The individual must be taught the appropriate, friendly, congenial, co-operative way of dealing with problems and resolving them in such a way that his or her rights and wishes, as well as those of the other person, are dealt with honestly and fairly.

Rimm and Masters (1974) allege that assertion training results in feelings of well-being similar to that found in deep muscle relaxation.

In presenting the concept of assertion training to the group, the group facilitator must stress the negative effects experienced by the group like feelings of anger, depression, resentment, frustration and so on; followed by a projection of the feelings of personal well-being, relief and increased interpersonal satisfaction. Mention that these are very likely to be the expected consequences of increased assertiveness.

SESSION 15

Main objective: Discussing the components of assertive behaviour

According to Walker and co-authors (1981), the following components are imperative for assertive behaviour:

1. **Eye contact:**
   Look the person you are addressing directly in the eyes.

2. **Body posture:**
   Face the person and stand erect. If one leans, it should be toward the other person, not away.

3. **Gestures:**
   Use appropriate gestures - do not remain motionless, but at the same time, try not to overdo gestures.

4. **Facial expression:**
   This should be congruent; it should match the content of your message.
5. Voice:
   Tone, inflection and volume should be appropriate for the occasion.

6. Timing:
   Time and place of the assertive behaviour should be appropriate to the content. Some
   assertive acts require privacy and adequate time, whereas others may be brief and public.

7. Content:
   The individual should clearly have in mind what he or she is going to say and the words to
   be used, etc.

Homework task:

I want you to practice these seven points of assertive behaviour. In the next session,
we will discuss how they worked and how you felt afterwards.

SESSION 16

Main objective: Reviewing the components of assertive behaviour

Did anyone get the opportunity to use the skills of assertive behaviour that we spoke
about in our last session together?

If no, review them and ask for volunteers to rehearse them within the group. Sometimes adverse
reactions may occur in the individuals' first attempts at assertive behaviour. The individual may be
overly anxious or feel guilty afterwards. The other person involved may have retaliated with pouting,
aggression or withdrawal.

Homework task:

The following three sessions will involve role-playing within the safe confines of the group. Each
member should bring along a situation in which he or she believes more assertive behaviour is
required.
Behaviour rehearsal can only result in increased effectiveness in communication. If an individual is behaving assertively and confidently, it is difficult to experience much anxiety.

**SESSION 17, 18, 19 & 20**

| Main objective: | Assertion training via role playing and behaviour rehearsal |

Behaviour rehearsal within the confines of the group can be effective and useful, as the facilitator and the group members can provide immediate feedback and encouragement. Similarly, the group is able to offer evaluation and suggestions, as well as being exposed to a number of different models. Depending on the available time, this procedure can be repeated until all members agree that the response is appropriately assertive and is accompanied by minimal anxiety.

If the group is reluctant in initiating a role-play, it may be necessary to begin with a graduated series of exercises.

For example: **SESSION 17**

* I would like you to greet the person to the left of you. I will begin. I want you to practice the seven skills we have been discussing. Greet the person with warmth and make sure you have good eye contact as well as an audible and confident tone of voice.

**SESSION 18**

* Today, I would like you to exchange compliments with the person next to you.

The recipient must be encouraged to accept the compliment with a positive acknowledgement. Any self-disparaging comments should be gently, but firmly discouraged.
By now the group should be less anxious to initiate role-plays. The role-plays may involve any stressful situation, i.e., HIV/AIDS-related, employment, family, etc.

**SESSION 21**

**Main objective:** Information and discussion: sex education

The need for discussions regarding healthier living etcetera, are based on the presumption that individuals', once appropriately risk-sensitized, can learn to more effectively alter their risk-behaviour patterns if they acquire the behaviour competencies for change implementation. A commitment to healthy, less risky behaviour can afford a greater sense of control over one's life and less anxiety and distress.

**The areas for discussion may include:**

1. 'Safer sex' education.
2. Assertiveness to communicate safer sexual practices with potential sexual partners.
3. Resisting coercions to engage in high-risk behaviours.
4. Problem-solving skills to anticipate, avoid and/or develop alternative ways to handle risk triggers or antecedents.
5. Reinforcement of behaviour-change efforts.

**Session 21** should begin with an informational component regarding the risks involved in unsafe sexual practices. This includes the risk to others as well as to the self. Risky sexual practices may in fact accelerate the HIV-infectious continuum. Members may then volunteer to discuss any past situations in which they engaged in high-risk sexual behaviours. They may want to mention the mood, setting, the use of drugs or alcohol.
SESSION 22

Main objective: Behavioural self-management: sex education

This involves the generation and the practising of self-statements emphasizing that safer practices can be developed for future reference (eg. I can change risky sexual behaviour), that anxiety will be reduced by doing so (I will feel much better tomorrow if I don't do anything risky tonight), and that risk-education is praise-worthy (I am proud that I didn't do anything high in risk this week).

Homework task:

To practice behavioural self-management tasks.

SESSION 23

Main objective: Assertion training: sex education

The group has already practised assertive behaviour in previous sessions. Refresh their memories. This session will involve instruction and modelling within the group based on those standard assertion training procedures dealt with earlier. However, the emphasis will be on unsafe sexual behaviour and/or other risky behaviours such as drug and alcohol use.

Role-plays: The facilitator begins by approaching one member and coercing him or her to engage in a high-risk behaviour. The group must then be trained to acknowledge the partners' wish but to firmly refuse the unsafe request. A reason must be provided for the refusal as well as a suggestion for an alternate behaviour that would not involve as much risk.
SESSION 24

Main objective: Relationship skills and social support development

This involves each member to identify risk-reduction changes made and the strategies used to make them. This permits the other group members to:

(a) observe the strategies used by others;
(b) provide the group with multiple coping models; and
(c) strengthen the personal expectancies of risk-reduction behaviour.

If no-one has had the opportunity to practise their assertive behaviour in a risky situation, continue with role-plays and assertion training within the group.

Homework task:

I would like you to think about any aspects you are finding difficult to deal with and that you feel are beyond your control due to the fact that you have the HI-virus.

SESSION 25, 26 & 27

Main objective: Coping with HIV/AIDS-related uncontrollable stressors

According to Schneiderman (1992), the following constitute uncontrollable stressors:

Homework task:
1. physical and neurological deterioration;
2. legal and societal stigma;
3. rising medical costs;
4. multiple bereavements;
5. loss of medical aid and employment.

In South Africa, these are further compounded by many other factors (see chapter 1.3).

Compile a list with the group. Sessions 24, 25 & 26 will be reserved for providing information and coping skills for dealing with uncontrollable stressors.

**SESSION 28**

| Main objective: | Healthier living |

Healthier living may involve information and discussions regarding the following, as well as any additional ideas brought by the group members:

1. nutrition;
2. alcohol use;
3. substance abuse/use;
4. sleep;
5. smoking;
6. stress;
7. alternative therapies and so on.

The facilitator must be prepared to answer any related questions and to provide relevant information and suggestions concerning living with HIV/AIDS.
APPENDIX 5

PROTOCOL FOR AEROBIC EXERCISE INTERVENTION
SESSION 1

Main objective: Orientation to the exercise apparatus

This session is part of session 1 in the Cognitive Behavioural Protocol (see appendix 4). The subjects need to be introduced to the bicycle. The following needs to be explained:

1. The heart rate monitor and how it works. The three main functions of the monitor need to be explained. That includes how to read the heart rate, and to set upper and lower limits. The heart rate reading received is the current heart rate of the individual. The upper limit is set at 80% of the subjects maximum heart rate and the lower limit at 70%. The target heart rate zone ranges between 70% - 80%.

2. Subjects need to receive instructions on adjusting the seat for maximum comfort and ease of pedalling in order to prevent hypertension and excessive strain to the knees. Ideally, a slight bend in the knees should be maintained when the pedal is in the lowest position.

3. The subjects must receive instructions on how to adjust the tension control lever. The range is from 0 (no tension) to 10 (maximum tension). The higher the tension, the more difficult it is to pedal.

SESSION 2

Main objective: Orientation to training

This session follows session 2 of the Cognitive Behavioural Protocol's session 2 (see appendix 4). It involves teaching the subjects the stretching routine which is to be done before and after each exercise session. Secondly, the concept of interval training needs to be explained to the group.
1. **Stretching routine:**

The pre- and post-training stretching exercises take approximately 5-10 minutes to complete once the person has learnt how to perform them. The following six muscle groups are involved: calf, hamstring, lower back, groin, shoulder, and modified hurdler stretch.

Supervised demonstrations of each stretch are required until the subjects are proficient in the exercise.

2. **The concept of interval training:**

Interval training consists of alternating periods of exercise performed at higher and lower exercise intensities. The higher period is termed the **task** period and is attained when your heart rate is within your **target heart rate zone**. Your heart rate should never be allowed to exceed the upper limit setting on the heart rate monitor. The **task** periods last for 3- minutes.

The lower intensity period is termed the **recovery** or **off-task** period and is attained when your heart rate is below the lower limit setting on the heart rate monitor. This period lasts for 2- minutes. The objective of interval training is to maintain your heart rate within your **target heart rate zone** during the **task** periods, and for your heart rate to be below the **target heart rate zone** during the **off-task** periods. Your pedal speed should be maintained at a constant 60 revolutions per minute. Changes in your heart rate can be achieved by increasing or decreasing the bike's tension control setting.

Reassure the group that the concepts may seem alien and confusing to them at present, but that with each session, they will become more familiar with the procedures. Ultimately, the group members will become so proficient in the procedure that they will be able to continue the exercise at a gymnasium or at home, if they have the correct apparatus.

Each subject receives an **Exercise Programme Log** for each week of the intervention; as well as a **Training Record** which facilitates accurate recordings of each session by the exercise coordinator (see below for samples of the **Exercise Programme Log** and the **Training Record** which were developed by Miami University for the purposes of this study). In addition, each subject is expected to complete a **Pre- and Post-Session Mood scale** which is helpful in evaluating the impact of exercise on mood.
# TRAINING RECORD (*)

Subject identification number: 

Date: 

Target HR zone: 

<table>
<thead>
<tr>
<th></th>
<th>Period (mins)</th>
<th>HR: at beg.of period</th>
<th>Time to target HR</th>
<th>HR: at end of period</th>
<th>Time for HR to go Below Zone</th>
<th>Any comments</th>
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</thead>
<tbody>
<tr>
<td>Warm-up</td>
<td>0-2</td>
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<tr>
<td>Task</td>
<td>2-5</td>
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<tr>
<td>Recov.</td>
<td>5-7</td>
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<tr>
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<tr>
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<td>15-17</td>
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<tr>
<td>Task</td>
<td>17-20</td>
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<tr>
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<td>20-22</td>
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<tr>
<td>Task</td>
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<tr>
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<td>27-30</td>
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<tr>
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<tr>
<td>Task</td>
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<tr>
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</tbody>
</table>

* Training record developed by University of Miami
Target Zone (> 70%): total time=
Recovery Time: total time=
Average time to recovery after task period=

HR= Heart rate
Task= 3-minute periods of higher intensity exercise
Recovery= 2-minute periods of lower intensity exercise

Average HR=
Average HR=
Peak HR=

PRE-SESSION MOOD

Subject identification number: ________________
Date: ________________
Session number: ________________

Below are six (6) statements that describe feelings that people have. Please read each one carefully, then circle the number which best describes how you feel.

0 = Not at all
1 = A little
2 = Moderately
3 = Quite a bit
4 = Extremely

1. How anxious do you feel right now? 0 1 2 3 4
2. How sad do you feel right now? 0 1 2 3 4
3. How confused do you feel right now? 0 1 2 3 4
4. How angry do you feel right now? 0 1 2 3 4
5. How energetic do you feel right now? 0 1 2 3 4
6. How fatigued do you feel right now? 0 1 2 3 4

Our feelings are influenced by many things such as national and international events, local developments (such as politics, sports, the economy etc.), personal issues (such as family matters, work or school, relationships etc.). Please complete the following sentence:
Overall, I feel the way I do because __________________________________________
POST-SESSION MOOD

Subject identification number: _____________
Date: _____________
Session number: _____________

Below are six (6) statements that describe feelings that people have. Please read each one carefully, then circle the number which best describes how you feel.

1. How anxious do you feel right now? 0 1 2 3 4
2. How sad do you feel right now? 0 1 2 3 4
3. How confused do you feel right now? 0 1 2 3 4
4. How angry do you feel right now? 0 1 2 3 4
5. How energetic do you feel right now? 0 1 2 3 4
6. How fatigued do you feel right now? 0 1 2 3 4

Our feelings are influenced by many things such as national and international events, local developments (such as politics, sports, the economy etc.), personal issues (such as family matters, work or school, relationships etc.). Please complete the following sentence:
Overall, I feel the way I do because__________________________________________

* Developed by the University of Miami
EXERCISE PROGRAMME LOG (*)

Subject identification number: ____________
Month: ____________
Week begins date: ____________
Week ends date: ____________

<table>
<thead>
<tr>
<th>Session numbers: dates and times</th>
<th>Week 1: session 1</th>
<th>Week 1: session 2</th>
<th>Week 1: session 3</th>
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</thead>
<tbody>
<tr>
<td>Reactions:</td>
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<tr>
<td>Pre-session</td>
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<tr>
<td>Warm-up</td>
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<td>Exercise</td>
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<td>Cool down</td>
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<tr>
<td>Off-days</td>
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</tbody>
</table>

* Exercise Programme Log as developed by the University of Miami