

THE RELATIONSHIP BETWEEN OCCUPATIONAL STRESS,
EMOTIONAL INTELLIGENCE AND COPING STRATEGIES IN AIR
TRAFFIC CONTROLLERS

by

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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification

Date: 2 March 2009

Abstract

The aim of this study was to determine whether there is a relationship between Emotional Intelligence, Stress and Coping Strategies in the occupation of air traffic control. The focus was to determine whether the Emotional Intelligence of an Air Traffic Controller might have an effect on the recognition and management of stressful situations, and influence the way they select coping strategies.

Due to a lack of research on air traffic control in South Africa, focus are not only on the stress levels of Air Traffic Controllers, but also how their Emotional Intelligence could assist in the recognition and management of the stress they experience, and ultimately then contribute to select appropriate Coping Strategies.

A literature study discussed the role of Air Traffic Controllers, and factors that contribute to them experiencing stress. The constructs of Stress, Emotional Intelligence and Coping were elaborated on in detail. The constructs were defined as follows: Stress, as any demand eliciting a negative emotional state, that exceeds an individual's resources to cope; Emotional Intelligence, as the process of emotional information processing consisting of the dimensions of Self Awareness, Self Regulation, Motivation, Empathy and Social Skills (Rahim & Minors, 2003); and Coping as the efforts to manage environmental and internal demands and conflicts which tax or exceed a person's resources (Lazarus & Launier, 1978).

Survey research was conducted, and questionnaires were used for all three of the constructs.

The sample consisted of 64 Air Traffic Controllers, working at three airports in South Africa. A job specific Stress questionnaire was used to determine the respondents' stress levels in six subcategories. The overall reliability for the Stress Questionnaire was .828. The reliability for the dimensions ranged between .571 and .813.

Emotional Intelligence was measured using the EQ Index designed by Rahim (2001) and consisted of five dimensions. The overall reliability for the EQI was .932 for Emotional Intelligence (Self), and .976 for Emotional Intelligence (Manager). The reliability for the dimensions ranged between .542 and .932. Coping was measured using Amirkhan's Coping

Strategy Indicator (CSI) (Amirkhan, 1990) and consisted of three dimensions. The overall reliability for the CSI was .857. The reliability for the dimensions ranged between .778 and .972. All these reliability statistics are satisfactory.

Mean ranking found that the top five most stressful items for the Air Traffic Controllers were: Number of aircrafts under their control, Extraneous traffic, Unforeseeable events, Peak traffic hours and Limitations and reliability of equipment.

After correlation studies and Mann-Whitney tests, research results showed that there were significant relationships between Emotional Intelligence (Self), and Emotional Intelligence (Manager) as perceived by the individual. Relationships were also found between Problem Solving, and Seeking Social Support, as well as Problem Solving and dimensions of Emotional Intelligence (Self); Self Awareness, Motivation, Empathy and Social Skills. Furthermore, Operating Procedure (Stress) also showed relationships with dimensions of Emotional Intelligence (Manager); Motivation, Empathy and Social Skills.

The results of the current study were in line with previous results, and theoretical support was also obtained for the results.

Limitations of the study as well as suggestions to develop Emotional Intelligence, Coping and stress reduction were provided.

Opsomming

Die doel van hierdie studie was om te bepaal of daar 'n verwantskap is tussen Emosionele Intelligensie, stres en Hanteringstrategieë in die beroep van 'n lugruimbeheerder. Die fokus was om te bepaal of 'n lugruimbeheerder se Emosionele Intelligensie 'n impak het op die herkenning en bestuur van stresvolle ervarings binne die beroep en daardeur die selektering van hanteringstrategieë beïnvloed.

As gevolg van 'n tekort aan navorsing in die beroep van lugruimbeheer, is daar besluit om te fokus, nie slegs op die stresvlakke van lugruimbeheerders nie, maar ook hoe hul Emosionele Intelligensie hul kan bystaan in die herkenning en bestuur van die stres wat hul ervaar en uiteindelik help met die selektering van 'n geskikte hanteringstrategie.

'n Literatuurstudie bespreek die rol van 'n lugruimbeheerder, asook die faktore wat bydra tot die ervaring van stres. Die konstrakte van stres, Emosionele Intelligensie en Hanteringstrategieë is ook breedvoerig bespreek. Die konstrakte is op die volgende maniere gedefinieer: stres, as enige eis wat op 'n individu geplaas word, wat hul hantering daarvan oortref en 'n negatiewe emosionele reaksie uitlok; Emosionele Intelligensie, as 'n emosionele informasie prosesseringsproses, bestaande uit die dimensies Self Bewustheid, Self Regulering, Motivering, Empatie en Sosiale Vaardighede (Rahim & Minors, 2003); en Hanteringstrategieë as die poging om omgewings en interne eise en konflik te beheer wat 'n persoon se hanteringsvaardighede oortref (Lazarus & Launier, 1978).

Opname navorsing is gedoen en vraelyste is gebruik vir al drie konstrakte. Die navorsingsgroep het bestaan uit 64 lugruimbeheerders, werksaam by drie lughawens in Suid Afrika.

'n Beroep spesifieke stres vraelys is gebruik om die stresvlakke van respondente te bepaal in ses sub-kategorieë. Die algehele betroubaarheid van die stres vraelys was .828. Die betroubaarheid vir die dimensies wissel tussen .571 en .813. Emosionele Intelligensie is gemeet deur die *Emotional Intelligence Index (EQI)*, ontwikkel deur Rahim (2001) bestaande uit vyf dimensies. Die algehele betroubaarheid van die EQI was .932 vir Emosionele Intelligensie (Self) en .976 vir Emosionele Intelligensie (Bestuurder). Die betroubaarheid vir die dimensies wissel tussen .542 en .932. Hanteringsstrategieë is gemeet deur Amirkhan se

Coping Strategy Indicator (CSI) (Amirkhan, 1990) en het bestaan uit drie dimensies. Die algehele betroubaarheid van die CSI was .857. Die betroubaarheid vir die dimensies wissel tussen .778 en .972. Al hierdie betroubaarheid statistieke is aanvaarbaar.

Gemiddelde rangordes het gevind dat die vyf stresvolste items vir lugruimbeheerders behels: aantal vliegtuie onder beheer, eksterne verkeer, onvoorsiene gebeurtenisse, spits verkeer en beperkinge en betroubaarheid van toerusting.

Nadat korrelasie studies en Mann-Whitney toetse gedoen is, het die navorsingsresultate getoon dat daar beduidende verhoudings is tussen Emosionele Intelligensie (Self) en Emosionele Intelligensie (Bestuurder), soos waargeneem deur die individu. Verwantskappe is ook gevind tussen Probleemoplossing, en die soeke na sosiale ondersteuning, sowel as Probleemoplossing, en die Emosionele Intelligensie (Self) dimensies van Self Bewustheid, Motivering, Empatie en Sosiale Vaardighede. Verdermeer, het Operasionele Prosedures (Stress) ook verwantskappe met dimensies van Emosionele Intelligensie (Bestuurder); Motivering, Empatie en Sosiale Vaardighede getoon.

Beperkinge van die studie word bespreek sowel as strategieë hoe om stres te verminder en hoe om Emosionele Intelligensie sowel as hanteringstrategieë te ontwikkel word voorgestel.

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CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1 Introduction

This chapter looks at the occupation of air traffic control as possibly one of the most stressful occupations, and determine the moderating effect that Emotional Intelligence may have on recognising and managing stressful situations. The concept of Emotional Intelligence will be analysed and discussed as well as how, if at all it influences the way that Stress is recognised and managed within a group of Air Traffic Controllers (ATCs). Emphasis will be placed on whether the recognition and management of stressful experiences through an individual's Emotional Intelligence contribute to the selection of appropriate coping strategies. Few areas of contemporary psychology have received more attention than Stress (Hobfoll, 1986; Kaplan, 1983; Lazarus & Folkman, 1984), yet much controversy remain regarding the stress concept. Stress and coping with stress in organisations are becoming increasingly important concerns in both academic research and organisational practices. Yet there is still a great deal not known about stress or coping with stress in organisations (Beehr & Newman, 1978; House, 1981; Cooper & Marshall, 1976). What is known, however, suggests that the importance given to these areas are necessary, perhaps overdue.

This exploratory study therefore focuses on Occupational Stress as experienced by ATCs and the recognition of emotions elicited by stressful experiences. It also explores how Emotional Intelligence will influence this recognition and management of emotions, if at all, and possibly influence the selection of coping strategies by individuals to actively cope with stressful situations.

In the following section the nature and context of the role of ATC will be discussed.

1.1.1 The Nature and Context of Air Traffic Control

The Dictionary of Occupational Titles defines air traffic control as the process of controlling air traffic on and within the vicinity of an airport according to established procedures and policies to prevent collisions and to minimise delays arising from traffic congestions. An ATC:

- answers radio calls from arriving and departing aircrafts and issues landing and take-off instructions and information, such as which runway to use, the wind velocity and direction, visibility, taxiing instructions, and pertinent data on other aircraft operating in the vicinity.
- They transfer control of departing flights to, and accept control of arriving flights from air traffic control centres, using telephone or interphone.
- The ATC alerts airport emergency crew and other designated personnel by radio or telephone when airplanes are having flight difficulties.
- They push buttons or pull switches to control airport floodlights and boundary, runway and hazard lights. They also scan control panels to ascertain that lights are functioning effectively.
- The ATC operates radio and monitors radarscope to control aircrafts operating in the vicinity of the airport.
- They receive cross-country flight plans and transmit them to air traffic control centres. They signal aircrafts flying under visual flight rules, using electric signal light or flags.
- They may also control cross-runway traffic by radio directions to guards and maintenance vehicles. They may keep written record of messages received from aircrafts and control traffic within designated sectors of airspace between centres and beyond airport control tower area (Borins, 1983).
- They must monitor and process a rapid flow of information. They are required to make quick and confident decisions with a “zero-tolerance” for errors. Finkleman and Kirschner (1980) suggested that this information-processing demand may be a source of stress for some controllers, as the decisions made based on the information processing could have an injurious result if not made correctly.

From the above it is apparent that if an ATC cannot manage all the stressors (demands) that might arise from the tasks that they need to perform, or if the resources needed to cope with these stressors are not available, it can lead to problems in our nation’s airspace and only lead to higher levels of stress.

Various research studies (e.g. Rose, Jenkins & Hurst, 1978; Sega, Cesana, Costa, Ferrario, Bombelli & Mancina, 1998; Lesiuk, 2008) have been conducted into the field of air traffic

control and Stress but a limited amount has been specifically focusing on Stress and coping, or coping and emotions in air traffic control. Below are a number of studies that include the concept of stress in the role of an ATC. None of these previous studies have focused on the role of emotions as a stress response, and how this can influence an individual's coping strategies selected. Therefore it has been decided, that due to the lack of previous research that include coping and emotions in the study of stress, these constructs have also been included in the present study.

As will be discussed in detail in Chapter 2, research studies as early as the 1960s focused on the role of ATC and the greater risk that they face with regards to stress-related illnesses. The following research presented focus on previous studies conducted on the influence of stress on the biological (health) outcomes in ATCs.

In 1968 the Federal Aviation Authority (FAA) conducted a series of studies on the biochemical responses of ATCs to their work, specifically focusing on the adrenalin levels reported, which can be an indication of elevated stress levels (Hale, Williams, Smith & Melton, 1971). Twenty volunteers at O'Hare International Airport in Chicago showed highly elevated adrenalin and noradrenalin levels when compared to a control group (Hale et al., 1971). For night shift ATCs, levels remained significantly higher than control values, which imply an inability to "unwind". In some cases, these levels were higher than other groups tested in stressful situations (such as aircrews on long flights) (Hale et al., 1971).

In 1977 a Health Hazard Evaluation by the National Institute for Occupational Safety and Health (NIOSH) was requested following a lawsuit filed at O'Hare Airport by 30 ATCs complaining of understaffing, lack of special compensation or transfer opportunities, and inadequate equipment and training methods (Singal, Smith, Hurrell, Bender, Kramkowski & Salisbury, 1977). From O'Hare medical records, NIOSH found 25 of the 134 ATCs (19 percent) reporting "stomach trouble". NIOSH translated this into 8 percent active ulcer prevalence, not different to the 10 percent of the general population estimated to have had an ulcer at some point (McGuigan, 1983). This comparison was forged however. The 10 percent figure for the general population also includes people with inactive ulcers and those who will develop them in the future. A more appropriate comparison figure is the 2.3 percent active ulcer prevalence rate obtained from the 1975 National Health Survey (Rose et al.,

1978). Therefore it could be concluded that this research at O'Hare airport found a much higher prevalence of ulcers (which could be a direct symptom of elevated stress levels) within their ATCs than the general population average. ATC representatives at O'Hare also reported high rates of divorce, alcohol abuse and pressure to "cut corners" to maintain schedules. All which could be an indication of high levels of stress.

The FAA also reviewed medical certification examination records of ATCs for the period 1967-77 in order to determine whether increased medical conditions, such as for example hypertension, could be attributed to high levels of stress (Booze, 1979).

In 1973 the FAA awarded a five and a half year contract to the Boston University School of Medicine for an in-depth longitudinal study of ATC stress and health. This study (directed by Dr. Robert Rose) was methodologically superior to previous studies since it followed a group of men for three years. It is considered the most comprehensive health study ever made of any occupation (Rose et al., 1978). The most prevalent health problem discovered was high blood pressure. Impulse control disturbances (inability to control anger, anti-social impulses and illegal drug use) also developed in 30 percent of the ATCs that took part in the study. This could also be related to the fact that these individuals struggle with the management of emotions (Rose et al., 1978), and could not actively recognise the emotions that could lead to these control disturbances, as to manage them effectively.

About 15 percent of the sample developed signs of psychological burnout over the three year study (defined as development of work role pathology, increased work dissatisfaction, fewer competence nominations by peers, harder to shift between peak and slow periods, and increase in concern about burnout). Interestingly, at entry into the study, the burnout group scored higher on enthusiasm, vigour, assertiveness and peer ratings, and lower on anxiety and coping by drinking (Rose et al., 1978). The researchers concluded that controlling air traffic is not a uniquely stressful occupation. Stress and low morale face many other groups of workers. The relevant point, they argue, is that ATCs face significant stress and that the lessons of this study can be used to help workers in other industries (Rose et al., 1978). It can also be mentioned that even though ATCs face significant stress and great demands the importance should also be placed on the emotions they experience during stressful

encounters, and whether they can appropriately recognise and manage these emotions, in order to select the relevant coping strategies to deal with the significant stressful experience.

Another research study in 1981 also focused on the relationship between job satisfaction and psychiatric health symptoms for ATCs (Kavanagh, Hurst & Rose, 1981). In this study Kavanagh et al. (1981) argue that the workplace has been examined as a source of potential stressors, e.g. role conflict and ambiguity, and the relationship between these stressors and job satisfaction has been empirically demonstrated. The relationship between job satisfaction and health, however, has not been empirically established within a sample of ATCs. Data was collected from 416 experienced ATCs to examine the hypothesised positive relationship between job satisfaction and psychiatric symptoms. Job satisfaction was measured with self-report instruments while psychiatric symptoms were assessed via a standardised diagnostic interview. The results provide strong support for the existence of the hypothesised relationship. Satisfaction with the “work itself” for the ATCs, followed closely by co-worker satisfaction, showed the most frequent relationships to the presence or absence of different psychiatric symptoms (Kavanagh et al., 1981).

The next three studies conducted previously on ATCs focus more on the behavioural outcomes of stress on ATCs.

Between 1968 and 1971 the FAA’s Civil Aeromedical Institute (CAMI) conducted major surveys of ATCs. The pattern of responses was very similar across facilities, between journeymen (an ATC who has completed their apprenticeship, and actively working as a qualified ATC) and trainees (ATCs still in the process of apprenticeship and practical training), and between three ATC specialties (tower control, approach control and en-route control) (Smith, Cobb & Collins, 1973). The major “likes” of the respondents were the challenging, fast-paced, constantly changing nature of their work, and the prestige and professional pride in doing a job beyond the performance ability of many people. The primary “dislike” was management’s unresponsiveness to complaints and suggestions, that is, no role for ATCs in policy-making decisions of the agency. Other problems frequently listed in this study were work schedule, career plan deficiencies and outdated facilities. Similar results were also obtained in a 1968 survey (Singer & Rutenfranz, 1971).

In August 1981 a survey was conducted after 80 percent of the controller workforce, walked off their jobs in the United States (Bowers, 1983).

The typical form of stress revealed by interviews with the individuals that walked off their jobs, and through the survey were acute episodic stress along with interpersonal tensions stemming from management style. Working ATCs averaged five acutely stressful incidents in the past three years and striking ATCs reported 10. Incidents including “going down the tube” (or suddenly having more planes than can be handled), momentarily forgetting an aircraft, or, of course, a near miss or collision. The task force reported that 6 percent of the ATC sample could be classified as burned out – having large and debilitating loss of self confidence in their ability to do the job (Bowers, 1983).

In 1996, MacLennan and Peebles (1996) conducted a survey of Health Problems and Personality in ATCs. It was a national postal survey in which 400 surveys were randomly distributed and 217 were returned on Type A behaviour pattern and health problems.

The abovementioned 20-year history of medical research, commissions, surveys and job actions consistently indicate that ATC is a highly stressful occupation which has led to excessive hypertension, psychological burnout and the desperate tactic of an illegal strike.

In South Africa a Masters study was done by Van der Westhuizen (2002) focusing specifically on the incidence of Occupational Stress in ATCs, both in the South African Air force (SAAF) and in the civil sector. The study consisted of 97 ATCs, of which 52 was in the Air Force and 45 in the civil sector. A questionnaire of Rice (1992), “The Stress & Health Profile” was used to measure Occupational Stress of the respondents in three sub-categories. These three sub categories were interpersonal stress, physical stress and work-interest (Van der Westhuizen, 2002). The results showed that ATCs working in the civil sector within South Africa experienced a higher level of stress than those ATCs working in the SAAF. This can be attributed to the higher work demands the ATCs in the civil sector experience.

Further studies on ATCs, not specifically focusing on stress has also been done. The International Journal of Aviation Psychology published a number of studies on Air Traffic Control, of which the following are just a few examples. In 2000, Boudes and Cellier (2000)

did a study on the Accuracy of Estimations made by ATCs, in 2001, Glaster, Duley, Masalonis & Parasuraman (2001) conducted a study with the title Air Traffic Controller Performance and Workload under mature Free flight: Conflict detection and resolution of Aircraft Self-Separation, and in 2003 a study was conducted on the Cognitive Control Levels in Air Traffic Radar Controller Activity by Morineau, Hoc and Denecker (2003).

1.1.2 Personality Characteristics of Air Traffic Controllers

ATCs are a highly trained professional group. Their entrance into the occupation is dependent upon certain competencies. They must have sound mental and physical health, a good command of English, and exceptional spatial ability (Borins, 1983). On average, only 5 percent of applicants pass through initial screening for training programmes, and of these, only 40 percent become licensed controllers. Those individuals who successfully complete training tend to be ambitious and upwardly mobile (Borins, 1983). Rose et al. (1978) described male ATCs as being intelligent, bold and somewhat detached individuals who controlled their anxieties through compulsive activities. Using the Sixteen Personality Questionnaire, Rose et al. (1978) noted that ATCs scored higher than average on intelligence, ego-strength, group conformity, boldness, elation, dominance, self-sufficiency, free-floating anxiety (distinguished from phobia as it is not triggered by a specific object or situation) and compulsivity. They scored lower on the dimensions of criticalness, emotional sensitivity, anxious insecurity and guilt proneness.

ATCs feel somewhat alienated as an occupational group. These feelings of alienation (being unappreciated, misunderstood and not respected) may be aggravated by the nature of their work. On duty they have personal interactions with only their co-workers and perhaps, supervisors. All other communication as described in the above definition occurs via radio. Furthermore, working alternating shifts make it difficult to interact with family or friends who work regular hours. As a result of their social isolation, work involvement and perceived mistreatment, ATCs are a cohesive and tightly knit group who hold a protective attitude toward each other. In general controllers are loyal to their peers and fiercely proud of their profession. However, these aforementioned factors contribute to a great deal of stress for the ATC (Borins, 1983).

1.2 Defining key concepts/variables to be used in the current study

Given the abovementioned information regarding the role of ATCs and based on the previous research that has been conducted it is safe to assume that ATC is a stressful occupation, therefore it is necessary to also include the concept of stress in our introduction and focus on the various ways of defining occupational stress. This discussion is presented in the following section.

1.2.1 Stress

Most employees experience stress as a normal part of their jobs. However, some employees seem to experience stress more severely than others, to a point where they may need time off work. All employment generates stress and strain to some degree (Koeske, Kirk & Koeske, 1993); and it is generally assumed that stress has some negative implications (Dubey & Kumar, 1986). Stress is, however, neither inherently bad nor destructive. It is, in fact, one of a person's best resources in attaining peak performance and managing legitimate emergencies such as flight emergencies in the case of ATC, if utilised correctly. However, it does have the potential for turning into distress, or strain, due to a variety of reasons. It is this latter manifestation of stress that is individually and organisationally destructive (Quick, Murphy & Hurrell, 1993).

Stress can be defined as an imbalance between an individual's perceived environmental demands and their perceived ability to cope with these demands. It is generally thought to be subjective in nature, rather than objective (Cox, 1978; Lazarus & Folkman, 1984). Thus, the experience of Occupational Stress occurs with a person's appraisal of their ability to cope with exposure to psychosocial and physical conditions in the workplace (Cooper, Clarke & Rowbottom, 1999). From the above information on the role of an ATC, it is clear that a variety of demands are placed on them in order to do their daily work. If an ATC does not have the necessary resources, or control over these demands, it may lead to an imbalance between the demands placed on the individual, and the available resources to cope with these demands, which will then lead to experiencing stress. Based on this, the Job Demands-Control (JD-C) Model proposed by Karasek (1979) will be discussed in further detail in Chapter 2. It is also necessary to explore the Coping construct, in order to determine what

coping strategies ATCs employ to deal with stressful situations. Understanding stress involves assessing each facet of the stress process. These facets include:

- environmental and personal experiences;
- intervening processes;
- indicators of an immediate stress response; and
- long term consequences for individuals and organisations.

As mentioned in the previous section on air traffic control, various research studies have been conducted on stress in ATCs.

In 1981 a study on stress among ATCs focusing on occupational sources of coronary heart disease risk (Crump, Cooper & Maxwell, 1981) was conducted. The study attempted to assess the sources of Occupational Stress in ATCs. The study was based on data collected from a majority of ATCs at a large U.K. airport.

The above study confirms that air traffic control is an occupation where the nature of the work and the implications of failure can be highly stressful. Although the work differs from other professional and white collar occupations, stress makes the same demands on the individual's psychological and physiological resources. The most severe and widespread consequence of work stress has been found to be coronary heart disease (CHD) (Cooper & Marshall, 1976). A great deal of work has been carried out in different occupations linking sources of work stress and personality predispositions to CHD (Cooper & Payne, 1980). This has not been the trend in ATC stress research however, where the tendency has been to labour ergonomic approaches to the measurement of short term stressors, such as the number of planes handled, the duration of radio telecommunications and workload, etc. (Crump, 1979).

The study reported here (Crump et al., 1981) was designed to investigate the link between ATC stress and CHD, by identifying the sources of stress reported by controllers and their relationship, if any, to CHD risk. In particular, it was intended to use a more objective, yet distinctive approach to measuring stress than has been used in the past, and a more extensive screening of CHD risk factors. Crump et al. (1981) was mindful of the limitations in

similar studies, which have tended to use predesigned measures of stress, and paper-and-pencil measures to health and illness.

The study was carried out in three stages. First, a pilot stage was necessary to adapt and develop repertory grid methodology, as a measure of stress for use with the controllers. Second, in the main data collection stage, a questionnaire containing the repertory grid was submitted to the full sample of controllers, who also took part in an extended version of the statutory annual medical examination. Third, the analysis stage was concerned with identifying how the controllers interpreted their sources of stress and to establish, through multiple regression analysis, whether any of the job stressors, individual difference and demographic variables predicted CHD risk (Crump et al., 1981).

The use of the repertory grid approach provided interesting qualitative insights into the nature of ATC stress. From this study it was clear that the dimensions of *time* and *control* were important factors in the situations contained in the grid. Surprisingly, the more long term situations, such as the work environment and shift working, were not found to be stressful. In contrast the short term, infrequent occurrences were associated with stress, fear and coping inadequacy. It is possible that the unfamiliarity with situations such as being overloaded and equipment failure, prevented controllers from developing the resources necessary for coping with them. In studies with parachutists (Fenz, 1964), combat soldiers (Janis, 1949) and surgical patients (Janis, 1958), it has been found that increasing familiarity 'desensitised' individuals to the source of threat, thereby reducing stress and fear. The same effect might be achieved in controllers if more was known about the precursors of stressors such as overloading.

The evidence from the physiological analysis, however, suggests that when familiarity results from age and experience, it does not necessarily serve as an effective defence against stress. The multiple regression analysis showed that the older and more experienced controller, with a fear of stressful situations, was at relatively greater risk from CHD compared to his colleagues. This might be a case where the narrow margins for error in ATC work, coupled with the responsibility for safety and lives, have become increasingly difficult to sustain. The resultant drop in self-confidence increases fears that a mistake might be made (Crump et al., 1981).

In 1996 a study on the effects of work demands on immunoglobulin A and cortisol in ATCs were conducted (Zeier, Brauchli & Joller-Jemelka, 1996). Immunoglobulin A is an antibody found in the mucous secretions of individuals, for example tears, saliva, intestinal juices etc. Cortisol is a hormone produced by the adrenal gland. It is often referred to as the “stress hormone” as it is involved in response to stress. It increases blood pressure and blood sugar, and reduces immune responses (Zeier et al., 1996).

According to this study the professional activity of ATCs is often considered to be rather stressful (the above mentioned factors on the role of the ATC support this statement). Certain characteristics of this job are likely to produce stress; for example an ATC cannot predict when a situation becomes critical (low levels of control) and he is not able to regulate the workload (high demand). In order to assess psycho-physiological stress reactions in this working situation Zeier et al. (1996) took saliva samples from 158 male ATCs before and after each of two working sessions. In contrast to the expected immune-suppressive effects, the working sessions caused a marked increase in the concentration and secretion rate of salivary immunoglobulin A (slgA) as well as in the concentration of salivary cortisol. This could be due to higher levels of stress experienced, as it has been mentioned that slgA and cortisol is excreted in periods where stress responses are high. It is suggested that positive emotional engagement is responsible for the observed slgA increase and that measuring this physiological response may be a valuable tool for differentiating between positive and negative stress effects or between successful and unsuccessful adaptation and coping with situational demands (Zeier et al., 1996).

An individual's emotions can have an impact on how the individual recognises and manages these stressful situations (Lazarus, 1990). Since stress is conceived mainly as an emotional reaction (usually negative) to various environmental stimuli (Selye, 1956), Emotional Intelligence could be used as a framework, within which the individual could learn how to Cope with stress and how to control strong emotions (Selye, 1956). Given the fact that Stress is seen as an emotional reaction, Emotional Intelligence will be discussed in the next paragraph and also how this might be related to the coping process with different stressful stimuli.

1.2.2 Emotional Intelligence

Although Thorndike (1921), Guilford (1956) and later Gardner's (1983) research into social intelligence hints at the importance of emotions to intellectual functioning, the term Emotional Intelligence was not brought into mainstream psychology until the 1990's (Mayer, DiPaolo & Salovey, 1990; Salovey & Mayer, 1990). Currently Mayer, Salovey and colleagues argue that Emotional Intelligence incorporates a set of conceptually related psychological processes involving the processing of affective information (Mayer & Geher, 1996; Mayer & Salovey, 1997; Salovey & Mayer, 1990; 1994). These processes include the appraisal and expression of emotions, integration of emotions in thoughts, understanding emotion and the regulation and management of emotions.

Emotional Intelligence is a relatively new and growing area of behavioural research, having caught the imagination of the general public, the commercial world and the scientific community. Emotional Intelligence also connects with several cutting-edge areas of psychological science, including the neuroscience of emotion, self-regulation theory, studies of meta-cognition, and the search for human cognitive abilities beyond "traditional" academic research (Zeidner, Matthews & Roberts, 2004).

There are a wide variety of definitions of the term Emotional Intelligence, with these listed below as the most encapsulating of the concept.

Emotional Intelligence refers to one's ability to be aware of one's feelings and feelings of others, to differentiate among them, and to use the information to guide one's thinking and behaviour (Salovey & Mayer, 1990). This definition consists of three categories of abilities:

1. evaluation and expression of emotion,
2. regulation of emotion, and
3. using emotions in decision making.

A similar definition was recently provided by Goleman (1998, p317):

"the capacity for organising our own feelings and those of others, for motivating ourselves, and for managing emotions well in ourselves and in our relationships"

Another concise definition of the concept is: “an array of non-cognitive skills, capabilities, and competencies that influence a person’s ability to cope with environmental demands and pressures” (Martinez-Pons, 1997/1998, p. 313).

For the purpose of this study specific focus will be given to the definition of Emotional Intelligence formulated by Rahim and Psenicka (2002), as the questionnaire used to measure Emotional Intelligence later on in this study has been developed by Rahim. Rahim (2001) argues that there should be a more restrictive model of Emotional Intelligence based on ability and distinguished from personality. This is done for the present study by redefining the following Goleman (1998) dimensions of Emotional Intelligence:

1. **Self Awareness** is associated with the ability to be aware of which emotions, moods and impulses one is experiencing and why. This also includes one’s awareness of the effects of his or her feelings on others;
2. **Self Regulation** refers to the ability to keep one’s own emotions and impulses in check, to remain calm in potentially volatile situations, and to maintain composure irrespective of one’s emotions;
3. **Motivation** represents the ability to remain focused on goals despite setbacks, to operate from hope of success rather than fear of failure, delaying gratification and to accept change to attain goals;
4. **Empathy** refers to one’s ability to understand the feelings transmitted through verbal and nonverbal messages, to provide emotional support to people when needed and to understand the links between others’ emotions and behaviour; and
5. **Social Skills** is associated with one’s ability to deal with problems without demeaning those who work with him or her, to not allow own or others’ negative feelings to inhibit collaboration, and to handle affective conflict with tact and diplomacy.

Quy (1999, p. 325) suggests that “Emotional Intelligence facilitates individual adaptation and change”. Schutte, Malouff, Hall, Haggerty, Cooper, Golden and Dornheim’s (1998), study shows that Emotional Intelligence is associated with affective outcomes, such as greater optimism, less depression and less impulsivity. A study by Martinez-Pons (1997/1998) shows that Emotional Intelligence is positively associated with concerns with task mastery and life satisfaction and negatively associated with depression symptoms.

The preceding overview generally suggests that Emotional Intelligence is associated with positive outcomes for individuals as well as organisations. On the whole, the literature indicates that the components of Emotional Intelligence will have an effect on employees' work attitudes and behaviours. However, these effects may not always be independent of one another. It is quite possible that various components of Emotional Intelligence interact with each other to influence concern for quality, subordinates' problem solving, and other outcomes (Rahim & Minors, 2003).

Emotional Intelligence is claimed to influence one's ability to succeed in coping with environmental demands and pressures, clearly an important set of behaviours to harness under stressful work conditions (Bar-On, 1997). This statement by Bar-On (1997) provides tentative support for the inclusion of coping strategies and stress in this study, to see whether Emotional Intelligence does in fact, as stated above, assist ATCs to recognise and manage their demands, and therefore then selecting an effective coping strategy.

Emotional Intelligence has also been claimed to be an important factor in organisational leadership. George (2000) used the Mayer and Salovey (1997) four branch model of Emotional Intelligence as a heuristic framework for outlining the importance of Emotional Intelligence in effective leadership. George (2000) asserts that by accurately identifying how followers feel, leaders better appraise and influence followers' emotions so they are supportive of leaders' goals and objectives, thus insuring a shared vision. Leaders can use intense emotions as signals to direct their attention to issues in need of immediate attention, and can use emotions to prioritise demands. They can also better anticipate how well their followers will react to different circumstances and changes.

A recent theoretical model proposed by Jordan, Ashkanasy and Hartel (2002) implicates Emotional Intelligence as a moderating variable that predicts employee emotional and behavioural responses to job insecurity. According to this model, employees low in Emotional Intelligence is hypothesised to be more susceptible than employees high in Emotional Intelligence to negative emotions resulting from job insecurity. Therefore, they are more likely to behave defensively and negatively (e.g. hyper-vigilance, "copping out", "buck passing", avoidance), lowering affective commitment and increased job-related tension in response to their insecurity. These two emotional reactions then lead to negative coping (e.g. distancing,

wishful thinking) and defensive decision making behaviours. By contrast, high Emotional Intelligence employees are better able to deal emotionally with job insecurity and will be able to improve the effect of job insecurity on their affective commitment. This frequently leads to increased work commitment and effort, positive coping behaviours (problem-focused), and reframing of perceptions of insecurity as an existing challenge (Jordan et al., 2002).

Given the definition of Emotional Intelligence by Martinez-Pons (1997/1998) and the fact that Occupational Stress occurs with a person's appraisal of their ability to cope (Cooper et al., 1999), this study will also focus on coping strategies of individuals in stressful situations. On the basis of above it was mentioned that Emotional Intelligence is claimed to influence an individual's ability to cope with stressful situations (Bar-On, 1997). It is therefore important to also discuss the concept of coping in order to verify whether Emotional Intelligence does contribute to ATCs selecting appropriate coping strategies in times where demands (stress) outweighs the resources available.

1.2.3 Coping Strategies

Coping has been defined as the constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that have been evaluated as taking up or exceeding the resources of the person (Lazarus & Folkman, 1984). Research recognises two major functions of coping: (a) regulating stressful emotions and (b) altering the person-environment relations causing the distress (Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986). Referring to the first function of coping where it is mentioned that coping assist in the regulating of stressful emotions; this can also be linked to the functions of Emotional Intelligence, as mentioned earlier in this chapter. In the previous section on Emotional Intelligence it was mentioned that Emotional Intelligence involves the process of recognising emotions, understanding these emotions and then managing these emotions effectively. Salovey and Mayer (1990) also conclude that one of the abilities of an individual with high levels of Emotional Intelligence is to effectively regulate emotions, exactly as mentioned above as a function of coping. It can then be argued that both effective coping strategies and Emotional Intelligence assist individuals in regulating their emotions. Emotional Intelligence can be seen as a resource to assist individuals in selecting the appropriate coping strategy to effectively regulate and manage stressful emotions.

In the next section the two different types of coping will be discussed, namely problem focused coping and emotion focused coping.

Problem focused coping includes cognitive and behavioural attempts to modify or eliminate the stressful situation (Folkman & Lazarus, 1980). In contrast, emotion-focused coping involves attempts to regulate emotional responses elicited by the situation (Folkman & Lazarus, 1980). Therefore one can also link the major functions of coping as recognised by Folkman et al. (1986) with these two ways of coping as discussed above. Problem focused coping being related to the second function where the individual uses cognitive and behavioural attempts to amend the person-environment associations causing the distress and emotion focused coping linking to the function of regulating the stressful emotion. Researchers have suggested that emotion-focused coping is less effective and more likely to be associated with psychological distress than is problem-focused coping (Billings & Moos, 1981, 1984; Pearlin & Schooler, 1978; Sigmon, Stanton & Snyder, 1995).

Individuals often use both emotion-focused and problem-focused coping (Folkman & Lazarus, 1980), although research varies on which is more common in the workplace. The key appears to be the extent to which stressors are beyond the control of the individual (Folkman, 1984).

For the purpose of this study Amirkhan's (1990) Coping Strategy Indicator is used to determine which coping strategies ATCs tested in this study utilise to deal with stressful experiences.

Amirkhan (1990) argues that individuals utilise one of three distinct coping strategies when encountering a stressful situation. These are Problem Solving, Seeking Social Support and Avoidance. These strategies mirror, to an extent, the approach and avoidance dimensions mentioned frequently in the coping literature (Roth & Cohen, 1986), and particularly the problem- versus emotion-focused dichotomy proposed by Folkman and Lazarus (1980). The current Problem-Solving strategy, however, is more specifically instrumental, involving manipulation rather than simple awareness of the stressor. The Avoidance strategy reflects only a subset of possible emotion-focused responses, those entailing some form of withdrawal. Furthermore, the fact that Seeking Support emerged as an independent strategy suggests that human contact is valued for reasons apart from either instrumental or palliative

aid. This is consistent with recent conceptualisations of social support, as is the implication that people actively seek out, rather than passively await such social contact (Heller & Swindle, 1983).

When individuals perceive that no action on their part could change the stressful environment, they are left to adapt themselves by trying to change the meaning of the situation or trying to control their emotional response. Pearlin and Schooler (1978) found that the most common way individuals attempt to cope with workplace stressors, albeit without much success is through emotion-focused strategies, such as trying to minimise the importance of work, rather than by taking active steps to reduce stressors. Moreover, they found that stress at work is less open to effective coping than stress in more interpersonal areas of life, such as marriage and parenting. Therefore, Pearlin and Schooler (1978) conclude, that coping effectively with work stressors may require “interventions by collectivities” (p.18) rather than by individuals alone since problems in the workplace are often structural.

All jobs generate stress and strain to some degree. Researchers agree that the study of coping is fundamental to understanding how stress affects people (Skinner, Edge, Altman & Sherwood, 2003). The manner in which people cope can significantly amplify or reduce the effects of stress or adverse events on both individual and organisations (Skinner et al., 2003). Lazarus (1999) proposes that people cannot determine what to do in order to cope and improve the associated stress of a person-situation encounter until they first appraise the meaning of the situation, which in turn generates an emotional response. Lazarus' (1999) position underscores the goal-oriented nature of coping (Prussia, Fugate & Kinicki, 2001) and the behaviour-directing functions of emotions (Cacioppo & Gardner, 1999). Conceptualised in this manner, coping is a function of emotions as it is intended to reduce negative and facilitate positive emotions. It therefore is important to identify individuals' emotional reactions and the coping strategies they employ. Latack (1986) classified coping efforts into control- and escape-oriented strategies. Control coping consists of “both actions and cognitive reappraisals that are proactive, take-charge in tone,” (p. 378) whereas escape strategies consist of “both actions and cognitive reappraisals that suggest an escapist, avoidance mode” (Latack 1986).

It stands to reason that lack of success of individual coping efforts at work may increase perceived occupational stress (Parasuraman & Cleek, 1984). One inhibitor of the coping resources has to do with the level of threat. The greater the threat, the more primitive are efforts at emotion-focused coping, and therefore the less likely that effective problem-focused coping will occur. High levels of emotion adversely affect cognitive functioning and one's capacity for information processing (Lazarus & Folkman, 1984). This could have particular relevance to the role of ATC and the highly charged emotional content and context of their work, as they continuously deal with the threat of having hundreds of individuals' lives in their hands, and the possibility of making the wrong decisions that could lead to a disaster.

Some stress theorists propose that personal traits such as the impulse to approach or avoid stressful situations may translate into a personal style or preference for certain coping strategies (O'Leary, 1985; Parkes, 1986). This is particularly relevant to air traffic control where ATCs have responsibility for decisions affecting the safety and well-being of passengers travelling in the nation's airspace.

And yet, despite the highly stressful nature of air traffic control, there are individuals and supervisors who are able to manage the stress well enough to continue that work for years. Could this be that certain individuals have a higher Emotional Intelligence? This can assist them in regulating negative emotions elicited by stress, appraise the emotions in such a way, to select the appropriate coping strategy, that will moderate the effects of stress, and that will then not lead to burnout.

The study of strategies for coping with stress has an even longer history than burnout. Lazarus and Folkman (1984) and others (e.g. Pearlin & Schooler, 1978) initiated studies of coping with general life stress, and special attention has been given to coping with illness (Cohen & Lazarus, 1979; Moos, 1977). Coping mechanisms have also been studied in relation to job-induced stress (e.g. Menaghan & Merves, 1984; Osipow & Davis, 1988; Osipow & Spokane, 1984). A small body of literature has been developed on the use of coping mechanisms by human service workers attempting to deal with the special type of job strain referred to as burnout. Although the specific sources of job strain may be different in human service work, the procedures for coping with the strain, the strategies and styles are presumably like those used for stress and strain generally (Koeske et al., 1993).

These procedures may involve gathering information, planning, drawing on past experiences, venting feelings, prayer, distracting oneself, confronting others, seeking others' counsel and numerous other strategies. When other people are used as sources of information, appraisal and direct assistance, the social support system becomes a coping resource (Koeske et al., 1993). Thoits (1986a) has suggested how the processes involved in the much studied direct and buffering benefits of a supportive social environment can be integrated with the study of coping.

Taking this information into account it is of importance to also evaluate the coping strategies of ATCs partaking in this study.

Given this introduction of these three important aspects with regard to this study (Stress, Emotional Intelligence and Coping strategies) within the context of the occupation of air traffic control, it is clear that there is a need for an in depth study with regards to the stress levels of ATCs and the factors that contribute to the role of ATC being perceived as stressful, and how they cope in stressful situations. Focus will also be given to whether an ATC's Emotional Intelligence can be seen as a moderating variable in recognising the emotions elicited by stressful experiences. Related to this whether the management of these emotions, through the individuals Emotional Intelligence, can assist them in selecting the appropriate coping strategies to regulate and manage stressful experiences.

From the abovementioned research it is clear that there is definitely an interest in research into the field of air traffic control. Even though a number of studies focused on the high levels of stress that ATCs may be dealing with, limited research also include the concept of emotions and coping in the bid for ATCs to manage their high levels of stress. Therefore in this study there will be a specific focus on the role of ATC, their levels of stress, how effective the recognition and the management of emotions can contribute to the choice of selecting effective coping strategies to deal with stressful encounters.

Following is the research initiating question and the aim/purpose of the study.

1.3 Research Initiating Question

Given the previous research on stress (e.g. Smith et al., 1973; Singer & Rutenfranz, 1971; Hale et al., 1971; Singal et al., 1977; Booze, 1979; Rose et al., 1978) in ATCs as mentioned in the above introduction, and no concrete evidence on the emotions elicited in these stressful encounters and how these ATCs cope with these stressful situations the following research question need to be asked. It should be noted that this study is truly exploratory in nature

Does stress and Emotional Intelligence have an effect on Coping with stress in the occupation of Air Traffic Control, and if so to what extent?

The following propositions can then be given:

Proposition 1:

There is a significant relationship between stress and Coping in the occupation of an Air Traffic Controller.

Proposition 2:

There is a significant relationship between Emotional Intelligence and stress in the occupation of an Air Traffic Controller.

Proposition 3:

There is a significant relationship between Emotional Intelligence and Coping Strategies in the management of job-related stress in the occupation of an Air Traffic Controller.

1.4 Purpose/Aim of the Study

The aim of this study is to determine whether ATCs', Emotional Intelligence might have an effect on the recognition and management of stressful situations in the occupation of air traffic control. The focus will also be on determining the ATCs' stress levels and their relationship with coping strategies. In other words, will higher Emotional Intelligence assist ATCs in recognising the emotions they experience while dealing with stressful encounters, and how the management of these emotions will assist them in selecting the appropriate coping strategy to effectively deal with the stressful encounter they experience.

The purpose of this study would be to investigate whether an individual's Emotional Intelligence does have an effect on the recognition and management of stress, and what type

of coping strategies these ATCs utilise to deal with stress effectively. As indicated in the introduction, the occupation of air traffic control is regarded as one of the most stressful occupations, as the onus rests on each ATC to successfully regulate all air traffic to and from all airports, and to ensure that no accidents occur midair or on the airstrip. It is a highly technical job and requires a great amount of concentration, effort and a high level of education and training (Borins, 1983).

1.5 Summary

In the following chapters of this study an in-depth discussion of all the concepts and constructs pertaining to the research initiating question as highlighted in the introduction will be given.

In Chapter 2 more in depth information will be given on the definitions of the constructs discussed in Chapter 1 with a greater focus on previous studies done on these constructs (ATCs, Stress, Emotional Intelligence and Coping Strategies). In Chapter 3, the Research method, Research design and sample characteristics will be given and discussed. Chapter 4 will include the reporting of the data analysed from the current study, and the last chapter, Chapter 5 will focus on the interpretation of the data, conclusions, limitations of the study and recommendations for further research will be given.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The current chapter explores in detail the three concepts (Stress, Emotional Intelligence, and Coping) introduced in Chapter 1, and how they are related to the role of an Air Traffic Controller (ATC) in the South African context. First the focus will fall on the role of ATCs, then focusing on the stress experienced by ATCs and how it influences their working environment. After having discussed these two concepts emphasis will be placed on the factors influencing ATCs' stress levels in their working environment, after which the focus will shift to Coping and how ATCs are likely to cope in their stressful environments. The last section focuses on coping and emotions, the importance of Emotional Intelligence and how it relates to the perception of stress and subsequently coping with stressful experiences.

2.2 Air Traffic Controllers (ATCs)

The first concept to be discussed in this study is that of the role of ATC. This will be followed with specific focus on the ATCs' working environment, information processing tasks, the system in which they operate as well as a discussion of human factors applied in their occupation.

2.2.1 Introduction

Imagine trying to direct 260 tons of metal, filled with passengers and freight, through the air in the middle of a storm. ATCs are responsible for the safe and efficient flow of air traffic throughout a country's airspace. They navigate the airways, helping pilots pass other planes, find their way through fog and rough weather, and land safely at a busy airport. They coordinate flights to prevent accidents and minimise delays in takeoffs and landings (California Occupational Guide Number 230, 1998).

Air Traffic Control is the service provided to airlines, ensuring that aircrafts fly safely from one place (departure) to another one (arrival). Air traffic control is restricted to actions on aircrafts

from their taking off to their parking on airport areas. It aims at avoiding collisions between planes and managing the daily traffic.

ATCs can be found working in three basic specialities:

- a) Air Traffic Control Towers,
- b) En Route Centres and
- c) Flight Service Stations (Rognin & Blanquart, 2001).

Each one of these specialities will now be discussed below.

(a) Air Traffic Control Towers

Airport Tower Controllers regulate a specific airport's traffic. They use two-way radios to give pilots permission to take off and land. They also direct ground traffic (runway and parking), which includes taxiing aircrafts, vehicles and airport workers. Tower controllers normally direct air traffic within three to thirty miles of an airport. When planes leave this assigned airspace they are passed on to an En Route Centre (Rognin & Blanquart, 2001).

(b) En Route Controllers

En Route Controllers regulate flights between airports. They contact pilots by radio and control their position in the airways between tower jurisdictions. Using sophisticated radar and computer equipment, they maintain a progressive check on an aircraft and issue instructions, clearance and advice. When an aircraft leaves the airspace assigned to an En Route Centre, control passes on to the next centre or to a Tower Controller. If a pilot is lost or in trouble the En Route Centre gives the pilot orientation instructions and directions to the nearest emergency landing field. En Route Controllers work in teams of two or three (California Occupational Guide Number 230, 1998).

(c) Flight Service Station Controllers

Flight Service Station Controllers are experts on the terrain, airports, and navigational facilities in their areas. Pilots file their flight plans with Station Controllers who conduct pre-flight briefings on weather conditions, suggested routes, altitude, indications of turbulence and other flight safety information. They often use direction-finding equipment such as a VHF radio station which generates a bearing line on the radar display when an aircraft transmits. It facilitates ATCs to identify aircraft operating within his/her area of jurisdiction as well as

providing special assistance to search-and-rescue operations (California Occupational Guide Number 230, 1998).

Controllers are often responsible for several aircrafts simultaneously. The number of crafts varies with size of airport, time of day and weather. For instance the number of aircrafts under an ATC's responsibility at Cape Town International Airport will be significantly more than that of an ATC at George or Port Elizabeth Airport. Controllers must be able to work under extreme pressure, often without a break, for up to five hours at a stretch. They must be able to visualise the whole traffic picture, establish priorities and think clearly in emergencies. They must have good memory, and be able to listen to more than one pilot at a time. The pace is often hurried and ATCs must make quick and accurate decisions. Any indecision or delay could contribute to a catastrophic loss of lives and property. Therefore, based on the abovementioned factors, this occupation can be viewed as very stressful to some controllers (California Occupational Guide Number 230, 1998).

The following paragraphs will discuss the ATCs working environment, and how this could contribute to this occupation being viewed as stressful.

2.2.2 Working Environment

With a clear understanding of the role of an ATC and the specialities they work in, attention need to be given to the working environment in which an ATC operate, in order to determine whether this environment contributes to the notion that air traffic control is a highly stressful occupation, and if so, to what extent does the individual's working environment have an influence on this.

Katz (1980), thinking about the evaluation of pilot workload commented that the air traffic control system, and its controllers, not only experienced workload but also generated subsequent workload for the aircrews based on the demands controllers made on pilots. Most controllers would say the opposite. Controllers and pilots must function in the same system, and the system is expected to perform flawlessly. Katz (1980) refers to air traffic control as a highly reliability organisation in which individuals are irreplaceable for making decisions in unstructured and uncertain situations.

In the following paragraphs previous studies regarding the workload of ATCs will be discussed.

2.2.3 Previous studies regarding the workload of ATCs

In a study conducted by Melton (1979), a psychologist working at the Civil Aeromedical Institute (CAI) in Oklahoma City, he focused on workload in physiological terms. He believed stress was the principal product of workload. Stress could be measured by evaluating blood and urine chemistry. Melton (1979) found relationships between stress and task-load. He defined task-load in terms of radio transmission frequencies (the amount of radio communication between ATCs and other relevant parties) and durations along with traffic count, and defined stress by the presence of several bio-chemicals which he tested in the blood and urine samples. Despite the fact that these relationships were fairly strong, they did not explain the nature of the stress causing the chemical presence or how it applies to any practical matter such as procedures or equipment employed. It is a well known fact in stress physiology that good stress (i.e. positive excitement) has the same physiological effects on the body as bad stress (what we commonly see as stress) (Melton, 1979). From the above study it is clear that ATCs do experience high levels of stress, but researchers need to ask why they experience stress, and to what extent does workload contribute to these stressful experiences.

Repetti (1993) reported a study of controller health complaints and daily mood swings. These were seen as a function of workload defined in the objective terms of daily traffic volume and airport visibility. Fifty-two controllers were studied over a 3-day reporting period. They completed a health symptom survey each day along with subjective assessment of their own workload and their psychological mood states. Repetti (1993) concluded that, although previous researchers found increases in adrenaline excretion and heart rate (as also reported in a study in Chapter 1) as a function of environmental demands, controller health complaints only increased if they perceived an increase in their subjective workload. Negative social interaction at work was more predictive of increases in symptoms reported than was objective workload if workload perceptions were factored out. Repetti (1993, p.129) concluded that "The experience of physical strain occurs only when the person judges conditions at work to be demanding."

Much of the task of controllers involves monitoring and supervisory control, in which instructions are given to aircraft under their control. The controller is responsible for keeping space between aircraft to avoid collisions or near misses. This task places demands on attention and memory processes and vigilance skills. Hurst and Rose (1978) found that 15% of controllers' time was accounted for by monitoring, not involving communication, and 12% at peak levels of air traffic. The duration of radio communications is also a source of demand, and was found to predict behavioural responses ratings of pacing/demand by controllers (Hurst & Rose, 1978) and to account for a significant portion of the variance in subjectively rated workload (Farmer, Belyavin, Tattersall, Berry & Hockey, 1991).

Now that there is an understanding with regards to the environment an ATC operates in as well as some insight regarding research on the task-load of the ATCs, the concept of information processing as part of the ATC's task will be discussed.

2.2.4 Information Processing and the air traffic control task

Information processing refers to processes underlying human intelligent action. Much discussion has occurred around what exactly constitutes intelligent action (Lachman, Lachman & Butterfield, 1979; Newell & Simon, 1961; Turing, 1936). However, in general, and for the purpose of discussing air traffic control and information processing, researchers refer to such constructs as planning, problem solving, decision making, conceptualisation and other knowledge manipulation processes directly related to the execution of an ATC's job activities. The objective of ATCs is to prevent collisions between aircraft and avoid other potential hazards by means which nevertheless promote efficiency in flight. How these are achieved depends on a number of factors but most importantly it depends on the way that the ATC processes all the information available to him/her regarding to the situation (California Occupational Guide Number 230, 1998).

The mental processing capabilities of ATCs are the single most important determinant of their ability to deal effectively with the task demand of their environment.

An ATC's environment is filled with a surplus of physical and symbolic information presented in visual, physical and auditory form as discussed below (Smolensky & Stein, 1998).

Information about aircrafts is of two kinds, quantitative and qualitative. Quantitative information, e.g. on position, flight level, speed, heading and manoeuvres, can generally be expressed and communicated digitally, and presented on displays. Qualitative information, e.g. on the reliability, validity and trustworthiness of data, is not usually displayed but depends on how the information is sensed and processed, particularly in terms of its frequency of updating, accuracy, precision and the kinds of error, failure or degradation to which it may be susceptible. The experienced controller learns to adjust to information of poor quality, but this might not be the case with an inexperienced ATC (California Occupational Guide Number 230, 1998).

What makes the controllers' information-processing tasks so challenging is not merely the quantity of information impinging on their perceptual fields, although this is considerable, but rather the relative lack of influence they exert over the timing of those informational events to which they must respond (Roske-Hofstrand & Murphy, 1998).

In others words, when linking the above paragraph with the Job Demand-Control (JD-C) model by Richard Karasek (1979) it can be argued that the quantity of information can be seen as a job demand, and the influence of the timing of these events as job control or the lack thereof, or also stated differently, decision latitude. Job demands refer to the work load (in this case information processing), and have been operationalised mainly in terms of time pressure and role conflict (Karasek, 1985). Job control, which is sometimes called decision latitude, refers to the person's ability to control his or her work activities. Decision latitude includes two components: skill discretion and decision authority.

According to the JD-C model, having decision latitude over the work process will reduce a worker's stress but increase learning, whereas psychological demands increase learning as well as stress (Van der Doef & Maes, 1999). It has been hypothesised that employees working in a high-strain job (high demands-low control) such as ATCs experience the lowest well being, which could be a result of high levels of stress, due to the selection of ineffective coping strategies (Van der Doef & Maes, 1999). In the following paragraph an analogy will be given to simplify the process followed regarding information-processing.

2.2.4.1 Analogy of information-processing

For purposes of simplification, an analogy has frequently been drawn between stages in computer processing and those of the human beings information-processing system (Simon & Newell, 1964). For example, most theoretical models of human information processing detail the stepwise sequence of interpretive, deliberative and executionary acts called perception, cognition and action. The computer analogy refers to these stages as input, central processing and output. Because few analogies are perfect, however, the domain of computers can tell little about why or how controller errors occur in both low- and high-workload situations.

As a class of human behaviour, information processing refers to both repetitive and relatively unique cognitive activities involved in assessing (perception and cognition) and resolving cues and events in the environment (decision making and response organisation) (Smolensky & Stein, 1998).

The cognitive work or activities in the radar environment of the En Route Controller primarily involves the manipulation of symbolic information, where radar “targets” and flight progress strips represent aircraft in three-dimensional space. A Tower Controller, on the other hand, works traffic mostly by making visual contact with the aircraft that is being “controlled”. An Oceanic Controller is still largely working traffic without the aid of a situation display or radar or direct perceptual contact and must, therefore, maintain a board of flight strips representing aircraft in the sector traffic stream (Smolensky & Stein, 1998).

Although the information-processing capacity of all controllers involves basic memory functions, the demand on memory and the kind of remembering necessary for task execution is different for each position because the time course of the events in each situation is quite different (Smolensky & Stein, 1998).

Each ATC’s information-processing construct, such as decision making, planning, problem solving, and time sharing, can generally be viewed as either a process or a skill, depending on the focus of the discussion. It is also important to understand that most cognitive processes and constructs should not be thought of as either unidirectional or sequential, nor should they be viewed as static, fixed entities. Rather, perceptual, cognitive, and action planning activities are more accurately portrayed when their interactive, simultaneous, and dynamic nature is emphasised.

Finally, many of the controller's information processing actions are subconscious, routine activities that can rarely be brought into the realm of consciousness (Smolensky & Stein, 1998).

A discussion regarding the various approaches to the modelling of the information-processing system will follow in the next paragraph.

2.2.4.2 Approaches to modelling the information-processing system

There are many proposed approaches to modelling the human information-processing system. For example Card, Moran and Newell's (1983) Model Human Processor shows sensory information flowing through a perceptual processing system, to a memory system, which in turn activates motor processes. Their three subsystems constitute a typical "bottom-up" processing model with many of the same stages that can be found in other hybrid "bottom-up/top-down" information-processing models (Wickens, 1984). The Model Human Processor performs well at the keystroke level but is not intended to model complex problem solving and decision making.

Although the study of human information processing is critical to understanding the skill of the ATC in dealing with the complexity of his or her task environment, it is an oversimplification to discuss ATCs information processing as some uniform global activity. In fact, there are a variety of controller positions, which make quite different cognitive demands on the controller. Each position, dealing with unique aircraft flight phases, as discussed in the introduction and the above paragraphs, has a different set of task aids and time constraints, and these factors, among others, will constitute the cognitive task requirements of that position; that is, they will result in qualitatively different work experiences (Roske-Hofstrand & Murphy, 1998).

The following section will discuss the system in which the ATC operate.

2.2.5 The Air Traffic Control System

The air traffic control system is made up of not only hardware and software but also includes the controller workforce, management structures and the organisational climate of the various facilities. The regulatory structures, for example the International Civil Aviation Organization (ICAO), the Federal Aviation Administration (FAA) and the Civil Aviation Authority (CAA) in South Africa and personnel who support selection and training are part of the overall system

as well. Air traffic control takes place not only in the technical context defined by aerodynamics, equipment and automation, but also in a broader social-psychological context.

The air traffic control system is part of a larger aviation system, which includes pilots, air carriers, military aviation and general aviation, all with their own socio-technical infrastructures (Roske-Hofstrand & Murphy, 1998).

Personnel in this enormous system operate in a complex configuration of overlapping information spaces made up of disrupted, shared and unique informational elements. As discussed in the previous section, information processing becomes an important factor between these systems, as incorrect information processing can lead to undesirable outcomes, which in turn contributes to the elevated stress levels of ATCs. Each information space (e.g. a person's situation awareness) comprises real-world data, rules and procedures, and individual and cultural beliefs, which, when mixed with operational knowledge and experience factors, create individual and shared expectations about the course of events and the general protocol of interaction (Roske-Hofstrand & Murphy, 1998).

The air traffic control system aims to achieve a safe, orderly and prompt flow of air traffic and is an example of a large human-machine system. In such systems, humans interact with machines to fulfil the functions of the system. However, individuals do not usually all have the same tasks, jobs, equipment or functions, although they may have similar professional training and qualifications. A safe and efficient air traffic control system must include appropriate technology. It must also have trained and knowledgeable professional ATCs who can understand and use all available facilities to provide a satisfactory air traffic control service in order to fulfil the requirements as discussed in the Introduction to the discussion of ATCs. It has been mentioned that the ultimate aim of air traffic control is to safely navigate aircraft through the nation's airspace, and therefore trained and knowledgeable professional ATCs are essential (International Civil Aviation Organization (ICAO) (1993).

Now that there is an understanding regarding the working environment of the ATC, the information processing involved in performing their tasks and the system in which ATCs operate, focus will be given to the human factors applied in the occupation of air traffic control.

2.2.6 Human Factors

Human factors are the applied discipline that takes knowledge regarding human functioning and strives to improve both existing work structures and the design of human-technological systems (Roske-Hofstrand & Murphy, 1998). Most human factor issues in air traffic control are not new but derive from fundamental human capabilities and limitations. Yet human factors have to respond to changes that originate elsewhere, for example in increased air traffic demands or technological advancements. For example, if the number of aircraft arriving at, or taking off from Cape Town International Airport increase from 15 per day to 40 per day, surely certain changes need to be made to both the individual's capability as well as the technology available. This may include having more individuals on a shift to accommodate the increase in traffic, and updating technology to successfully process all the information. The achievement of the full expected benefits of these advancements requires the successful matching of individual and machine, so that individuals do not impede technical progress because they have been given tasks beyond their coping capabilities. The aim of human factors in air traffic control is to match an individual's capabilities and limitations with the specifications and design of the air traffic control system. This matching of individual and system is an active process, the achievement of which may imply changes to either or both (ICAO) (1993).

If the definition of information processing as discussed earlier (Section 2.2.4) is taken into account, where it has been mentioned that information processing is all the processes such as planning, problem solving, decision making, conceptualisation and other knowledge manipulation processes (Lachman et al., 1979) and the researcher review the function of human factors in air traffic control a link could possibly be established between these two functions. The individual's capabilities are taken into account in the human factors description, but so also during information processing it refers to the processes underlying human intelligence.

Human factors apply knowledge of how individuals perceive, sense, learn, understand, interpret, process, remember and use information, and also apply knowledge of how to measure human performance and its effects within a functioning system. This sentence also relates back to the processing of information (as discussed in Section 2.2.4) and the way it is interpreted by the ATCs and applied to the human factors. Human factors examine the many

ways in which the controller and the system can influence each other, and help to reveal whether the main influence on events is the structure of the air traffic control system or the actions of individual controllers. Human factors knowledge is applied to air traffic control to understand and quantify the interactions between the system and the individual. It is used to guide how each should adapt to the other and to suggest how human and system requirements that may appear to differ can nevertheless all be met, so that air traffic control efficiency and safety are optimised without harm to the controller. The human factors knowledge is applied to both the effects of the individual on the system and to the effects of the system on the individual (Roske-Hofstrand & Murphy, 1998).

An ATC need to have an understanding of how the air traffic control system have been designed and how it can function, in order to interact with it and contribute to the benefits of the controller's professional knowledge. The fundamental reason for applying human factors to ATC is to improve safety and help prevent accidents (ICAO, 1993).

In the following paragraphs the SHEL model developed by Edwards (1972) will be discussed, to assist individuals to understand the process of human factors, and the interaction of these factors with each other more clearly.

- **The SHEL Model**

To understand these human factors more practically a model for aviation was developed by Edwards (1972) called the SHEL model. SHEL is an acronym for “**S**oftware”, “**H**ardware”, “**E**nvironment” and “**L**iveware” and can be applied to air traffic control. These four factors all have an influence on the way ATCs perform their tasks and also have an influence on their working environment and the processing of information.#

Software represents bulletins, manuals, maps and other information sources.

Hardware includes any advance aviation technology such as “autopilot”.

Environment is the physical state of affairs within the cockpit (or the ATCs control tower) such as the temperature, noise and lighting.

Liveware is the human or individual for example the ATC or pilot.

This model presents the main elements and interactions of human factors, and is specifically applied to air traffic control in this study.

The individual – liveware, has four main kinds of interaction:

- Liveware-hardware: individuals and machines including equipment. Highly automatised equipment could for example change the ATCs' role from an "active planner" to that of a person that reacts passively to alternative commands of action that is proposed by the machine (computer). This could lead to boredom, confidence and lowered readiness (Koenig, 1995).
- Liveware-software: individuals and materials, such as documents, procedures, symbols, etc (ICAO, 1993).
- Liveware-environment: individuals and the environment, including factors internal and external to the workplace (ICAO, 1993).
- Liveware-liveware: individuals and other individuals, including colleagues (ICAO, 1993).

The objective is to optimise these relationships. The SHEL model can be used to identify problem areas, to trace the origins of specific problems and to define appropriate data collection tasks. The SHEL model includes the main interactions between the individual and the other aspects of the system, but there can be second and third order interactions too. For example, what a controller (liveware) actually sees on a display can depend on which information is displayed (hardware), how appropriate it is for the task (software), whether it is obscured by glare (environment) and what the controller is expecting to see after conversing with the pilot (liveware) (ICAO, 1993).

The SHEL-model can be used to investigate the relationship between airplane crashes and communication patterns with ATCs. NASA (National Aeronautics and Space Administration) has studied more than 28 000 incident reports and has found that more than 70% of these incidents are due to a problem in the transfer of information, especially between the pilot and the ATC (ICAO, 1993). Researchers have found that the most common cause for this lack of communication is that the person that had the critical information, did not believe that it was

important enough to communicate, or that the information was communicated, but incorrectly. A factor that contributed to this is among others high workload, one of the aspects that contribute to ATCs' high stress levels, which could then lead to incidents or accidents (Van der Westhuizen, 2002).

Given the work environment, the information processing tasks, the system in which an ATC operates, as well as the human factors influencing the transfer of information of an ATC as discussed in the above paragraphs, it can with some certainty be said, that the area in which an ATC operates, and the factors that influence the task performance does contribute to the experience of stress. It is therefore essential to also discuss the concept of stress, to understand further how stress manifests within the role of an ATC.

2.3 Stress

In the following section a brief overview regarding the concept of stress will be discussed. The discussion will commence with the definitions of stress, different types of stress, discussing the Job Demand-Control (JD-C) Model and then focusing on stress in air traffic control. Throughout this discussion attention will also be given to previous research done in this field.

2.3.1 Introduction

Stress is an occupational hazard of modern living. In today's fast-paced, high-tech society, the devastating effects of stress are not limited to those engaged in police work, even though this might be listed as one of the most stressful jobs across all occupations, but can affect all workers in a variety of different occupations, including air traffic control.

Illnesses related to stress have now replaced infectious disease as the leading cause of death in the United States of America (Stinchcomb, 2004).

According to Krebs (2000) experts estimate that up to 90% of visits to physicians are due to stress-related illnesses that manifest as headaches, hypertension, insomnia, gastro-intestinal disturbances, chronic pain, fatigue, and skin disorders, to name a few.

Psychological symptoms may include feelings of inner tension, anxiety, depression, anger, pessimism, resentment, increased irritability, cynicism and an inability to concentrate or perform at normal levels.

The hormones that the body release when an individual is stressed, namely adrenaline and cortisol, are important if a person needs to run from danger or stand and fight. However, over time these hormones take their toll on the body, especially if the individual is chronically “stressed out”. Although a single stressful event may not place great demands on the coping abilities of most persons, it is when multiple problems accumulate, persisting and straining the problem-solving capacity of the individual, that the potential for serious disorders occur (Cohen & Wills, 1985).

The negative effects of occupational stress on the health and psychological well-being of individual employees and the businesses of their employing organisations are well documented. For example, the results of a large-scale household survey indicated that 19.5 million working days were lost in the UK during 1995 due to work-related illnesses, with by far the largest category of illness being ‘musculoskeletal, stress, anxiety and depression (Jones, Hodgson, Clegg & Elliot, 1998). Organisations suffer business loss through lost working days (due to work-related illness or accidents), absenteeism, staff turnover, lowered performance, and the associated, often hidden, costs of training replacement staff and the added burden placed on the colleagues of absent or under-performing staff. Recently, an additional source of business costs to employers has been the increase in personal injury claims against them, brought by employees who have suffered from the adverse effects of workplace stress (Earnshaw & Cooper, 1996).

Occupational stress can no longer be considered an occasional, personal problem. It is becoming an increasingly global phenomenon, affecting all categories of employees, all workplaces and all countries. This trend — coupled with its rising cost to the individual, to industry and to society as a whole — has greatly heightened awareness of the need for effective and innovative ways of tackling stress (Stinchcomb, 2004).

On the basis of the above, the current study includes the construct of coping into this study in order to identify ways to alleviate the negative consequences of stress on the individual ATC,

but also the effects that stress can have on ATCs effectively performing their tasks. The concept of coping with stress and the related emotions arising from dealing with stress will be discussed in a later stage in this chapter.

In order to understand stress and the influence that stress has on ATCs, it is important to first accurately define stress. The following section will first discuss general definitions of stress, and then focus on occupational stress, which is the type of stress relevant to this study.

2.3.2 Defining stress

In 1956, Selye (1956, p.33) defined stress as “a non-specific response of the body to any demand placed upon it.” Stress is considered to be an internal state or reaction to anything individuals consciously or unconsciously perceive as a threat, no matter whether this is a real or imagined threat. Stress can evoke feelings of frustration, fear, conflict, pressure, hurt, anger, sadness, inadequacy, guilt, loneliness, or confusion (Cavanagh, 1988). Prolonged exposure to stressful circumstances can produce long-lasting effects on an individual’s physical and mental well-being.

Lazarus (1966) suggested that stress be treated as an organising concept for understanding a wide range of phenomena of great importance in human and animal adaptation. Later Lazarus and Folkman (1984) suggested that perhaps the most useful approach to stress would be to regard it not as a variable but as “a rubric consisting of many variables and processes” (p.12). It is still believed that this is the most useful approach to take when considering the over-arching concept of stress, since it considers the relationship between the person and the environment.

On the one hand, stress can be examined as a personified experience, i.e. sets of physical responses to unfavourable work conditions. Headaches, illness, fatigue and sleeping problems are examples of such personified experiences. In this perspective, stress is not seen as being different from any other form of illness. Stress is simply a matter pertaining to the body and needs to be treated as such (Lazarus & Folkman, 1984).

On the other hand, stress can be seen as an emotional reaction to external demands and expectations. Based on this (the fact that stress is seen as an emotional reaction), it could be assumed that Emotional Intelligence can assist an individual in recognising and managing this emotional reaction to stress, and then contribute to selecting the appropriate coping strategy, as it has been mentioned that individuals higher on Emotional Intelligence can more accurately recognise emotions within themselves, and manage these emotions.

The problem of stress operates within these two divisions; on the one hand, stress is embodied; on the other hand, it is emotional (Lazarus & Folkman, 1984). It is impossible to place the experience of stress in either of these two entities. It is experienced in the body, the stressed body, but equally it is experienced as an emotional state. There is thus a certain degree of vagueness in the definition of stress; it is in-between embodied as well as emotional, personal as well as social. Stress, then, is not something that occurs from outside sources alone, much of it has to do with what goes on within the person (Bonner, 2004).

Looking first at the concept itself, it is apparent that there is no uniform agreement on just what, in fact, stress is. In general there are four approaches to defining stress.

- Stimulus based,
- Response based,
- Interactive based, and
- Transactional based (Selye, 1956; Stinchcomb, 2004; Cooper & Marshall, 1977; Lazarus, 1966).

These four general definitions of stress will be discussed below, followed with a more specific definition of Occupational Stress, which will be the definition used in this study.

2.3.2.1 Stimulus based definition of stress

According to certain researchers (e.g. Selye, 1956; Goodell, Wolf & Rogers, 1986) stress is a stimulus in the environment that creates tension, threat, anxiety – and ultimately, a need to readjust (Selye, 1956). From this perspective, stress has often been viewed as exposure to catastrophic situations – wars, riots, and natural disasters – or traumatic incidents – death,

accidents, violence. It has even been recognised that the normal but harmful characteristics of everyday life can be stress-provoking, such as noise, crowds, or traffic congestion. This is especially true if exposure to these more subtle sources of stress occurs chronically over a long period of time. But whether catastrophic or commonplace, such disruptions have now become identified as *stressors* rather than stress itself. Stressors are the disrupting conditions which create the need for the readjustment that can potentially produce stress (Selye, 1956).

Identification of potential sources of stress is the central theme of the stimulus-based model of stress (Goodell et al., 1986). The rationale of this approach is that some external forces impinge on the individual in a disruptive way. Stimulus-based definitions of stress have their roots in physics and engineering, the analogy being that stress can be defined as a force exerted, which in turn results in a demand or load reaction, hence creating distortion. This can be seen in the same light as the JD-C model where stress/strain is also experienced when the job demands of an individual are high and the control they have over their job is low. If the individual's tolerance level is exceeded, temporary or permanent damage occurs (Goodell et al., 1986).

The expression “the straw that breaks the camel’s back” summarises the essence of stimulus-based definitions of stress. An individual is continuously bombarded with potential sources of stress (which are typically referred to as *stressors*), but just one more apparently minor or harmless event can alter the delicate balance between coping and the total breakdown of coping behaviour. In short, this model of stress treats stress as an independent variable that elicits some response from the person (Goodell et al., 1986).

Rapid industrialisation provided the initial drive for this approach, and much of the early research into blue-collar stress aimed to identify sources of stress in the work environment in order to provide optimal working conditions (Cooper & Smith, 1985). Considerable attention was paid to physical and task circumstances (such as heat, cold, noise and social density). However, it is now realised that focusing solely on objective measures of environmental conditions is inadequate. Individual differences, such as variability in tolerance levels and expectations, can account for the fact that two individuals exposed to exactly the same situation might react in completely different ways. This is a major weakness of the stimulus

model. In fact, Lazarus (1966) stated that no objective criterion is sufficient to describe a situation as stressful and that only the person experiencing the event can do this. Nevertheless, although the stimulus model has limitations, it is useful in identifying common stressor themes or patterns that might affect the majority of the workforce.

2.3.2.2 Response based definition of stress

In contrast to the stimulus model, other researchers (e.g. Stinchcomb, 2004; Cooper, Dewe & O'Driscoll, 2001) have taken the position that stress is the manner in which the body responds physiologically and/or psychologically when trying to adjust to these stressful stimuli, as explained above. Physiological reactions to stress can include anything from headaches, stomach aches and backaches to more severe conditions such as ulcers, heart attacks or strokes. Psychologically, stress-related indicators could range from simple irritability to more serious anxieties, depression, flashbacks or panic attacks. But again, these physiological and psychological symptoms are precisely that – *symptoms* of an individual's response to stress, rather than the actual condition of stress itself (Stinchcomb, 2004).

The phrase “being under stress” is one that most people can identify with, although it can mean different things to different individuals. This expression focuses not so much on the nature of stress itself but on its outcomes or consequences. A response based approach (see Figure 2.1) views stress as a dependent variable (i.e. a response to disturbing or threatening stimuli).

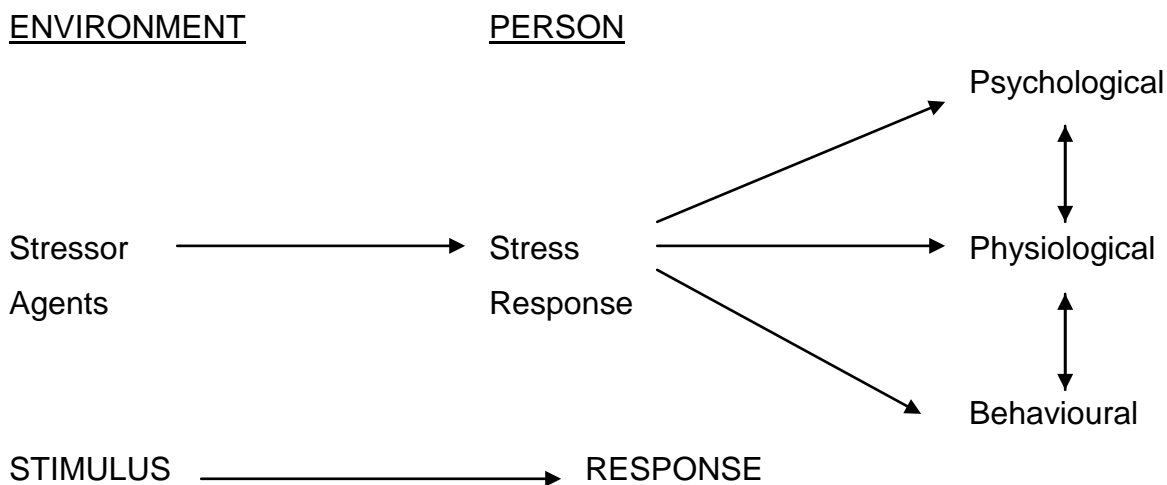


Figure 2.1 A Response Based Model of Stress

(Cooper et al., 2001, p. 5)

The origins of response based definitions can be found in medicine and are usually viewed from a psychological perspective – a logical stance for a discipline trained to diagnose and treat symptoms but not necessarily causes. The work of Hans Selye in the 1930s and 1940s marked the beginning of this approach to the study of stress. In 1936, Selye (1936) introduced the notion of stress-related illness in terms of the *general adaptation syndrome* (GAS), suggesting that stress is a non-specific response of the body to any demand made upon it (Selye, 1956).

Selye's focus was medical: General depression, leading from stressful experiences was characterised by loss of motivation, appetite, weight and strength. Evidence from animal studies also indicated internal physical degeneration and deterioration. Responses to stress were considered to be invariant to the nature of the stressor and therefore to follow a universal pattern (Selye, 1956).

Selye (1956) thought that the general adaptation syndrome involved two major systems of the body, the nervous system and the endocrine (or hormonal) system. He then went on to outline what he considered as three distinctive stages in the syndrome's evolution. He called these stages the alarm reaction (AR), the stage of resistance (SR), and the stage of exhaustion (SE). These three stages are discussed below.

1. The alarm reaction

The alarm reaction is the immediate psycho-physiological response, when the initial "shock" phase of lowered resistance is followed by "counter shock". At this time, defence mechanisms are activated, forming the emergency reaction known as the "fight or flight" response (Cannon, 1935). Increased sympathetic activity results in the secretion of catecholamine, which prepare the body physiologically for taking action: For example, heart rate and blood pressure increase, the spleen contracts, and blood supplies are redirected to the brain and skeletal muscles.

2. The stage of resistance

The second stage is resistance to a continued stressor, in which the adaptation response and/or return to balance replace the alarm reaction. However, resistance cannot continue indefinitely, and if the alarm reaction is elicited too intensely or too frequently over an

extended period, the energy needed for adaptation becomes depleted and the third stage (exhaustion, collapse or death) occurs (Selye, 1983).

3. The stage of exhaustion

At this stage, the stress has continued for some time. The body's resistance to the stress may gradually be reduced, or may collapse quickly. Generally, this means the immune system, and the body's ability to resist disease, may be almost totally eliminated. Patients who experience long-term stress may succumb to heart attacks or severe infection due to their reduced immunity. For example, a person with a stressful job may experience long-term stress that might lead to high blood pressure and an eventual heart attack (Selye, 1983).

Although the word stress usually has negative connotations, Selye (1976) emphasised that stress reactions are not automatically bad and that they cannot be avoided because being alive is synonymous with responding to stress. In fact, a certain level of stress is necessary for motivation, growth, development and change and has been referred to as *eustress* (Selye, 1976). However, unwanted, unmanageable stressor situations are damaging and can lead to *distress*.

Because of their medical focus, which emphasises the individual's response, Selye's (1976) approach and response-based definitions generally have also been criticised because they appear not to consider environmental factors in the stress process (Cooper et al., 2001).

The following paragraph discusses stress as an interaction.

2.3.2.3 Stress as an Interaction

Neither the stimulus nor the response perspective takes into account the *interactive* nature of stress. Nor do they explain why some people are more negatively affected by stressors than others. In that regard, it is interesting to note that the notion of 'stress' first emerged in the field of physics, where it refers to the distortion produced by an external force placing strain on an object. The amount of damage that results will depend on both the strength of the force and the ability of the object to withstand it, or in other words, the coping mechanisms an employee need in order to mitigate the force and as such cope with the stressor. Translated

into the social sciences, stress becomes the complex manner in which individuals interact with their environment (Cooper & Marshall, 1977; Cox, 1978).

From an interactive perspective, stress has been defined as “an *imbalance* between environmental demands and individual resources” (Cherniss, 1980, p. 22). Stress thus occurs when the demands placed on any individual exceed his/her capacity to deal with them. More specifically, this means that stress develops when the individual is not able to *avoid, alter, or control* those demands (Stinchcomb, 1986). Only those nerve-wracking situations that are outside of an individual’s spheres of control will become stressful. The interactional approach to defining stress focuses on the statistical interaction between the stimulus and the response. This approach, described as structural (Stahl, Grim, Donald & Neikirk, 1975) and quantitative (Straus, 1973), is one where a relationship, usually correlational, is hypothesised between a stimulus and a response. This approach is essentially static (cause and effect), with any consideration of process being limited to inferential explanations when the interaction fails to materialise or is different from that predicted. This is where, according to Lazarus and Launier (1978), description has taken a back seat to simple cause-effect formulations. A definition like this, which focuses only on the interaction between two variables (i.e. stress and coping), means attempts to explain the complexity of such a relationship are limited to structural manipulations such as the influence of a third (moderator, i.e. Emotional Intelligence) variable, which again do not provide an explication of the stress process.

Taking this argument further, job stress should now be viewed as a transaction – an ongoing relationship between the individual and the environment. The *interactional* approach is limited in its ability to expose the causal pathways inherent in that relationship.

In contrast, the *transactional* model of stress endeavours to explore the essential nature of stressor-response-outcome relationships and to summarise an understanding of the dynamic stress process itself, not merely the statistical relationship between variables (Lazarus, 1966). In the next paragraph stress as a transaction will be discussed.

2.3.2.4 Stress as a Transaction

Whereas the interactional definition of stress focuses on the structural features of the person's interaction with his or her environment, transactional definitions are more concerned with the dynamics of the psychological mechanisms of cognitive appraisal and coping that underpin the stressful encounter (Lazarus, 1966).

There are two types of appraisal.

1. From a transactional perspective (Lazarus, 1966), the experience of stress is defined first by the person's realisation that something is in jeopardy (*primary appraisal*). In the primary appraisal process, the individual gives meaning to an encounter. Primary appraisal for an ATC can be the demands of the number of aircraft under their control, or the effect of a natural storm on the safe navigation of an aircraft in flight. The meanings that best express this appraisal process are those involving *harm* (in the case of an ATC asking the question, can it lead to injury or death?), the *threat* of harm, or *challenge*.
2. Once an encounter is appraised as being in some way a threat to the person's well-being, the *secondary appraisal* process begins. This process is concerned with the identification and availability of coping resources to deal with the threat, harm or challenge (Lazarus, 1991). These two appraisals are the key to the stress-coping process (Dewe, Cox & Ferguson, 1993) and will be discussed in greater detail later on in this chapter.

Due to the importance of the secondary appraisal process whereby individuals identify coping resources in order to manage stressful situation, it has been decided to include the concept of coping in this study of stress in ATCs in order to also determine which type of secondary appraisal and coping strategies ATCs use in order to manage stressful situations. Coping will be discussed in detail later in this chapter.

Stress is, therefore, not a factor that resides in the individual or the environment; rather, it is embedded in an ongoing process that involves individuals transacting with their environments, making appraisals of those encounters, and attempting to cope with the issues that arise. At the heart of the transactional definition is the idea that stress is a dynamic cognitive state. It is a disruption in *homeostasis* or an *imbalance* that gives rise to a requirement for resolution of that imbalance or restoration of homeostasis (Dewe et al., 1993).

What distinguishes this approach from other definitions is its emphasis on the process – on meaning, adjustment, and coping as core defining elements – and its focus on understanding the adaptive process itself. The term *transaction* implies that stress is neither in the person nor in the environment but in the relationship between the two (Lazarus, 1990). The transactional definition points to three important themes:

- a dynamic cognitive state,
- a disruption or imbalance in normal functioning, and
- the resolution of that disruption or imbalance (Dewe et al., 1993; Holroyd & Lazarus, 1982; Newton, 1989).

It is clear that there is a gap between interactional and transactional approaches to defining stress and that the transactional perspective requires a fundamental shift in how stress is conceptualised and researched. From an interactional point of view (Coyne & Gottlieb, 1996), constructs such as causes (stimuli) and consequences (responses) are concepts capable of being described independently of each other and, when entered into a causal relationship, maintain a conceptual uniqueness. From a transactional perspective, on the other hand, such constructs are defined relationally and ultimately become inseparable from the context within which the stressful encounter takes place. As Lazarus (1990) has illustrated, no single variable can be said to be “stress”, as they are all part of the transaction process, and an independent variable at any one time (as the encounter unfolds) can be considered at another time as a dependent variable. For example, trying to predict which factors influence how people cope at one time makes the process of coping a dependent variable (as is the case in this study), whereas other research may explore coping as a predictor of an individual’s well-being and hence treat coping as an independent variable.

The following paragraph will identify and discuss the two different types/forms of stress. This will be followed with an in-depth discussion of occupations and stress.

2.3.3 Types/Forms of Stress

Basically, stress has been categorised into two forms, namely acute stress and chronic stress (Aldwin, 1994). Acute stress is a response to imminent danger, while chronic stress is caused by constant emotional pressure the individual cannot control. The chronic stress that millions of people feel every day from simply trying to deal with the pressures of modern life

can unleash a flood of hormones that are useful in the short term but subtly toxic if they persist. Psychologically, it is believed that chronic stress is generally more harmful since it takes a toll on an individual's overall well-being (Crampton, Hodge, Mishra & Price, 2000). An extreme case of chronic stress is known as burnout.

Burnout can be understood as a condition that occurs over time and it is characterised by emotional exhaustion and negative attitudes that include boredom, discontent, cynicism, inadequacy and failure (Crampton et al., 2000). Burnout, caused by the cumulative effect of the stressful working environment, that exceeds the coping capability of the individual, is a state which forces employees to become introverted. According to Maslach (2003) burnout is most commonly defined as a syndrome of feelings of emotional exhaustion, depersonalisation and reduces personal accomplishment.

An individual's physical response to stress known as the "fight or flight" response probably evolved to help our primitive ancestors deal with a treacherous world (Cannon, 1931; McCarty, 2000). No matter what the situation, when the demand an individual perceives exceeds the resources the individual thinks he/she has, the body and mind are aroused and all systems are geared up either to fight the challenge or to flee from the situation to avoid harm. In the biological usage of the concept of stress, it is understood as an active and dynamic process. Lazarus and Folkman (1984) wrote

When one views stress as a dynamic state, attention is turned toward the ongoing relationship between the organism and the environment, and interplay and feedback. With a dynamic formulation we are less likely to settle for incomplete and inadequate definitions of stress that are based solely on what is happening within the organism (Lazarus & Folkman, 1984, p. 113).

Now that there is a clear understanding as to what stress is, these approaches and definitions of stress discussed are all just focusing on stress in general, and not as much on stress specifically experienced in the working environment. The following sections will specifically focus on occupational stress, defining it, and then also focusing on previous research regarding organisational stressors.

2.3.4 Occupations and Stress

In more ways than one, the job an individual performs has an influence on his/her stress levels. Certain tasks expected within an ATC's work environment, will inevitably contribute to them experiencing stress in some way. The number of aircraft under their control, technological breakdown and the fear of collisions, constantly place demands on ATCs which in time contribute to them experiencing stress in their job. In the next paragraph specific attention will be given to occupations and the stress experienced within these occupations, and also how stress can be defined in this context. This is followed by a discussion regarding previous research on organisational stressors.

2.3.4.1 Introduction to Occupational Stress

HELP WANTED: World's busiest airport seeks radar jockies for unusually stimulating, high-intensity environment. Must be able to direct at least 12 aircraft at one time and make instant decisions affecting the safety of thousands. No degree required, but prior experience as traffic cop, seeing-eye dog or God helpful. Severe stress will jeopardize sanity and result in early termination from job, but employer will absorb cost of medical and psychiatric care (Martindale, 1977).

Although this advertisement never appeared, it does illustrate one of the most stressful occupations – air traffic control. The stressors of this occupation are of gruelling pace (beyond the immediate control of the controller), split-second decisions (time pressure) and the constant threat of mid-air collisions. In addition, there are numerous conflicts between the employers and the FAA in America. The results are predictable: ulcers, high blood pressure, arthritis, colitis, headaches, allergies, upset stomachs, alcoholism, depression and acute anxiety (Martindale, 1977).

High levels of workplace stress are frequently reported in connection to the occupation of air traffic control. Recent events, such as the terrorist attacks of September 11, 2001 and potential terrorist attacks of August 11, 2006, contribute to crises and traumatic experiences for ATCs. Research on ATCs attributes stress responses to the level of air traffic activity and potential conflicts (Vogt & Kastner, 2001). The need for stress coping strategies following critical incidents is crucial for reactivating air traffic control personnel in a quick, effective and

sustainable way (Angenendt, 2003; Vogt & Kastner, 2001). Historically, role responsibility, episodes of role overload and high concentration demands have been constant. Numerous cases of hypertension, upper respiratory infections, and disturbances of impulse control, depression and substance abuse are reported (Mohler, 1983).

Stress for white collar workers (especially managers) has been associated with decision-making and its consequences, responsibility for people, heavy demands for cooperation between superiors and subordinates, time pressure, fear of failure, fear of poor performance, mid-career crisis from lack of promotion, and management of a workforce with rapidly changing values (McLean, 1979; Warshaw, 1980; Cooper, 1979).

Although research on occupational groups indicates that different stressors are more important in the stress of one group than in another, perhaps one of the most important conclusions is that the blue-collar workers do not necessarily suffer from fewer stress responses than white-collar workers. If anything, some white-collar workers probably suffer from less stress, or at least enjoy it more, than some blue-collar workers. Nevertheless, both groups are concerned with dealing with the stress they do have, that is, with coping.

Now that it is clear that stress exist within occupations, and especially within the occupation of air traffic control, a need to define occupational stress arises. In the following section various definitions of occupational stress will be presented and discussed.

2.3.4.2 Defining Occupational Stress

Beehr and Newman (1978) define occupational stress as follows:

Job stress refers to a situation wherein job-related factors interact with a worker to *change* (i.e. disrupt or enhance) his or her psychological and/or physiological condition such that the person (i.e. mind-body) is forced to deviate from normal functioning (pp. 669-670).

Occupational stress has been defined by many researchers (for example, Cox, 1978; Cummings & Cooper, 1979) as a negative perceived quality which, as a result of inadequate coping with sources of stress at work, has negative mental and physical health consequences. There are two key dimensions of this definition: in order for an individual to experience stress symptoms, firstly the source of stress must be negatively perceived and

secondly, the individual must display inadequate coping. The emphasis is on the interactive nature of the relationship between perceived demands and the responses to those demands.

Marsella (1994) suggests that stress involves an emotional reaction, especially a reaction involving the negative emotional states. Briner (1996) argues that more in depth research are necessary if questions are to be asked about the processes producing negative emotions and individuals' experiences of psychological distress as well as implicating work environments or situations as contributory factors of such distress.

The definition for occupational stress given by Beehr and Newman (1978) above, views job-related stress as a perceived imbalance between demands arising from a job characteristic (a stressor) and the person's perceived capability (physical or psychological) to respond. That results in an experienced strain, or response by the person. The resultant strain could be physiological, psychological or behavioural; or the strain could be a combination of these types of variables (Kavanagh et al., 1981). A physiological strain would be a change in blood pressure; a psychological one would be a negative attitude about a given aspect of the job; and a behavioural one would be change in productivity. The demand may be physical or psychological. A physical demand would be extreme heat, whereas a psychological one would be a perception of time urgency to meet a deadline (Kavanagh et al., 1981)

Occupational stress can have its roots in organisational policies or practices, in the demands of the job itself, and in the nature of the physical and social context of work. Moreover, different major occupational groupings can produce varying degrees of stress. Stress can be produced by work or non-work pressures and by such career concerns as obsolescence, employment discrimination and threatened job loss. The presence of an environmental stressor does not inevitably produce stress. It depends on how the situation is interpreted or appraised (Greenhaus, Callanan & Godshalk, 2000).

As described previously in this chapter, the work environment in which ATCs operate could be a definite source of stress for those individuals that could not successfully cope with the stressful situations.

It could then be assumed that because stress is seen as an emotional reaction (Marsella, 1994), an individual high in Emotional Intelligence can effectively recognise these emotional states and in such a way assist in selecting appropriate coping strategies.

Stress and the emotional component of stress, as mentioned by Marsella (1994) above will be elaborated on later on in this chapter which focuses on Emotional Intelligence and stress, and how they interact and correlate with each other, in order to determine whether this assumption mentioned in the previous sentence can be confirmed.

Lazarus and Folkman (1984) proposed that an individual's responses to occupational stress may be mediated through appraisal processes: cognitive appraisal of the nature and extent to which the situation is considered to be threatening and appraisal of the range of actions that may be available to deal with the stress. This appraisal may include selecting certain coping strategies to deal with the threatening or stressful situation. If the coping strategies do not seem to be effective, these may be followed by further processes of reappraisal. There may be a mismatch between the demands perceived by individuals and the internal and external resources available to deal with the situation, in which case psychological or physiological strain may result.

An important aspect of this view of the process of stress and coping is that individuals are considered to take an active part in the process rather than simply acting as passive responders. Karasek (1979) has emphasised the importance of control over the work environment, finding that strain was particularly associated with jobs having high demands and low levels of job decision latitude. Job decision latitude is an operationalisation of the concept of control and has often been defined as the combination of job decision-making authority and the opportunity to use and develop skills on the job (Karasek, 1979). Parkes (1991) suggests that demand and control may interact with the individual factor of locus of control such that those individuals who prefer external control show an additive relationship between demand and control, whereas internals show an interactive relationship. Internals tend to be more goal directed and purposeful in the way that they approach work and adapt more easily to conditions at work that grant high levels of discretion. Locus of control is also found to moderate the impact of workload on work satisfaction (Perrewe, 1986). Therefore, the extent to which individuals are able to control the work environment may determine the

effectiveness of particular coping strategies and the extent to which personal and organisational goals are met.

The experience of stress symptoms is therefore both subjective and dependent on individual differences.

Lazarus (1991) suggests that in order to understand stress in the workplace, individual patterns of response to various working conditions need to be studied. It is not sufficient simply to identify potentially adverse conditions of work because strain may be manifested in a number of different ways depending on the nature of the task and the individual (Broadbent, 1985; Frankenhaeuser, 1986; Hockey, 1986). In other words, even if it were possible to identify all potential sources of stress in the workplace, this would not allow the confident prediction of the effects of these stressors on individual performance and well-being. What is needed is a more detailed understanding of the cognitive control processes that govern individual responses to different work demands. It is argued that individuals in many jobs, particularly those involving high levels of cognitive demands, may be able to exert some degree of control over their work in order to deal with perceived demands. Furthermore, individuals may differ in the extent to which they utilise different strategies in applying control activity. They may be employed to prevent either negative psychological states or decrements in work performance in difficult or demanding situations (Hockey, 1986).

Following on this discussion and having a clear understanding as to what occupational stress is, the next section places emphasis on the different types/forms of stress and how they influence individuals and their working environment.

In the following section a review will be given on previous research done on organisational (environmental) stressors.

2.3.4.3 Review of the Research on Organisational (Environmental) Stressors

Sources of occupational stress (or 'stressors') have been categorised by Cooper and Marshall (1976) as: intrinsic to the job; an individual's role in the organisation; relationships at work; career development; organisational structure and climate; home-work interface (see Figure 2.2).

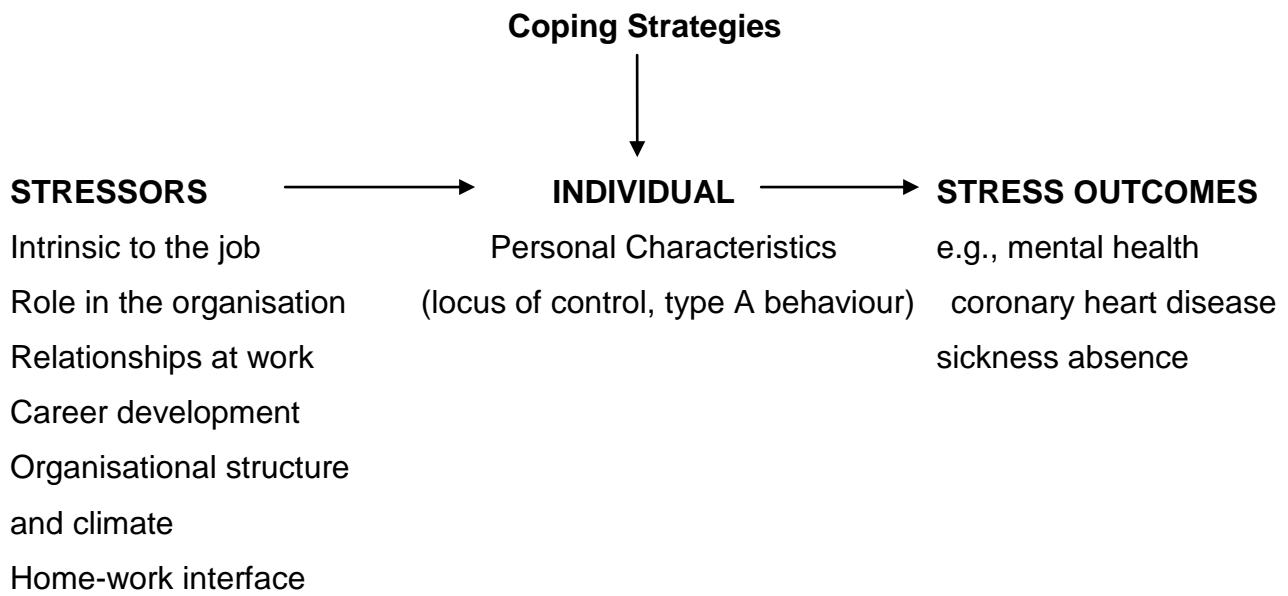


Figure 2.2 The Occupational Stress Model

(Clarke & Cooper, 2000, p. 175)

Those stressors that are 'intrinsic to the job' will include physical aspects of the working environment, such as noise and lighting, and psychosocial aspects, such as workload, and will vary in importance depending on the job; for example, health-care professionals experience high workload, the need to work long hours, time pressures and inadequate free time (Wolfgang, 1988; Sutherland & Cooper, 1990); whilst money-handling and the threat of violence at work are stressors for bus drivers (Duffy & McGoldrick, 1990). Sources of pressure derived from factors inherent to the job itself, but also from the organisational context, such as the structure and climate of the organisation (such as the management style, level of consultation, communication and politics). Research shows that organisational stressors can have more impact, even in seemingly 'stressful' jobs, than factors intrinsic to the job, for example, the police (Hart, Wearing & Headey, 1995) and teaching occupations (Hart, 1994). Hart et al. (1995) found that 'hassles' associated with police organisations (such as communication and administration) were the main predictor of psychological distress amongst police officers.

An early study of stress in ATCs was that of McBride, Lancee and Freeman (1981) who used the occasion of a labour dispute among Canadian controllers to identify the aspects of their job that these controllers found stressful. Later, in the context of a subsequent study of ATCs'

work load, Shouksmith and Burrough (1988) used the same stress measure with a New Zealand sample. The similarity of the results from the two studies was striking. The patterning of responses fitted traditional occupational stress analysis emerging from a number of stress studies (e.g. McGrath, 1976), producing separate groupings of job stress factors in terms of job tasks and conditions, role ambiguity and role conflict, and task load issues. Beyond these universal occupational stress factors and ATC-task specific ones, however, a number of unique issues related to each of the two countries emerged. Canadian controllers were concerned with bilingualism, for example, which had no relevance for New Zealand controllers. New Zealand's general temperate climate, on the other hand, means that controllers found the impact of bad weather much less stressful than did the Canadian ones. The fact that the Canadian study was undertaken at the time of a labour dispute, probably accounts for a further intra-country difference: the Canadian group rated "relationships with management" as being much more stressful (Shouksmith & Taylor, 1997). This study will be discussed in greater detail later in this chapter.

The findings of these studies are in line with the latest statement of the transactional model of occupational stress (Lazarus, 1995) as discussed earlier in this chapter. "Transaction" Lazarus (1995) wrote, "means not only that in a particular adaptational encounter, the person influences the environment and vice versa, but also that person-environment relations transcend the separate interacting variables of person and environment and are constantly subject to change" (p. 5).

This analysis, which focused on the interaction between employees and their operating environments as being the basis for stress, fits modern conceptions of the role of organisations.

Because several excellent reviews and compilations of the research on stress in organisations currently exist (e.g. Cooper & Marshall, 1976; Cox, 1978; Beehr & Newman, 1978; Caplan, Cobb, French, Van Harrison & Pinneau, 1975), in the following section a limited body of research will be reviewed in order to highlight what has been done, with particular emphasis on the definition and conceptualisation of stress in organisations. Research that has focused on organisational conditions associated with stress will be reviewed first. Stress research uniquely related to occupational groups will also be highlighted since it identifies an important body of research and concern.

The organisational (environmental) conditions most frequently identified as stressors are: (a) role characteristics, (b) job qualities, (c) relationships at work, (d) organisational structure, and (e) physical qualities. However, there are several other environmental stressors. Those examined here, tend to be among the most commonly researched in the study of stress. These stressors mentioned above will all be discussed in greater detail.

a) Role Characteristics

Role characteristics have been one of the most widely investigated organisational conditions in stress research. Selected role characteristics most frequently researched include role ambiguity, role conflict, role overload, role underload and role status congruency. Each one of these role characteristics will be discussed below:

1. **role ambiguity**: Role ambiguity occur when a person's tasks or authority are not clearly defined and the person becomes afraid to act on or take responsibility for anything (Jones, 2004).

2. **role conflict** (person-role, inter sender, and intra sender): Role conflict occurs when two or more people have different views of what another person should do and, as a result, make conflicting demands on the person. The person may be caught in the crossfire between two supervisors or the needs of two functional groups (Jones, 2004).

Role conflict is present whenever compliance by an individual to one set of expectations about the job is in conflict with compliance to another set of expectations. Facets of role conflict include being torn by conflicting demands from a supervisor about the job and being pressured to get along with people with whom you are not compatible. Regardless of whether role conflict results from organisational policies or from other areas within the working environment, it can be a significant stressor for some individuals. For example, a study at Goddard Space Flight Centre determined about 67 percent of employees reported some degree of role conflict. The study further found that Goddard employees who experienced more role conflict also experienced lower job satisfaction and higher job-related tension (Kahn et al., 1964). It is interesting to note that the researchers also found that the greater the power or authority of the people sending the conflicting messages, the greater was the job dissatisfaction produced by role conflict (Kahn et al., 1964).

3. **role overload** (quantitative and qualitative): Role overload refers to the extent to which the job demands exceed the available resources and the extent to which the individuals are able to cope with the demands and accomplish workloads (Wu, Zhu, Li, Wang & Wang, 2008). If we look at the tasks that ATCs need to accomplish during a working day, such as the management of aircraft under their control, peak traffic hours, extraneous traffic, time pressures and unbroken duty periods, it could be that ATCs suffer from the effects of role overload. Task requirements related to complex work environments are ever-increasing, especially in situations in which time constraints are always present, such as in air traffic control. It thus seems important to assess mental workload (which can be a result of role overload) induced by such demands. Mental workload may be defined as the interaction between the structures and systems and tasks (role overload) on the one hand, and the abilities, motivation and state of the individual ATC (resources) on the other (Collet, Averty & Dittmar, in press). Therefore, it is the result of the interaction between task demands and the ATC's functional state (Hockey, 2003). Strain is a subjective concept that may represent the "cost" endured by the ATC, i.e. the effects caused by previous constraints. According to Gaillard (1993), there is a general agreement to consider that strain is the actual workload and reflects the overall demand for resources. Stress is another aspect of workload and is related to the measurable constraints pertaining to the task and its environment.

In air traffic control, task demand (that can lead to role overload) can be directly related to the number of aircraft to be monitored.

In a study by Zeier et al. (1996) they identified that certain characteristics of the job of ATCs are likely to produce stress; for example an ATC can not predict when a situation becomes critical and he is not able to regulate the workload. Various studies have shown that the work stress of ATCs can be quite demanding (Mohler, 1983; Rose et al., 1978). Due to a continuous increase in air traffic over the last decade, higher peak traffic levels and the increasing duration of these peaks is considered as possible factors to role overload and seen to be a major stress factor in air traffic control (Costa, 1993; Farmer, Belyavin, Berry, Tattersal & Hockey, 1990, Shouksmith & Burrough, 1988; Zeier, 1994).

4. **role underload** (quantitative and qualitative): Role underload refers to the state in which too few expectations or demands are placed on a person (Noe, Hollenbeck, Gerhart & Wright, 2003).

Role overload and underload appear to be directly associated with an individual's need for stimulation (Levi, 1967, 1972a). Typically, situations of overload are associated with too much stimulation and situations of underload are associated with too little stimulation (Levi, 1972a). Either situation is associated with high stress (French, 1974; Frankenhauser & Gardell, 1976), although qualitative overload (e.g. responsibility for people rather than things) may be more stressful (Wardwell, Hyman & Bahnson, 1964; French & Caplan, 1973).

Research suggests that role underload represents a constraint, while role overload represents a demand (Terryberry, 1968). Qualitative overload occurs when people feel they lack the ability needed to complete their jobs or that performance standards have been set too high. Quantitative overload on the other hand, results from having too many things to do or insufficient time to complete a job.

In the case of role underload it has been noted by Sperandio (1978) that accidents also happen during times of role underload. As the number of aircraft under an ATC's control decreases and the weather is clear, the ATC is more likely to become relaxed, and when unforeseeable events does take place, more errors can occur, as an ATC is not as vigilant and aroused at that time (Sperandio, 1978).

5. role-status congruency: Holtom, Tidd and Lee (2002) define role-status congruence as the degree in which employers match employee preference for full-time or part time status schedule, shift and number of hours.

Each of these role characteristics has been shown to be associated with stress (French & Caplan, 1973; Kahn, Wolfe, Quinn, Snoek & Rosenthal, 1964). As suggested by Kahn et al. (1964) and French (1974), among others, some of these role characteristics, particularly role conflict and role ambiguity, tend to prevent an individual from attaining or completing a task. This prevention probably represents a constraint on an individual's need to achieve and be productive (Seashore, 1972). In addition to its relationship to an individual's need for achievement, role ambiguity also appears to be directly associated with an individual's need for certainty and predictability. In the case of an ATC, certainty and predictability is not necessarily possible. As noted in the study by Zeier et al. (1996) an ATC has very little control over his/her working environment and cannot predict with 100% certainty when situations might become critical, and when natural disasters might influence their situations. It

is perhaps because of these dual need relationships that role ambiguity often tends to be more highly related to stress than role conflict (Van Sell, Brief & Schuler, 1981).

The following role characteristic that might lead to the experience of stress is that of relationships at work. This characteristic will be discussed below.

b) Relationships at Work

Poor relationships within and between individuals or groups can be a source of stress. Poor relationships may include low trust, lack of cohesion, low supportiveness, and lack of interest in listening to and dealing with the problems that confront a group or a group member. Troubled relationships can lead to communication breakdowns and low job satisfaction, further increasing the likelihood of stress (Gibson, Ivancevich, Donnelly & Konopaske, 2003). Supervisors are often stressors for individuals in organisations. “Two major subjective stresses that blue-collarites associate with supervision, involve the enervating pettiness of various work rules and the weakened nature of relentless pressure for more and more production” (Shostak, 1980, p. 49). In both cases, the employee is denied freedom of control and the need for recognition and acceptance as an individual. As a result, employees often try to bend or violate rules in order to regain some control of their work situation. The concept of control can be linked to the JD-C Model, where it has been mentioned that an increase of control over the working environment can be seen as an opportunity for learning and growth, and lower strain in their work.

Relationships at work can be both a source of stress and support. Interactions with supervisors, peers and subordinates have been found to mediate perceived workplace stress. For example, Buck (1972) found employees who perceived their bosses to be supportive and considerate (Could this be due to higher Emotional Intelligence?) experienced less pressure at work than those who had a more ‘critical’ boss. Levinson (1973) found individuals who were hard-driving and abrasive in nature caused stress for other work colleagues.

Due to the fact that the relationships with an individual’s supervisor (as mentioned above) has an influence on the levels of stress they experience, it has been decided to also include the Emotional Intelligence of supervisors in the questionnaire that would be completed by ATCs, in order to determine whether it will contribute to lower levels of stress in ATCs if their

supervisors are more emotionally intelligent, and aware of their emotions and the emotions experienced by their employees.

Relationships with co-workers have also been found to induce stress, especially when poor relations exist and lead to low trust, low supportiveness, low interest in listening to and trying to deal with problems that confront the organisational member (French & Caplan, 1973). Mistrust of co-workers has been found to be positively related to role ambiguity and inadequate communications which result in low job satisfaction and in feelings of a job-related threat to one's well-being (Kahn et al., 1964; French & Caplan, 1973; Buck, 1972). In addition, Kahn et al. (1964) reported that poor relations with one's subordinates were highly related to feelings of threat among colleagues and superiors.

Another issue is the quality of social interactions. Social interactions may be experienced as pleasant, neutral or unpleasant.

Pleasant social interactions are characterised by mutual support and appreciation, unpleasant interactions are typically characterised by conflicts, misunderstandings, animosities and exaggerated expectations of the interacting person. Again, it can be assumed that the quality of social interactions both affect the cognitive and emotional aspects of work. Decisions about goals and how to achieve them may be a more difficult task to manage in complicated situations. Thus, goal attainment may take longer than planned which in turn contributes to time pressure. Complicated social interactions may be more unpredictable and contribute to uncertainty of goal achievement and organisational problems. Uncertainty of goal achievement is an action theory based concept of a job stressor (Frese & Zapf, 1994; Semmer, Zapf & Dunckel, 1995; Zapf, 1993). Uncertainty is high if goals are unclear, ambiguous or contradictory or if feedback is lacking or ambiguous so that it is difficult to decide whether or not one is approaching the goal.

Not only do relationships in an individual's working environment contribute to stress, as mentioned in the above paragraph, but an organisations' structure and the politics in the organisation could also be a contributing factor to an individual's stress levels. These characteristics will be discussed in the following paragraph.

c) Organisational Structure and Politics

Few aspects of the organisational structure have been examined in stress research. The two frequently studied aspects of structure include (1) participation (centralisation-decentralisation) and (2) occupational type or level in the organisation.

An individual's participation in the decision making process, especially when these decisions bear on the employee's own work, should enhance meaningfulness of the job and provide a sense of responsibility, autonomy, certainty, predictability and a measure of ownership (French & Caplan, 1973; Schuler, 1980a). Similar relationships would exist whether the individual's participation is one-on-one with the manager or is with other group members such as found in the autonomous work groups (Susman, 1976). Because of the large number of needs related to participation, it is not surprising to find many studies discovering the benefits of participation in reducing stress (Buck 1972; Kasl, 1973; Schuler, 1980b).

ATCs have job and career aspirations; they need to be able to plan their futures (have input in the decision making process regarding their careers). They can become disillusioned if their actual career prospects are below their expectations, even though their expectations may seem unrealistic to others. Air traffic control jobs now and in the future should recognise individual aspirations for job satisfaction. Among the most effective advocates of air traffic control as a profession are the controllers themselves, provided that their jobs seem satisfying and meet basic needs at work (ICAO, 1993).

High levels of political behaviour in organisations can be a source of stress for many employees. Office politics are consistently cited as a primary stressor in organisations. Political activity, game playing and power struggles can create friction, heighten dysfunctional competition between individuals and groups, and increase stress (Gibson et al., 2003).

Performance can be influenced by conditions of employment, by professional ethos, norms and standards, by morale through working as a member of a professional team, and by the attitudes of ATCs. ATCs form attitudes to:

- The air traffic control system itself;
- Their profession;
- Those for whom they work, such as managers or employers;

- Colleagues;
- Pilots;
- Those who design air traffic control systems and facilities;
- Those who service and maintain the system; and
- The equipment and facilities with which they are provided (ICAO, 1993).

Attitude to equipment are influenced by its suitability to their tasks, how error-free it is, and how modern it is. The provision of up-to-date equipment is often interpreted as a symbol of the value and status accorded to the ATC.

Whether possible, managers should seek to promote favourable attitudes towards ATCs, and in such a way reduce certain negative attitudes. It is unsupportive if, for example, ATCs are blamed for delays or aggravation for which they are not directly responsible, and factors over which they do not exert any control (ICAO, 1993).

Like individuals, organisations have distinct personalities. The personality of an organisation is shaped largely by its top executives. A tyrannical and autocratic executive team is able to create a culture that is filled with fear (Matteson & Ivancevich, 1982). Such a culture can then lead to ATCs experiencing unnecessary stress that is contributed to the politics in the organisation.

The subsequent characteristic that could contribute to the experience of stress for an employee is the physical qualities of an organisation, such as the environment the ATC operates in. This characteristic will be discussed in the following paragraph.

d) Physical Qualities

Physical qualities of an organisation refer to the physical conditions that surround the individual; the presence of pathogenic agents, such as poisons and chemicals; noise; space; privacy; and visibility. Each of these physical conditions in the workplace is associated with an individual's needs, whether those needs operate for a minimum of biological functioning such as physical safety, or for purposes of autonomy, ownership and interpersonal needs (Manning, 1965; Selye, 1976; Sundstrom, 1977). The results of research on the significance

of privacy and crowding generally suggest that individuals value some degree of privacy in the workplace, as is found in traditional office layouts (Sundstrom, 1977; Oldham & Brass, 1979). The need for privacy, personal ownership, and control over one's environment appear to play an important role in successful job performance.

To reduce stress in the ATC's workspace, and to have them function as effectively in their working environment, ICAO (1993) has suggested ergonomic principles to meet all ATC requirements.

The air traffic control unit (building) located within an airport requires extensive sound insulation so that noise does not impair the intelligibility of speech. Parking, canteens, rest rooms, toilets and other amenities should be near the workspaces so that rest breaks do not have to be lengthened significantly to include time to use these amenities.

The layout of the room must accommodate all those who work there at the maximum planned staffing level, including controllers, assistants, supervisors and those with other functions. There should be ample room in the workspaces for watch hand-over, for on-the-job training and assessment without distracting or disturbance of controllers, which can lead to stress, and for back-up positions used in an emergency or when equipment becomes unserviceable (ICAO, 1993).

These characteristics assist in explaining which factors in an individual's working environment can contribute to the experience of stress.

To understand this stress information, Karasek (1979) developed a model, called the Job Demand-Control Model. Below the model will be discussed in detail, first looking at a general overview, and then discussing each one of the areas comprising the JD-C model, job demands, job control and job strain). The discussion will conclude with details regarding previous research done on the JD-C model.

2.3.5 The Job Demand-Control Model (JD-C model)

Most research in the last 20 years on the possible stress-moderating effects of control has been based upon Karasek's (1979) ***Job Demands-Control*** model, also known as the *demands-discretion* model or simply the *decision latitude* model (Fox, Dwyer & Ganster, 1993). The JD-C model concerns the joint effects of job demands and job control on worker health.

Before the introduction of the JD-C model, research on the psychosocial work environment focused either on job decision latitude (work control) or on various specific stressors in the job. The research was not integrated, which led to inconsistencies. The development of the JD-C model provided an instrument to join the two areas, yielding a closer analysis of the psychosocial aspects of work and work settings (Karasek, 1979). Since its introduction, the JD-C model has increasingly been used in studies of work and health and has also been connected to stress physiology. It is now presented as a major theoretical contribution of a working organisation, stress and health (Karasek & Theorell, 1990).

The JD-C model was developed from two research traditions: one about job decision latitude (work control) and another about 'stressors' (job demand) on the job as mentioned in the previous paragraph. Development of the model by Karasek (1979) was influenced by a Swedish research tradition on work organisation and stress with Gardell's (1971) analysis of workload, autonomy and participation as the most important source of inspiration. Another source was Kohn and Schooler's (1983) research on characteristics of work, such as complexity, routinisation and closeness of supervision, and their effects on psychological functioning (Gardell, 1971; Kohn & Schooler, 1983).

The Karasek model proposes that psychological strain does not result from a single aspect of the work environment, but from joint effects of the demands of a work situation and the range of decision making freedom available to the employee in meeting the demands.

Specifically, two aspects of the work environment are considered:

1. The job demand placed on the employee, and
2. The discretion permitted to the employee in how to meet the demands, in other words job control (Karasek, 1979).

Although the JD-C model has been conceptualised and applied in many different ways, central to the model is the inclusion of three components, namely job demand, job control, and job strain (Karasek, 1979). These three components will be discussed in detail later in this section.

While job demand refers to an independent variable that is a source of stress present in the work environment (e.g. workload), job control, or job decision latitude, represents an individual's opportunity to influence work activities, the work process, and the work environment (Karasek, 1979). Finally job strain is defined as symptoms of mental strain that result in poor psychological and physiological well-being.

The JD-C model can be regarded as a social psychological model, since it emphasises the interaction between a person and his/her immediate work environment. This description can be linked to the definition of stress proposed earlier where Beehr and Newman (1978) defined stress as a situation wherein job-related factors interact with a worker to change his or her psychological and/or physiological condition in such a way that the person is forced to deviate from normal functioning. This definition again focuses on the interaction between individuals and their environment.

In further development and refinement of the model, it has become connected to physiological stress theory (Frankenhauser, 1986; Levi, 1972b) by the collaboration between Karasek and Theorell (1990).

The core of the model is a set of combinations of job demands and job control, resulting in four different types of jobs with different effects on health and well-being. Figure 2.3 demonstrates the basic elements of the Karasek (1979) model, and each one of these four jobs will be discussed in detail below the figure.

	Low Job Demands	High Job Demands
Low Control	Passive Job	High-Strain Job
High Control	Low-Strain Job	Active Job

Figure 2.3 Karasek's Job-Demand Control Model

(Fox, Dwyer & Ganster, 1993)

High strain jobs, the combination of high demands and low control. This is the critical combination of the model, and it is proposed to produce psychological strain and adverse reactions like fatigue, depression, anxiety and eventually physical illness. An example of this type of work is assembly work. Due to the fact that ATCs experience high demands and low control in their work as discussed previously in the first section of this chapter, regarding the role of an ATC, we can safely assume that air traffic control is a high-strain job.

Active jobs, the combination of high demands and high control, which results in challenging but stimulating work situations with no particular risk for psychological strain or illness. People with active jobs are also active in leisure activities. Examples of active jobs are found among professionals but are also among entrepreneurs like farmers.

Low strain jobs, the combination of low demands and high control. In such jobs the risk for strain and illness is lower than average. Empirically, few jobs are found in this category.

Passive jobs, the combination of low demands and low control. In such jobs, the employees are not given opportunities to utilise their skills. Combined with lack of job challenges this can result in an un-motivating job setting, with average risk of psychological strain and illness. A prime example of a passive job is surveillance work of various kinds of industry (Karasek & Theorell, 1990).

Looking at the four types of jobs presented in the Karasek (1979) model one can in some way determine in which area the role of an ATC should fit in. It is well known that air traffic control is a stressful occupation as discussed earlier in this chapter, and that great demand is placed on them during peak hours of traffic, and when they have a high number of aircraft under their control. In these situations they also experience low levels of control or job decision latitude, as strict safety guidelines govern them in performing their job, and the fact that there is no margin for error. At these times ATCs have no control over the number of aircraft under their control, and the external environmental factors that influences their working environment. Thus, in this case the role of an ATC can be seen as a High Strain Job according to the Karasek (1979) model.

The logic underlying the demands-control model is clearly described by Fox et al. (1993). The reason that high work demands are stressful is that they create anxiety about job performance and the personal consequences of not completing work in a specified time frame. In Karasek's (1979) theory, this anxiety can be reduced if workers:

- (a) have the power to make decisions on the job (decision authority), and
- (b) can use a variety of skills in their work (skill discretion).

Typically, researchers have combined these two factors into one construct, variously referred to as *decision latitude* or *control*.

The above discussion gave a thorough understanding on what the JD-C model is, and from that it is clear that three factors are at play. Job demands, job control and job strain. These three factors will be discussed in more detail below.

2.3.5.1 Job Demands

In the literature on the JD-C model, it is pointed out that the theoretical conceptualisation of demand is complex and difficult. The most general common trait is said to be the subjective assessment of 'work load' resulting in mental alertness, or physiological arousal. In his original specification of the model, Karasek stated that job demands referred to "psychological stressors involved in accomplishing the work load, stressors related to unexpected tasks, and stressors of job-related personal conflict" (1979, p. 291).

As a consequence of the theoretical difficulties in connecting the psycho-physiological concept of arousal to job characteristics, it is difficult to have just one specific definition for demand. The general feature of demand is said to be 'how hard you work'. Several more specific characteristics comprise this concept: work load, mental stimulation necessary to accomplish the work task, coordination burdens, skill obsolescence, and fear of losing the job. Of these demands, work load poses the greatest psychological job demand for most employees (Karasek & Theorell, 1990).

For the most part, job demands have been measured by scales such as workload, time pressure, or role conflict (Karasek & Theorell, 1990).

In relation to the original formulation of the demand concept by Karasek (1979), it is consequently obvious that the concept has been widened in his above mentioned formulation in 1990 (Karasek & Theorell, 1990). In the latter work, physical demands are included in the demand concept in the sense that high physical exertion is said to result in psychological exertion. Additionally, role conflicts at the work place have also become included in the demand concept. Role conflict, incompatibility of demands from the environment, represents frequent demands in all occupations (Satyamurti, 1981).

2.3.5.2 Job Control

Karasek and Theorell (1990) define job decision latitude, or job control to refer to an individual's perceived ability to control the work environment, work activities, and the outcomes of the work activities. This clearly means control *by* the employee on his or her specific work, but alternatively this is also set in a direct and contrary relation to the control *of* the employee by the organisation.

The more control the organisation has, the less control there is for the employee. Control has two components, skill discretion and decision authority.

(a) Skill discretion

Skill discretion is the degree to which the job involves learning new things, novelty, absence of routine, creativity and development of the individual's special abilities. A high level of skill

is supposed to give the worker control over which specific skills to use to accomplish a task (skill discretion is also called intellectual discretion and skill utilisation). In many work settings, individuals have to maintain continuously a precise knowledge, related to the state of the technical system and of the environment on the one hand, and the actions, intentions and knowledge of their colleagues on the other hand. This is the key for their ability to handle appropriately the unexpected events: detection of errors (due to human or technical components), diagnosis and selection of an appropriate sequence of actions.

To a large extent, the global dependability of many social-technical systems thus depends on the efficiency of teamwork (Rognin & Blanquart, 2001). ATCs work in cooperation with colleagues (other controllers in the same or other countries, pilots, etc.) and use the support of a computerised system, so as to provide a critical service, ensuring both the traffic handling (availability concerns) and the collision avoidance (safety concerns) (Rognin & Blanquart, 2001). Based on the above information, it could be said that ATCs do encounter some skill discretion based on the role they fulfil. They continuously need to update their skills and learn new things, in order to not have their knowledge become obsolete. ATCs have to be trained on a regular basis as to manage their socio and technological systems. Even though some of the tasks of an ATC might be routine, some will definitely require fast thinking, and immediate decision, especially when safety becomes a concern.

(b) Decision authority

Decision authority is the individual's freedom to make decisions about his own job, influence the work group, and influence the company policy. Decision authority is also called task authority (Karasek & Theorell, 1990).

In the case of ATCs, most company policies are very rigid, and individuals need to stick with this. Also a decision that has to be made has to take place in a controlled environment, as the wrong decision might have negative outcome (safety, accidents, etc).

2.3.5.3 Job Strain

According to the JD-C model, developed by Karasek, (1979) strains are produced by job stressors and job control. The stressors have their greatest negative impact when job control (decision latitude) is low and job demands are high. This particular combination of job characteristics is termed 'job strain' or a 'high strain job'. An increase in job control serves to

reduce the negative effects of job demands on strain. A central focus of this model is an interaction between, on the one hand, job demands that are placed upon the employee (i.e. psychological job demands) termed by Karasek (1979) and, on the other hand, job-related resources (such as job decision latitude) to cope with such requirements. In this way, the model can be seen as a balance model, in which job demands can be generally defined as those aspects of the job which require additional/sustained physical, psychological or emotional effort (De Jonge & Dormann, 2003).

Demands are not necessarily negative; they can also be positive in the right circumstance, as described above. Job resources can be generally described as those aspects of the job which can lead to buffering job demands and related efforts (Karasek, 1979; Schaufeli & Bakker, 2004).

Research has shown that high levels of control are related to less anxiety, burnout and illness (Elsass & Veiga, 1997) as well as physical symptoms, emotional distress and turnover (Spector, 1988). In fact, in his original work, Karasek (1979) observed that decision latitude possessed direct relationships with the strain indicators (e.g. exhaustion, depression, sick days) such that greater decision latitude was associated with less strain.

Now that there is a clear understanding of the three areas of the JD-C model, the importance of control (one of the areas within the JD-C model and discussed above) will be focused on in the next paragraph.

2.3.5.4 Importance of Control

There is growing consensus among researchers that appropriate levels of control over the environment (personal as well as work) are important for employee well-being and even their physical health (Fox et al., 1993; Kristensen, 1996; Sutton & Kahn, 1987), and considerable evidence has accumulated to indicate that control (or perceived control) is significantly associated with these outcomes (Jones & Fletcher, 1996). However, the critical issue is whether control functions as a moderator of the relationship between job demands (stressors) and individual's affective and physiological outcomes (strains). Unfortunately, evidence relating to this question is not clear-cut. From their own research, Karasek and Theorell, (1990) argued that job demands and control have interactive effects on worker well-being.

However, some of these research studies did not measure extent of control directly but rather inferred levels of control from occupational classification. It is not possible to determine whether these inferences always accurately reflected the amount of control that workers actually possessed (Karasek & Theorell, 1990).

Failure to confirm the demands-control model may therefore be attributed, at least partially, to inappropriate assessment of one of the critical elements of the model. Wall, Jackson, Mullarkey and Parker (1996) developed a more focused measure of perceived job control, explicitly tailored to the job demands experienced by respondents in their study.

Taking this important information into account, this is exactly why a role specific stress questionnaire was developed for this study, specifically focusing on the demands experienced by ATCs as described later in this chapter, while performing their respective tasks. From their investigation, Wall and his colleagues concluded that “where a more clearly descriptive measure of demands is used in conjunction with a more focused measure of control” (Wall et al., 1996, p. 162), the likelihood of demonstrating the expected interaction effect is increased, although they did caution that the amount of variance accounted for by this interaction was relatively small (around 1%), which is not atypical in field research of this kind (Wall et al., 1996).

The study assumes that ATCs have little control over their surroundings - therefore not measured directly. However, their control over their emotions is of particular interest, especially relating to the emotional response to stress.

The next section will discuss some of the previous research conducted on the JD-C model.

2.3.5.5 Previous research on the JD-C Model

The predictions of the JD-C model have been tested extensively both in the US and in Sweden, using data from the U.S Quality of Employment Survey, and the Swedish Level of Living Survey (Muntaner & O’Campo, 1993; Karasek, Baker, Marxer, Ahlbom & Theorell, 1981; Pieper, La Croix & Karasek, 1989). In the course of testing and analysing the model, it has been subjected to several modifications, one of them being the inclusion of the concept of social support in the workplace (Johnson, 1986). However, the level of social support does

not disqualify the model but introduces support as a buffering factor in the interaction between demand and control (Karasek & Theorell, 1990).

It might be thought that actual control is essential for Karasek and Theorell's (1990) argument, and much of his early epidemiological research was based on the assumed degree of control held by various occupational groups (Ganster, 1989). One criticism of this line of research, however, is that it contains no direct measurement of the amount of control that different occupations may actually exert in their jobs.

Recently, more attention has been given to employees' perceptions of control, on the assumption that, irrespective of objective levels of control, the extent to which individuals believe they have control is a major determinant of their affective responses, such as job satisfaction and strain (Schaubroeck & Merritt, 1997; Spector, 1986; Yoon, Han & Seo, 1996).

In the case of this study, it is noted that even though there has been some extensive research regarding the JD-C model, the studies supporting the model is outweighed in this case by studies criticising the model. Cognisance is given to the important role that demands and control play in stress, and stress research, but it has been decided rather to focus on the specific tasks of ATCs and use that in a questionnaire to measure the stress of ATCs in the sample. These tasks are listed in Table 2.2 later in this chapter.

The following section focuses on the sources of stress in the role of an ATC, which were also used to develop the stress questionnaire used in this study.

2.3.6 The sources of stress in air traffic control

ATCs are generally considered one of the working groups having to deal with a highly demanding job. In fact, it entails a complex set of tasks requiring very high levels of knowledge and expertise, as well as the practical application of specific skills pertaining to cognitive domains (e.g. spatial perception, information processing, logic reasoning, decision making), communicative aspects and human relations.

To have an idea of its complexity, it is sufficient to mention that, according to a job analysis of En-Route controllers carried out by a group of American researchers (Ammerman, Bergen,

Davies, Hostetler, Inman & Jones, 1987), six main activities can be identified (i.e. situation monitoring, resolving aircraft conflicts, managing air traffic sequences, routing or planning flights, assessing weather impact and managing sector/position resources). These main activities include 46 sub-activities and 348 distinct tasks. For example, the relevant cognitive/sensory attributes required for high performance levels at radar workstations are spatial scanning, movement detection, image and pattern recognition, prioritising, visual and verbal filtering, coding and decoding, inductive and deductive reasoning, short- and long-term memory, and mathematic and probabilistic reasoning (Ratcliffe & Gent, 1974).

Using the Karasek (1979) model, the pattern of ATC dissatisfaction is quite consistent. In addition to high workload demands and responsibility for people's lives, three of the major sources of stress involve aspects of job decision latitude:

1. Poor training methods (which prevent the development and improvement of skills);
2. Dead-end jobs (few opportunities for transfer or promotion, no early retirement); and
3. Authoritarian management (little control over schedule, no input into decision making, pressure to "cut corners", poor supervision, non-acceptance of unions) (Karasek, 1979).

A major reason for a labour dispute in 1968 was the insistence of the Professional Air Traffic Controllers Association (PATCO) that ATCs use their own judgment to maintain airline safety, a classic battle over decision making authority. While any workers may face stress from low decision latitude, a highly skilled worker (such as an ATC) may feel greater resentment over limits placed on his or her actions (Landsbergis, 1986).

It is evident that the cognitive and operational processes of an ATC vary not only according to the number of aircraft under control, but also with the number and complexity of problems to be solved (Ratcliffe & Gent, 1974).

The ATC must constantly re-organise his or her system of processing flight information by changing operating methods (in particular, cognitive processes, conversation, coordinating with assistants, anticipation and solving problems) as they arise and interact with each other (Sperandio, 1978).

This is carried out by means of the precise and effective application of rules and procedures that, however, need flexible adjustments according to differing circumstances, often under time pressure.

At the same time, the job includes high levels of responsibility, not only with regard to risking lives, but also for the high economic costs of aeronautical activities.

In a study by Shouksmith and Taylor (1997) they compared the interaction of Culture with general Job Stressors in ATCs. The sample included ATCs from three different countries (Singapore, New Zealand and Canada). Using a 20 item stress questionnaire developed from that first used by McBride et al. (1981), controllers were asked to say how stressful each of the 20 factors was. Similar to the stress questionnaire used in this study, Shouksmith and Taylor (1997) developed their own stress questionnaire based on the general job stressors experienced by ATCs.

The reason for this is to keep the questionnaire as job specific as possible. The 20 items of the Shouksmith and Taylor (1997) questionnaire corresponds in many areas with those items used in the present study. Fourteen of the 20 items can be positively associated with those used in the present study.

The 20-items used by Shouksmith and Taylor (1997) are listed below (in no specific order):

1. Fear of failing medical
2. Boredom
3. Conflict with aircrews
4. Foreign pilots
5. Reporting co-workers errors
6. Fear of slowing down
7. Working closely with co-workers
8. Too much overtime
9. Equipment limitations
10. Bad weather
11. General work environment

12. Fear of causing accidents
13. Status comparison with pilots
14. Peak traffic situations
15. Queries on legal liabilities
16. Procedural changes
17. Shiftwork
18. Disciplinary procedures
19. Local unit management
20. Regional/HO management

All items were judged to produce some stress by the Singapore sample.

For the New Zealand sample, however, the following factors, with mean scores less than 1.00, were judged to produce little or no stress. Overtime (Ranked 20th stressful), dealing with foreign pilots (ranked 19th stressful), working closely with co-workers (ranked 18th stressful), status comparison with pilots (ranked 17th stressful) and fear of failing annual medical (ranked 16th stressful).

Non-stressful aspects of their work for Canadian controllers were too much overtime (17th stressful), working closely with co-workers (16th stressful) and conflict with aircrews (13th stressful).

Turning to those aspects judged highly stressful, the top five items (top 25%) in rank order of stressfulness, for each of the three samples, are presented in Table 2.1.

Table 2.1 Top Five Stressors for each of the three Samples

<i>Rank</i>	<i>Item in Sample</i>
<i>Singapore</i>	
1	Fear of causing accidents
2	Peak traffic conditions
3	Equipment limitations
4	Fear of slowing down as a controller
5	Relationships with local management
<i>New Zealand</i>	
1	Equipment limitations
2	Peak traffic conditions
3	Reporting co-workers' errors
4	General work environment
5	Fear of causing accidents
<i>Canada</i>	
1	Equipment limitations
2	Peak traffic conditions
3	Fear of causing accidents
4	Bad weather
5	General work environment

(Shouksmith & Taylor, 1997)

Of the top five stressors, three were the same for all three samples. These are equipment limitations, fear of causing accidents, and peak traffic situations. New Zealand and Canadian controllers rate a fourth item in their top five, which is the general work environment (Shouksmith & Taylor, 1997).

According to several surveys (Smith, 1980; Farmer et al., 1990) the main sources of stress reported by ATC are connected both to operative aspects and to organisational structures (see Table 2.2). For the former, the most important are peaks of traffic load, time pressure, having to bend the rules, limitations and the reliability of equipment. The latter are mainly concerned with shift schedules (night work in particular), role conflict(s), unfavourable working

conditions and the lack of control over work. These stress factors can affect not only job satisfaction, but the well-being and safety of ATCs. In fact, as the workload increases the ATC tends to employ more procedures which are less time consuming, together with a progressive reduction to the minimum of flight information and the relaxation of certain self-imposed qualitative criteria. It is evident that the number of decisions to be made becomes a stressful condition when the controller's decision-making capacity is stretched to the maximum; this can lead, in case of overload, to a very risky situation defined as loss of picture (Smith, 1980; Farmer et al., 1990).

On the other hand, it is frequently reported that, paradoxically, many errors often occur during periods of light or non-complex traffic. This points to the great effort required to regulate the psycho-physical reactions, maintaining high level of arousal and vigilance even in conditions of underload (Sperandio, 1978).

Table 2.2 Main sources of stress for ATCs

Demand:

- number of aircraft under control
- peak traffic hours
- extraneous traffic
- unforeseeable events

Operating procedures:

- time pressure
- having to bend the rules
- feeling of loss of control
- fear of consequences of errors

Working times:

- unbroken duty periods
- shift and night work

Working tools:

- limitations and reliability of equipment
- VDT, R/T and telephone quality
- equipment layout

Work environment:

- lighting, optical reflections
- noise/distracters
- microclimate
- bad posture
- rest and canteen facilities

Work organisation:

- role ambiguity
- relations with supervisors and colleagues
- lack of control over work process
- salary
- public opinion

(Smith, 1980; Farmer et al., 1990)

Given these main sources of stress for ATCs as determined by Smith, (1980) and Farmer et al. (1990) these stressors can be categorised according to the JD-C model (Karasek, 1979) The first three factors (demand, operating procedures and working times) being demands and the last three (working tools, work environment and work organisation) being resources.

Another important stressful factor is shift work, connected with the requirement of an optimum use of all mental faculties at all hours of the day and night, sometimes irrespective of the workload. It has to be taken into account that ATCs work performance can be impaired at certain hours of the day by an excessive workload, but it can also be lowered during the night by a decline in mental and physical functions, in spite of a reduced external load. In fact, a lack of stimulation from a low workload can further increase the normal drop in physical and mental efficiency during the night hours, connected to disruption of sleeping habits and circadian rhythms of body functions. This can be particularly harmful in emergency situations (Folkard & Monk, 1985; Costa, 1991).

Furthermore, ATCs are among the groups of employees more exposed to “critical accidents”, these being situations which cause unusually strong emotional reactions, such as in the case of air accidents with loss of life or serious injury, near collisions or loss of control due to overload (Costa, 1991). Could it be that if an ATC cannot effectively recognise and manage

these emotional reactions, by means of higher Emotional Intelligence, it could lead to them selecting inappropriate coping strategies?

The psychic (anger, guilt, grief, anxiety) and physical (tachycardia, hypertension, headache, sweating, heartburn, insomnia) reactions cannot only hamper work performance (poor attention and concentration, impaired thinking and memory), but can also give rise to long-term post-traumatic disorders (Folkard & Monk, 1985; Costa, 1991).

In the following section, focus will be on previous research in the role of ATCs.

2.3.7 Research on stress and air traffic control

Research initiated in the 1960s suggested that ATCs faced greater risk of stress-related illness than other workers. In a 1963-64 medical study in the FAA's South-western Region a sample of 569 ATCs reported significantly higher percentage of headaches, indigestion, chest pain and ulcers than 330 other FAA employees (Rose et al., 1978).

The apparent contradiction between the ATC's enjoyment of the "challenge" of their job demands and the chance that their work organisation is the source of stress arises from the conceptual ambiguities that have plagued stress research. The field has been dominated by two divergent and often mutually exclusive research traditions. The literature on job satisfaction and mental strain has focused on aspects of job decision latitude such as skill variety and autonomy (Hackman & Oldham, 1980) which could also be viewed in line with the JD-C model discussed earlier. The other view is the "life stress" tradition of epidemiological studies of physical and mental illness with its focus on stressors such as life changes and job demands (Theorell & Floderus-Myrhed, 1977). Inconsistencies have resulted from confusing these two characteristics of the working environment. For example, "responsibility" is often defined as a stressor, despite the fact that decision-making authority has the opposite effect of reducing stress. As Beehr and Newman (1978) point out, job stress researchers have "generally ignored the decision-making or response selection process of employees" (p. 672). This has helped maintain the myth of "executive stress" despite the fact that higher socio-economic status is associated with lower risk of coronary heart disease (CHD) (Karasek, Baker, Marxer, Ahlbom & Theorell, 1981).

Conflicting reports exist as to whether ATCs have an increase in blood pressure (BP) and prevalence of hypertension because of the stressful nature of their job. Segal et al. (1998) have addressed the issue in male ATCs working at the Linate airport in Milan. A total of 80 ATCs participated, and the 24 hours blood pressure monitoring was obtained during two working shifts separated by one night of rest. Blood pressure was measured conventionally and by 24 hours ambulatory monitoring; data were compared with those of an age matched male sample three times as large, selected from the data of the Studio delle Pressioni Ambulatoriali delle Loro Associazioni (PAMELA), i.e. a large sample representative of the population of the nearby town of Monza. Treated hypertensive subjects were excluded from both groups (Segal et al., 1998).

The results showed no difference between diastolic blood pressure and heart rate in the tested ATCs and controls, however the measurement of systolic blood pressure was significantly greater in ATCs than the controls. Thus daily life blood pressure is not increased in ATCs. This may result from the fact that, being a highly selected group with suitable training, these subjects adequately cope with the stress inherent to the job (Segal et al., 1998).

In a study by Lesiuk (2008), researching the effect of preferred music listening on stress levels of ATCs, work stress in ATCs were measured by means of the Stress Diagnostic Survey (Ivancevich & Matteson, 1988). It is a 60-item scale designed for employees to report perceived job related stress. Narrative responses from the Stress Diagnostic Survey revealed the nature of the controllers' work stressors. For example, the following responses, were commonly given to the open-ended statement "The most stressful part of my job is...."

- Busy periods of traffic for long periods of time.
- During busy traffic periods, trying to avoid having an operational error.
- Training. During training you do not have 100% control of the sector/traffic. You do not know what the trainee is thinking or going to do next.
- Dealing with management.
- Sequencing numerous arriving aircraft with delays and weather deviations.
- Dealing with different supervisors, with different ways of doing the same thing, every day (Lesiuk, 2008, p. 5).

Comparing these stressors with the ones outlined in Table 2.2 and used to compile the stress questionnaire used in this study, some similarities cannot be missed. Busy periods of traffic can be related to peak traffic hours as mentioned in Table 2.2. Avoiding an operational error could be related to unforeseeable events and fear of consequences of errors. Dealing with management and supervisors can relate to relations with supervisors and colleagues and lastly sequencing numerous arriving aircrafts with delays and weather deviations relates to peak traffic hours and feeling loss of control.

This review of stress, occupational stress, types of stress, and previous research on stress in ATCs give a clear understanding to the stressful nature of the ATCs' job.

In the next section of this literature study the focus will be on coping and the role that coping can play in assisting ATCs to deal with stressful encounters in their work environment.

Specific focus will be given to Amirkhan's model of coping.

2.4 Coping

In the following section a discussion regarding the concept of coping will be given. Starting with a definition of the coping construct, and focusing on what exactly coping is. This will be followed by presenting an integrative transactional process model of coping, and focusing on the process followed in order for an individual to cope in their working environment. Different typologies of coping strategies will be discussed. This section will conclude with a discussion on coping as a mediator, the different roles of coping, and focusing on the different coping strategies individuals use to deal with stressful experiences.

2.4.1 Introduction

Stress at work has been identified as a major occupational health and safety issue; eliminating the causes of stress in the workplace is the most effective strategy for reducing job stress. Yet some industries and occupations present stressors that are to some degree unavoidable. The role of an ATC as discussed in a previous section is also seen as stressful, due to the fact that some of the stressors they experience are also to some degree out of their control and unavoidable, examples being natural phenomena such as the weather, number of aircraft under their control and equipment limitations (Baugher & Roberts, 2004). According to Karasek (1979) in his description of the JD-C Model, when job control is low this leads to

an increase in job stress that in some way need to be reduced. When it is not possible to completely eliminate the stressors an employee experience, the issue turns to which resources an employee have to effectively cope and manage these stressors (Baugher & Roberts, 2004).

In recent years, it has been acknowledged that individual well-being is influenced not only by the amount of stress experienced by the individual, but also how the individual *cope*s with this stress (Antonovsky, 1979; Holroyd & Lazarus, 1982; Lazarus & Launier, 1978). While there is widespread agreement concerning the importance of coping, there is little agreement concerning the meaning of coping and the mechanisms by which it influences stress and well-being.

Four fairly recent books confirm the growing expansion of the field of coping – Aldwin (1994) dealing with developmental issues; Gottlieb (1997), who deals with chronic stress; Eckenrode and Gore (1990), who deals with social stress; and a handbook edited by Zeidner and Endler (1996), that ambitiously tries to cover the field.

Lazarus (1999) views ego defence as falling within the broader field of coping, a convention that seems to have become widely accepted. The Freudian view of defence was process centred, but ironically, it inspired mainly trait-centred efforts at measurement – for example, the contrasting coping styles of repression and sensitisation.

Ego psychologists, such as Menninger (1954) and Haan (1969), viewed coping and defence as reflecting a hierarchy of health and pathology. Coping was said to be the most mature way of dealing with stress or trauma. Defences were regarded as neurotic or psychotic efforts to adapt because they departed significantly from reality.

Due to this widespread complexity in defining coping, it is important to discuss the various definitions proposed by different researchers. The following section describes various definitions of coping.

2.4.2 Defining Coping

As with stress, coping has been defined in a number of ways. These include coping as a psychoanalytical process, as a personal trait or style, as a description of specific strategies, as a process and as an arrangement of strategies (Dewe et al., 1993). From the debate surrounding the various approaches, the theme that emerges, at least in a work setting, is that coping is part of the transaction between the person and the environment where that transaction is appraised as stressful, or stated in terms of the JD-C model, where the demand is exceeding the individuals control or resources over the specific situation, and leads to a high-strain situation (Latack & Havlovic, 1992).

Reflecting on the definition of coping stated above it is mentioned that coping is seen as a transaction between individuals and their environment. As previously discussed one of the ways of defining stress is seeing it as a transaction. In this definition focus is on the dynamics of appraisal (of the stressful stimuli) and coping, that underline the stressful encounter. Once again, referring to the discussion of the JD-C model, the interaction between the individual and his/her working environment is emphasised. In short it can be assumed that there is a direct link between stress, the JD-C model and coping based on this transaction between the individual and his/her environment, and whether the environment produces stressors that exceed an individual's resources.

According to Lazarus and Launier (1978), coping is defined as "efforts, both action-oriented and intra-psychic, to manage (i.e. to master, tolerate, reduce and minimise) environmental and internal demands and conflicts among them which tax or exceed a person's resources" (p. 293). These resources Lazarus and Launier (1978) refer to can also be seen in the light of the JD-C model of Karasek (1979), where Karasek specifically refers to stress being experienced, when the demands placed upon an individual exceeds the resources (control) that the individual has over these demands in order to effectively cope.

Also based on this definition, Lazarus and his associates (Folkman, Schaefer & Lazarus, 1979) describe four strategies of coping (all essentially process-oriented cognitive strategies):

- (1) information search;
- (2) direct action;
- (3) intra-psychic modes; and
- (4) inhibition of action.

These strategies are used either to mediate person-environment relationships or to control selectively individual stress responses in a calming mode. For example, an individual may take direct action and talk to the supervisor who is sending ambiguous messages. Or the individual may decide not to take direct action and avoid seeing the supervisor as much as possible. The strategy selected and its use may be a function of individual differences such as cognitive complexity, problem-solving and decision-making skills, experience, personality and total stress.

Pearlin and Schooler (1978), state that coping refers to behaviour that protects people from being psychologically harmed by problematic social experience. Coping protects by:

- (1) eliminating or modifying stressors;
- (2) perceptually controlling the meaning of the stress experience, and thus neutralising its problematic character; or
- (3) keeping emotional consequences within manageable bounds.

McGrath (1970) defines coping as an array of covert and overt behaviour patterns by which the individual can actively prevent, alleviate or respond to stress-inducing circumstances.

Drawing upon these definitions discussed above, coping is defined here as a process of analysis and evaluation to decide how to protect oneself against the adverse effects of any stressor and its associated negative outcomes, and at the same time take advantage of its positive outcomes (Schuler, 1984).

This definition has several important aspects which will be discussed below.

1. Coping is an intentional, cognitive act of **analysing** the perceived qualities or conditions in the environment that are associated with a stressful experience. In essence, this is Lazarus's (1978) primary appraisal process (discussed in detail later in this section) during which time the individual asks, "What is it?" "Does it offer harm, threat or benefit?" and "Is it important?" Thus an individual may experience stress without really having thoroughly evaluated or analysed the stressor. In coping, however, it is necessary that the individual begins analysis and evaluation explicitly of what amounts to problem-solving and decision-making.

2. The challenge and effort involved in this process of analysis and evaluation are determined in part by the “structural ambiguity” of the situation, that is, the degree to which the stressor is identified, uncertainty over the outcomes, and its importance (Shalit, 1977). Clearly and correctly identifying these characteristics become important in determining how effective a selected coping strategy will be. As structural ambiguity increases, coping effectiveness is influenced by the level of an individual’s cognitive complexity in dealing with complex situations (Driver & Streufert, 1969). The greater an individual’s ability to deal with difficult or complex situations, the easier it is for the individual to differentiate a complex situation and then integrate the appropriate information for effective coping. Increased cognitive complexity facilitates effective analysis, problem-solving and decision-making.
3. Stress can be associated with uncertain positive or negative outcomes as long as they are important to the individual. It is with regard to negative outcomes that an individual cope in order to protect. It is with stressful situations having positive outcomes that an individual engages in coping to take advantage. But the process of coping applies in either case (Schuler, 1984).
4. Coping strategies are action-based on an analysis and evaluation of the stressor, with particular attention paid to the importance and uncertainty associated with it. The strategy selected should be influenced by an analysis and evaluation of the personal and environmental resources (control or decision latitude according to the JD-C) and constraints (demands placed on individuals according to the JD-C) in addition to personal values and needs. One can also ask whether Emotional Intelligence could not possibly be seen as a resource. Associations between Emotional Intelligence and coping have also been of interest in recent studies. It has been suggested that Emotional Intelligence can be regarded as a coping mechanism which facilitates “successful and efficient self regulation toward desired ends” (Salovey, Bedell, Detweiler & Mayer, 2000, p. 511), relating to the view expressed by Folkman and Moskowitz (2000) that coping research should cover positive as well as negative emotions and outcomes.

Strategy selection should also reflect the immediate and future costs and benefits. For example, some types of coping strategies may reduce negative physiological consequences (Gal & Lazarus, 1975).

An individual may find leaving a stressful or demanding job (such as air traffic control) more costly than the potential benefits associated with a new job. An important aspect of the strategy selection process is an evaluation of the potential effectiveness of the various strategies that can be used. Only by incorporating this range of possibilities can the true costs and benefits of strategies be estimated (Schuler, 1984).

5. Costs and benefits of coping strategies imply criteria upon which to evaluate the effectiveness of strategies. Criteria may include:
 - (a) physiological and psychological well-being (Pearlin & Schooler, 1978);
 - (b) success in altering the source of stress (Haan, 1977; Menninger, 1963);
 - (c) success in attaining the opportunity associated with a stress condition (Haan, 1977; Menninger, 1963);
 - (d) success in removing the condition associated with a constraint, (i.e. gaining the ability to anticipate stress conditions so as to reduce their potential adverse effects) (Haan, 1977; Menninger, 1963);
 - (e) gaining the skills and the ability needed to analyse and evaluate stress situations in order to develop appropriate strategies more quickly (Haan, 1977; Menninger, 1963);
 - (f) the time it takes to develop an effective strategy (Haan, 1977; Menninger, 1963);
 - (g) the number of interactions it takes in developing, implementing and evaluating strategies to find one that is acceptable (Haan, 1977; Menninger, 1963);
 - (h) the impact of a current strategy selection on future coping strategy selections (Haan, 1977; Menninger, 1963); and
 - (i) the extent to which valid information is obtained and processed in the analysis and evaluation of a stressful condition (Haan, 1977; Menninger, 1963).

To summarise coping, like stress, is highly dependent on the individual's perception of the environment and, as with stress, involves a transaction with that environment. Coping is thus

a process of gathering and evaluating information, generating alternatives, weighing (through cost-benefit analysis) and selecting alternatives, implementing these alternatives (strategies), evaluating the effectiveness of the strategy selected, and then, if necessary, considering additional strategies.

Coping therefore requires an analysis of one's own needs and values as much as an analysis of the situation. In this transaction between the person and environment both may change, perceptually if not objectively (Schuler, 1984).

The following section introduces another definition of coping by Latack and Havlovic (1992), in which they focus on a broader approach to defining coping.

A broad integrative approach is usually called for when defining coping (Latack & Havlovic, 1992). This has, particularly in a work setting, a number of advantages. These include:

- Recognising that the targets towards which coping is directed can be emotional (internal) as well as situational (external), including identifying those aspects that individuals find taxing (Latack & Havlovic, 1992). Looking at the internal direction, is it possible that there is a relationship between the direction of coping (internal), and an individual's Emotional Intelligence?
- Acknowledging that the meaning individuals give to events (primary appraisal) includes not just threat and harm/loss but challenge and benefit as well (Cox & Ferguson, 1991);
- Focusing researchers towards not just asking "How much stress is there?" but also to ask "Why is stress a problem?" (Newton 1989) or "What is it about work that may stimulate stress and coping processes?" (Brief & George, 1991);
- Directing attention towards coping actions and behaviours, allowing coping strategies to be considered independently of their effectiveness, reducing the temptation to declare one strategy more effective than another and providing a more robust set of measures through which effectiveness can be judged (Dewe & Guest, 1990; Latack & Havlovic, 1992).

The importance of coping strategies and styles during periods of stress has been well documented in past research. The most common conceptualisation of coping refers to the cognitive, emotional and behavioural efforts to manage internal and external demands presented in a specific situation (Holahan, Moos & Schaefer, 1995; Lazarus & Folkman, 1984; Moos & Schaefer, 1993; Zeidner & Saklofske, 1995).

In the following section an integrative transactional process model of coping will be introduced and discussed.

2.4.3 Integrative transactional Process Model of Coping in Organisations

The use of a transactional framework as the context for defining coping is usually taken to reinforce the importance of coping as a major factor in the appraisal process. Within this context coping should be seen as:

- (a) relational in that it reflects the relationship between the individual and the environment (Folkman, 1982);
- (b) a dynamic process in contrast to the more traditional trait-oriented approaches (Cox, 1987; Edwards, 1988) and
- (c) integrative in that it links the other components of the stress process (Cox & Ferguson, 1991; Schuler, 1984). Here the question can be asked if these other components Cox and Ferguson (1991) is referring to could possibly be linked to emotions and an individual's Emotional Intelligence?

2.4.4 The Process of Coping in organisations

Based upon the above definition of coping and the definitions of occupational stress, the following model of coping is presented.

The process of coping in organisations consists of the following components: (1) the coping trigger; (2) primary appraisal; (3) secondary appraisal and strategy development and selection; (4) strategy implementation; (5) strategy evaluation; and (6) feedback (Schuler, 1984).

1. *The coping trigger*

An individual begins to engage in coping once a situation is perceived as stressful and a response is felt. In light of the JD-C model, this occurs when job demands are high and job decision latitude (job control) is low, and the stressful situation overpowers the amount of resources (control) an individual has to deal with this situation. For example, an ATC can experience the number of aircraft under their control as stressful when they do not have enough control over all the aircraft, and no resources to fall back on in order to assist them. Almost instantaneously with the perception of stress, the individual experiences a short-term physiological response (Mason, 1975). Although the individual may not have obviously and logically interpreted the environmental stressor in terms of uncertainty and importance (Schuler, 1980a; 1982), the short-term physiological response is experienced nonetheless. Because of the discomfort associated with this physiological response the body seeks to restore itself to its natural state of homeostasis (Cannon, 1929). This physical discomfort triggers the individual to find a solution to the stressful condition, and the search for resolution of this condition begins.

2. *Primary Appraisal*

Primary appraisal involves generating answers to three basic questions: (1) what is the relevant stressor/demand? (2) where is the uncertainty? and (3) is it really important? These questions are essentially those which form part of Lazarus's (1966) primary appraisal process. For Lazarus (1966) primary appraisal initiates the coping process. For the model of coping described here, however, this aspect of coping initiates a systematic evaluation of a stressful event that has already occurred and for which the individual has experienced a short-term physiological or psychological response.

These three questions of the primary appraisal process directly links coping with the definition of stress. To the first question, the individual seeks to locate which of the potential stressors (i.e. roles in organisations, job qualities, relationships, organisational structure, physical qualities, career development and organisational changes as discussed previously in this chapter) might be associated with the individual's discomfort. The degree of uncertainty associated with the stressor is then determined. The individual tries to determine if the uncertainty is associated with the effort-performance relationship (the harder I work, the better I perform) or the performance-outcome relationship (good performance will lead to a positive

outcome and negative performance leading to a negative outcome). An individual's success in accurately perceiving and determining the degree, as well as the type, of uncertainty can be critical in the development of coping strategies. An individual's ability to perceive the relevant information in the environment is therefore important in the coping model, together with individual cognitive qualities of cognitive complexity and problem-solving and decision-making ability (Schuler, 1984). It can be argued that this information in the environment can also include emotional reactions, and for emotional reactions to be effectively recognised and managed in order to positively cope with stress, Emotional Intelligence is needed.

If the cause of discomfort is judged to be unimportant the coping process is terminated. If the answer to the final question in the primary appraisal is "yes" and the stressful condition is deemed to be really important, then the secondary appraisal process begins.

3. *Secondary appraisal, strategy development and selection*

To commence an analysis of why the stressful situation is significant requires of the individual to recognise the factors that have been acknowledged as related to stress (Schuler, 1980a). This analysis is critical because it not only attempts to determine if a situation is really important, but also, why it is important. The individual must determine the needs and values associated with this situation. Such identification is important in the development of coping strategies and their relative appropriateness (Schuler, 1984).

After the question of "why" has been addressed the question of "Is it still important?" must be answered. After this second query the answer may be no, and the coping process is terminated. But if the response is positive, the final question in the secondary appraisal process must be asked: "What can or should be changed: the situation or the individual?" The answer to this question initiates the strategy development process. It should be noted that during the primary and secondary appraisal processes, the individual may wish to involve other individuals in the analysis of the environment and the individual's needs and values. This could possibly be related to the coping strategy of seeking social support. For example, an ATC may perceive that their supervisor is sending ambiguous messages for example in the way to manage certain situations and so must decide what strategy to take to deal with this situation. Although a direct-action strategy of talking with the supervisor may appear reasonable, colleagues with previous experience may know that his/her supervisor would

perceive this action as a direct threat to his/her ability to communicate. Consequently, if the ATC asks colleagues their advice on what to do, the path of direct action may not be selected. Others can be useful in providing much-needed information to make coping as effective as possible (Schuler, 1984).

When conditions of stress are appraised as changeable – that is, when they are viewed as falling within the person’s control – problem-focused coping may be appropriate. However when the conditions are perceived as unchangeable, emotion-focused coping may be appropriate (Folkman, 1984; Folkman et al., 1986; Lazarus & Folkman, 1987). These two coping strategies will be discussed later in this section of coping. This finding links secondary appraisal, which has to do with the options of coping, with the choice of the coping strategy.

Secondary appraisal essentially answers the question, “What should I do now?” The answer to this is critical in developing ways to deal with the stressful situation. Although many responses to this question have already been identified, the purpose here is to offer a typology of the strategies that can be considered in an attempt to reduce the stressfulness of situations for individuals. At first the individual recognises the problem, react to the problem and then select a relevant coping strategy. With regard to these coping strategies, specific attention will be given to Amirkhan, and the Coping Strategy Indicator developed by him. This typology is presented after discussing strategy implementation, strategy evaluation and feedback (Schuler, 1984).

4. *Strategy Implementation*

Strategy implementation should consider the cost and benefits of alternative strategies, readiness for change, and support. Analysis of the costs versus the benefits of alternative coping strategies should specify what is needed to implement each strategy and what is to be gained from each strategy. Essentially this is a utility analysis as suggested by Landy, Farr and Jacobs (1982). Implementation must include an analysis of the readiness for change and what it will take for the appropriate level of readiness to occur. For example, an individual may decide that the best way to deal with the stress of being unemployed is by getting a job and that this requires further education. Yet the individual is not ready to go back to school. Deciding to return to school, though potentially most effective over the long run, may prove to be ineffective as long as the individual is not motivated to learn. If for example, the individual

believes that getting a degree is the best thing to do but not at this time, it is still possible to determine the things that are necessary before readiness is established. In this case, the individual may begin by entering into an independent programme to see how it feels to read and study again.

In addition to readiness, support conditions must be established. If group support is necessary to implement a strategy for an individual, the group must be available and ready. If an ATC decides to manage and deal with a large number of aircraft under his/her control that is seen as a significant demand, accomplishment may be made much easier by asking for assistance in the workload from colleagues or supervisors. The organisation can generally be helpful in assisting its employees in coping with stress by building and maintaining social support groups (House, 1981). The unconditional support provided by these groups serve to increase an individual's self-esteem and self-confidence, of which both can reduce the stressfulness of situations and increase the effectiveness of the individual's coping efforts.

If an organisation can assist individuals in coping with stress, it can also prove to be a roadblock. It may, for example, prevent the formation of social support groups, prohibit its employees from taking continuing education courses on company time, or it may not provide tuition reimbursement assistance (Schuler, 1984). After the process of strategy selection and implementation, an individual needs to evaluate whether the strategy selected was the most appropriate one to deal with the stressful encounter. In the next step this process of strategy evaluation is discussed.

5. Strategy Evaluation

After the chosen strategy has been implemented, its effects must be evaluated. This can be done at the organisational, group and individual levels. Currently evaluation regarding the success of coping strategies is limited at best (Newman & Beehr, 1979). Evaluation, however, is critical in order to determine if opportunities have been utilised and constraints successfully removed.

Criteria for evaluating coping strategies include three classes of outcomes of stress:

1. physiological;
2. psychological; and
3. behavioural

Since these three classes of outcomes are so diverse, their use requires evaluating coping along several methodological lines (McGrath, 1976; Burke & Weir, 1980).

Physiological outcomes require medical methodologies such as measures of heart rate, blood pressure, catecholamine and cholesterol (McGrath, 1976).

Psychological outcomes require methodologies such as interviews and questionnaires.

Behavioural outcomes require industrial engineering and personnel methodologies in order to measure employee performance, safety, absenteeism and turnover (Burke & Weir, 1980).

Consequently, extensive evaluation would require the efforts of a team of researchers. Most individuals and organisations, however, would be likely to use fewer than all three classes of outcomes. Individuals, for example, may base the success of their coping efforts on how well they feel psychologically. Organisations may attempt to evaluate their efforts to help employees cope by examining the rate of absenteeism. Although there is nothing inherently wrong with evaluations this restricted, the real effects of a coping strategy may be understated or result in a strategy being evaluated as unsuccessful. Since such results would likely have a serious impact on the future use of a coping strategy, evaluation using all three sets of outcomes should be done whenever possible (Schuler, 1984).

A final consideration in strategy evaluation is determining the appropriate time to gather the three classes of outcomes. It is probable that the effects of a coping strategy will occur over time with some physiological and psychological effects occurring before some behavioural effects. Employees are likely to become dissatisfied with their jobs before deciding to quit. Similarly employees are likely to experience tension and anxiety before having ulcers. Although these and other relationships seem plausible, little evidence exists as to their order of occurrence. However, because an understanding of their relationships appears critical to an evaluation of any coping strategy, extensive research in this area is warranted (Schuler, 1984).

6. Feedback

Completion of the strategy evaluation stage results in feedback to the individual, group or organisation. Since evaluation occurs over time, so will feedback of the results. For purposes of carefully evaluating the effectiveness of coping strategies, evaluation and feedback should be done formally by the individual and the organisation, but individuals can provide their own informal evaluation. Individuals are perhaps best able to make informal judgments about whether they have coped successfully, especially when using psychological criteria such as job satisfaction, esteem, and involvement. They may, however, be less able to make informal judgments regarding physiological criteria such as blood pressure, and may even be inappropriate sources of judgment concerning the performance level of a unit in the organisation or even their own performance. Consequently, formal evaluation by others is appropriate and necessary. This formal, outside evaluation can then be made available to the individual or the organisation (Schuler, 1984).

Feedback serves the individual and the organisation by providing information, especially over time, about the effectiveness and efficiency of various coping strategies. This, of course, is useful for dealing with future stress episodes, and can assist the individual or organisation in determining the utility of alternative coping strategies. When feedback is provided, it is important that certain facts be established; for example, the individuals who were involved, the strategy that was used, the conditions under which the strategy was implemented, and the history of coping. This feedback information enhances future coping strategies undertaken by the individual alone or conducted by the organisation and its employees (Schuler, 1984).

Feedback to the individual, whether based on informal or formal evaluation, can be critical to an individual's self-esteem. To the extent that the strategy was effective; the individual's self-esteem will be positively influenced. This, in turn, may serve to enhance the individual's problem-solving and decision-making skills, and enable the individual to be even more effective in dealing with stress in the future (Schuler, 1984)

Now that the concept of coping has been defined and an idea of the process individuals follow in order to cope with stressful experiences in their working environment has been established the focus shifts to elaborating on the typology of coping strategies. In this section the different types of coping individuals use will be discussed, with focus on previous research studies.

2.4.5 Typology of Coping Strategies

The typology begins with an analysis of the situation and the individual. The critical questions here are:

- (1) Will the situation be changed or modified, and if so, how? and
- (2) How can the individual manage or change the situation?

Since this study is specifically addressing coping strategies for individuals dealing with work stress, the typology is only focusing on coping strategies relating to individuals.

Only a few individuals in an organisation may be experiencing stress, due to the unique on-the-job conditions, hereditary characteristics, or off-the-job stress conditions (Bhagat, 1983). Organisationally-based coping strategies may then be inappropriate, and it is likely that aspects of the organisation will not be changed. Strategies dealing with the stress in this example must therefore focus on the individual either managing or changing. This will be discussed in the following section.

- **Change within the individual experiencing stress**

If a rather limited number of individuals are identified as being under stress in an organisation, having the individual change or manage the stress may be more appropriate. There are two major sets of strategies that individuals can use. One set is aimed at the uncertainty associated with the stressful conditions. Strategies to reduce the uncertainties include additional experience, training and education. Assistance from individuals who have information related to the stressful conditions can also be an effective strategy to reduce the uncertainty. This could also be related with the coping strategy of Seeking Social Support.

In essence these strategies represent ways to gain control over the situation so that fewer uncertain situations result (Thompson, 1981).

For example, if an individual is experiencing stress over the uncertainty of not knowing how to perform a task, appropriate training can eliminate this uncertainty. Or if an individual is uncertain about the appropriate behaviour in an organisation, interaction among colleagues can provide information that enables the individual to define the appropriate role. The sooner

this action is taken, the shorter the duration of the experienced stress and its effects. The duration of the stress can also be reduced by minimising the importance of the situation.

- **Reducing the importance of the situation**

When it is not feasible or appropriate for the employee to change in order to reduce the uncertainty of the situation, the individual can engage in strategies that reduce the importance of the situation and diminish the impact of the effects of stress. These strategies are also referred to as palliative strategies (the action taken to relieve the emotional impact of stress by making the person feel better) (Lazarus, 1978).

Reducing the importance of stress can involve denial, avoidance, withdrawal and projection (Folkman et al., 1978). This can also be linked to the concept of emotion-focused coping which involves attempts to regulate emotional responses elicited by the situation, exactly as stated above. As mentioned in the introduction it has been suggested that this type of coping is less effective and more likely to be associated with psychological distress (Billings & Moos, 1981; Pearlin & Schooler, 1978; Sigmon et al., 1995).

In a study by Doering, Dracup, Caldwell, Moser, Erickson, Fonarow and Hamilton (2004) researching if a coping style is linked to emotional states in heart failure patients, the data indicated the avoidance coping style was associated with significantly higher negative emotional states including confusion, fatigue, anxiety, anger and depression. Furthermore it was found that the association of avoidance coping with negative emotional states is consistent with the work of other investigators who have studied negative coping styles.

Ketterer, Huffman, Lumley, Wassef, Gray and Kenyon (1998) demonstrated that denial (i.e. underreporting of emotional distress relative to a significant other's rating) was the strongest predictor of recurrent cardiac events in a sample of men followed over 5 years.

It is possible that this research could also be linked to an individual's Emotional Intelligence. One of the reasons for this is that when an individual selects an avoidance coping strategy it could be said that they do not effectively regulate and manage the emotions that are apparent from the stressful encounter. Avoidance is seen as trying to flee or withdraw from the stressful situation. An individual's Emotional Intelligence could assist them in actively

recognising the emotions they feel when encountering a stressful situation, and then regulate these emotions in order to select an appropriate coping strategy to deal with the stress, and not avoid the stress, as stress that has just been avoided can in the long term re-occur.

It has been mentioned by Leventhal (1990) that prior to effective coping occurring, the emotional distress need to be reduced, and this can be done by using Emotional Intelligence to effectively recognise and manage the emotional distress experienced.

Strategies may also include taking advantage of the main or buffering effects of social support groups (House & Wells, 1978), dietary changes, physical exercise, meditation (Frew, 1977), feedback and muscle relaxation exercises (Benson, Beary & Carrol, 1974).

With so many strategies available, the question arises, "What strategy will be selected?" The choice depends on several factors which will be mentioned and discussed below:

- (1) the potential and perceived costs and benefits of each strategy;
- (2) environmental constraints or support;
- (3) individual experience; and
- (4) individual attributes.

The *potential costs and benefits* of a strategy can be determined by an individual in many ways. Appropriateness depends upon the situation. If the individual is experiencing stress because of uncertainty over how to perform a job, which, if performed well, can lead to a promotion, the individual can determine the costs (Rands and time) of receiving the necessary training, and then judge the benefits (in Rands and self-satisfaction) of knowing how to do the job, and thus earn the promotion.

The *organisational environment* may help determine the strategy chosen by the support, or lack of support, that it provides. If, for example, the organisation provides tuition reimbursement to individuals for taking training or education classes, individuals may find (through cost/benefit analysis) that training is an attractive coping strategy (Schuler, 1984).

Individual experiences are also likely to influence strategy selection. If an employee has previously and successfully coped with role ambiguity by talking to a supervisor, the worker is

likely to do the same thing when experiencing this form of stress again. If an individual has experienced failure with a particular strategy, it is likely that the strategy will be avoided in the future (Jones, 2004).

Individual attributes likely to influence strategy selection include problem-solving and decision-making skills, cognitive complexity, self-esteem, Type-A personality, and an individual's total skills. There are individual differences in problem-solving and decision-making skills. These differences are, in turn, influenced by an individual's level of cognitive complexity (Driver & Streufert, 1969; Hamburg & Adams, 1967). Individuals who rank high in these skills are more likely to diagnose and analyse stressful conditions more effectively than individuals who do not. The former are also more likely to select effective coping strategies.

Some characteristics seen in ATCs seem reminiscent of the Type A personality-construct. Type A behaviour pattern (TABP) is a personality style adopted by individuals in response to their environments (Rose et al., 1978). The associated characteristics include competitiveness, a need for control, aggressiveness, striving for achievement, and impatience. The ATCs' work environment (as described in subsection 2.2.2) appears to be well-suited to individuals with some or all of these qualities.

Some researchers have found that specific components of TABP factor scores manifest distinct cardiovascular response to stress (Gray & Jackson, 1990). Individuals with strong Type A personality traits also have been found to have poor social support networks (Smith & Sanders, 1986). Proponents of interactional models suggest that individuals with TABP arouse elevated levels of stress through their choice of environments, aggressive behaviours, coping strategies and appraisal of challenge (Martin, Kuiper & Westra, 1989).

Individuals with high self-esteem are likely to be more confident and willing to engage in direct confrontation to seek information to reduce uncertainty than individuals with low self-esteem. Those with low self-esteem are also likely to have a low sense of personal efficacy and consequently withdraw from stressful situations. They may do this even after correctly diagnosing the situation and realising that direct confrontation is better.

An individual's current level of stress may also have an impact on the selection of strategies. As shown by Anderson (1976), problem-solving activities (those which seek to incorporate more information and decision-making) are more likely to be involved at low and moderate levels of stress. At higher levels of stress, emotional activities displace problem-solving activities. It is important to keep in mind that cognitive processes pertaining to coping with stress are of long-term duration (Weick, 1979; Doob, 1971).

Given this above statement, it could be said that it seems that stress, when experienced on higher levels, could overpower an individual's decision to select effective coping strategies, to deal with these stressful episodes. Based on this the following question could be posed. If an individual possess higher Emotional Intelligence, could it assist them in effectively recognising the emotions they are experiencing at a specific stressful period, and then manage those emotions effectively in order to select the coping strategy most relevant to the specific stressor being experienced?

Thus, and this is a key point, some individuals may not implement the appropriate coping strategy because they cannot diagnose the situation or because they are not able to implement the most appropriate strategy. The need for higher Emotional Intelligence arises, in which individuals can effectively recognise the stressful situation and the subsequent emotions, and then select the appropriate strategy. Of course, use of an inappropriate strategy could also be due to a lack of correct information. Whatever the specifics, however, there is evidence to suggest that not everyone always selects the best coping strategy (Lazarus, 1978).

The theory of Abramson, Seligman and Teasdale (1978) concerning learned helplessness can be tied to the notion of duration of some stressful events. Stressful events requiring long-term and repeated coping and adaptive resources may lead a person to experience lack of control over the event and the environment because success seems to be elusive. Such lack of control over important outcomes could develop into depression. In turn, this depression is likely to result in withdrawal from active coping and a reduced sense of personal efficacy (Abramson et al., 1978).

In the following section a discussion regarding coping as a mediator will be given. This discussion will focus on the process of mediation, and whether coping can be seen as a mediator in stressful encounters.

2.4.6 Coping as a Mediator

Coping is a powerful mediator of the emotional outcome of a stressful encounter. It is not a moderator because the coping process arises sequentially from the transaction between the person and the environment – that is, it is not present as a personality disposition prior to the occurrence of the encounter. Folkman and Lazarus's (1988) and Folkman et al's (1986) research has shown that the emotional state an individual is in at the beginning of a stressful encounter changes by the end of the encounter. The direction of this change is dependent on the coping strategy utilised by the individual.

It could be argued that if an individual has higher Emotional Intelligence the probability is greater for selecting a more effective coping strategy at the beginning of a stressful encounter, for the reason that higher Emotional Intelligence assist individuals in effectively recognising their emotional states at the beginning of the encounter, and as such interpreting these states, in order to manage the stress more effectively. According to Bolger (1990), planned problem solving and positive reappraisal led to changes in emotion from negative to positive, while confrontive coping and distancing led to emotional changes in the opposite direction. One weakness of this research is that it did not use a prospective research design. However, the finding was replicated prospectively in another laboratory (Bolger, 1990).

Researchers should be wary about generalising too easily about the efficacy of coping strategies from one or a few limited research findings for two reasons:

Firstly, most, though not all, of the research linking coping to particular emotional outcomes depends entirely on self-report data, which increases the possibility that the results confused coping process and outcome measures.

Secondly, evidence suggests that a coping strategy, such as distancing, may be beneficial under certain conditions. This could be when nothing can be done to affect an outcome, and all one can do is wait. However, it may be harmful under other conditions, as when the

person must mobilise to confront and change what is happening (Folkman et al., 1986). To know the details of this contextual theme requires that the same coping strategy be observed under diverse conditions likely to influence its efficacy.

In a more general way, the efficacy of any coping strategy depends on its continuing fit with the situational demands and opportunities provided by the environmental conditions being faced as well as the outcome criteria employed to evaluate it. The use of the qualifying word “continuing” expresses the idea that as conditions change, a prior way of coping may become obsolete and need to be changed to fit the new person-environment relationship (Lazarus, 1999).

In the next section the focus shifts to the role of coping, and how coping assists individuals to deal with stressful encounters.

2.4.7 The Role of Coping

The functions of coping in the stress process have also been of considerable interest to job stress researchers, who have tried not simply to describe the variations in coping responses but also to describe the conditions under which different coping strategies are used and to assess the effectiveness of such strategies. One of the dilemmas facing researchers doing this type of research is that the relationship between coping and other stress-related constructs is reciprocal. Coping operates as both a cause (an independent variable) and an effect (a dependent variable) of other stress-related constructs (Kinicki & Latack, 1990). Similarly, coping responses may function as both mediators and moderators of stressor-strain relationships (Kinicki, McKee & Wade, 1996). Coping as a mediator has been discussed in the previous section.

Consequently, researchers have examined, for example, (a) the influence of personality, gender and race on the use of different coping strategies; (b) strategies used when coping with specific stressful work experiences; (c) the relationship between coping and adaptational outcomes; (d) the effectiveness of coping strategies; and (e) the mediating properties of coping strategies.

According to Kinicki et al.'s review (1996), the basic proposition that environmental and personality variables influence the choice of coping strategies has been generally supported in empirical research, but the relationships between coping strategies and outcomes are inconsistent, and moderating effects of coping have not always been demonstrated.

To understand these results, it is of importance to consider the theoretical role of coping in the stress process. A number of themes emerge.

The first is whether coping functions as a mediator or moderator. The transactional model of stress views coping as a mediating variable (Lazarus & Folkman, 1984). Treating coping as mediating the link between stressors and strain entail a different research design from considering it as moderating the stressor-strain relationship (Cox & Ferguson, 1991). Small effects and mixed findings may well be the result not just of design and methodological limitations (Parkes, 1994), but also of the difficulties involved in deciding how to research the complexities of the transactional relationship.

Another reason for the confusion surrounding the mediating-moderating effects of coping may be that such effects are present only under fairly specific conditions (Trenberth, 1996). In many studies, little information is provided on why coping was expected to moderate a particular relationship or on the basis for selecting the dependent and independent variables (Parkes, 1994). Finally, as noted above, there is sometimes both theoretical and methodological confusion between coping "behaviours" and coping "styles". Whereas dispositional styles are more likely to moderate linkages between environmental conditions (stressors) and individual reactions (strains), specific behaviours may function as mediators between these variables. For instance, increased work demands may lead to an individual working harder to achieve required goals, which in turn reduces the strain associated with the initial demands.

Inferential support for this distinction comes from studies that have demonstrated a clear relationship between personality and coping (Parkes, 1994). Although there are powerful arguments for measuring coping behaviours rather than style or personality variables (Lazarus, 1990; Parkes, 1994), equally strong arguments can be mounted for considering the relationship between personality and coping. For example, secondary appraisals (of what

copied resources are available to the person) include assessment of dispositional factors such as the person's resilience or hardiness and self-efficacy as possible buffers of the impact of stressors on an individual's well-being. Clearly, individual differences may play an important role in both the selection of coping strategies and their effectiveness (Cooper et al., 2001).

Based on this discussion that individual differences may play a role in the selection of coping strategies and their effectiveness it is important to now shift the focus specifically to coping strategies which will be discussed in the next section. The section will start with a general introduction to coping strategies, followed by more specifically identifying the strategies (problem and emotion focused coping, seeking social support and avoidance) and discussing them in detail.

2.4.8 Coping Strategies

Measures of coping have been presented (Aldwin, Folkman, Shaefer, Coyne & Lazarus, 1980; Latack, 1986; Sidle, Moos, Adams & Cady, 1969; Stone & Neale, 1984) and the role of coping in the stress process has been examined (Folkman & Lazarus, 1980; Newton & Keenan, 1985; Pearlin & Schooler, 1978), but still relatively little is known about the specific coping strategies individuals use in dealing with stress, the process by which individuals select and implement these strategies, or the mechanisms by which coping affects stress and individual well-being.

Coping strategies, or specific types of coping responses, play a significant role in an individual's adaptation to stressful life events and can impede or facilitate both mental and physical health (Clark & Havonitz, 1989; Endler & Parker, 1990; Suls & Fletcher, 1985). Coping strategies are those steps individuals take to alter a stressor or reduce its impact. It is important to note that coping resources are not the same as coping responses/strategies. Despite the importance of emotion regulation for adaptation (even to stressful encounters), individuals greatly vary in their ability and propensity to implement regulatory processes (Gross & John, 2003). Whereas some individuals appear perfectly able to control their irritation when dealing with a stubborn supervisor, others lose their temper, thereby only worsening their situation. Emotional Intelligence is part of the various concepts that have

been proposed to account for this variability. Emotional Intelligence aims to provide a scientific framework for the idea that individuals differ in the extent to which they attend to, process and utilise emotional information of an intrapersonal (e.g. regulating one's own emotions) or interpersonal (e.g. regulating others' emotions) nature (Petrides & Furnham, 2003), which can also refer to a stressful situation. It could then be argued that Emotional Intelligence can also be seen as a coping resource.

Several studies have suggested that trait Emotional Intelligence is a particularly useful construct to capture individual differences in emotion regulation. For instance, Mikolajczak, Luminet & Menil, (2006) and colleagues have repeatedly found that high Emotional Intelligence individuals display less of an increase in distress than their low Emotional Intelligence peers in response to various adverse events or conditions. In applied settings, students with higher Emotional Intelligence scores displayed a smaller increase in psychological symptoms and somatic complaints during exams than their lower Emotional Intelligence counterparts (Mikolajczak et al., 2006). In the same vein, nurses with higher Emotional Intelligence scores reported lower levels of burnout and somatic complaints than nurses with lower scores (Mikolajczak, Menil, & Luminet, 2007). These findings were replicated in laboratory settings, in which Emotional Intelligence was found to moderate both the subjective (mood deterioration, emotional intensity, action tendencies and bodily sensations) (Mikolajczak, Luminet, Leroy & Roy, 2007) and endocrine response to acute stressors (Mikolajczak, Roy, Luminet, Fille'e & de Timary, 2007).

There is preliminary evidence that Emotional Intelligence influences the appraisal of both the situation (stressful encounter) and one's resources to face it (Mikolajczak & Luminet, 2008), and that these appraisals mediate the effect of Emotional Intelligence on the emotional response to the situation (Mikolajczak et al., 2006). There is also evidence that Emotional Intelligence might influence the choice of coping strategies, namely the specific behavioural and psychological strategies that people implement in order to deal with negative events. Petrides, Pe' rez-Gonza'lez and Furnham (2007) as well as Saklofske, Austin, Galloway and Davidson (2007) have shown that Emotional Intelligence is positively associated with the use of adaptive coping strategies (e.g. problem-focused coping) and negatively associated with the use of maladaptive coping strategies (e.g. avoidance).

Coping resources comprise a rather complex set of personality, attitudinal and cognitive factors that provide the psychological context of coping. They are relatively stable dispositional characteristics that affect coping processes and are themselves affected by the cumulative outcome of that process (Shaw, 1993).

Coping styles must also not be confused with coping strategies. Coping styles are stereotypical reactions to stress. They are habitual or preferred ways of approaching a problem or crisis (Menaghan, 1983). Coping strategies imply more flexibility and variety in responses than coping styles.

There are several coping inventories, but often there is a prevalent theme, namely that two basic coping strategies are identified: emotion-focused and problem-focused coping (Billings & Moos, 1984; Carver, Scheier & Weintraub, 1989; Endler & Parker, 1990; Folkman & Lazarus, 1988; Pearlin & Schooler, 1978). Several other researchers have identified a third basic coping strategy – avoidance (Amirkhan, 1990; Billings & Moos, 1984; Feifel & Stack, 1989; Nowack, 1989). The latter approach of identifying three basic coping strategies for managing stress has been adopted in this study, as the concept of only two basic coping strategies is too simplistic (Carver et al., 1989). Amirkhan's (1990, 1994) model, which is used in this study, identified three basic coping domains (Problem solving, Seeking Social Support and Avoidance), and was largely developed via factor analysis of Folkman and Lazarus's (1988) Ways of Coping Questionnaire items (Endler & Parker, 1994). These are also the three coping domains used in this study.

In the following section Lazarus and Folkman's (1984) two basic coping strategies will be discussed. This will be followed by also focusing on seeking social support and avoidance. The section will conclude with a discussion on coping and emotions.

2.4.8.1 Problem-focused coping

These strategies are similar to strategies used for problem-solving, and are thus often directed at defining the problem, generating alternative solutions, determining the alternatives in terms of costs/benefits, choosing among them, and acting, all which have been discussed in section 2.4.4 of this chapter.

Problem-focused coping is more comprehensive in its problem-orientated strategies than problem-solving alone, as it is not primarily focused on the external environment but also directed inwards. Problem-focused coping is often used when an individual feels he/she has some control or can make an impact on his/her environment (Lazarus & Folkman, 1984). This can then again be linked to the Job Demand-Control model, where it has been argued that the more control an individual has over a situation, the less stress he/she experience, or the better resources they have in order to deal with stressful encounters.

The next coping strategy discussed below is that of Emotion-focused coping.

2.4.8.2 Emotion-focused coping

A wide range of emotion-focused forms of coping have been identified (Lazarus & Folkman, 1984). One large group consists of cognitive processes directed at lessening emotional distress and includes strategies such as minimisation, distancing, selective attention, positive comparisons, seeking the positive in a negative occurrence, and avoidance, which within the framework of this study, is seen to be a separate coping strategy domain.

Many of the above-mentioned strategies have their origins in the theory and research on defensive processes which are often utilised in stressful encounters. These defensive processes were also discussed earlier, and are seen as less effective. During these processes the individual first determines and explains what is happening, and then decides whether the situation is stressful or not. These strategies require the individual to feel worse before they can experience relief, and thus engage in self-blame or other forms of self-punishment (Monat & Lazarus, 1991).

Certain forms of emotion-focused coping lead to a change in the way an encounter is perceived without changing the objective situation. Emotional Intelligence can influence the way individuals perceive stress, due to the process of recognising the emotions individuals experience in stressful encounters, and then how to understand and manage these emotions, to effectively deal or cope with the stressful situation. These strategies are equivalent to re-appraisal. This strategy is different to other coping strategies in that it changes the meaning of an event directly while other strategies do not, and therefore are not re-appraisals.

The distinction between problem-focused and emotion-focused coping is an important one. It is too simplistic to view factors other than problem-focused coping as variations of emotion-focused coping as these factors can differ noticeably in character, to the extent of being inversely correlated (Scheier, Weintraub & Carver, 1986).

This is why the Coping Strategy Indicator developed by Amirkhan (1990), which identified three factors, namely problem-solving, seeking social support and avoidance, has been used in this study. This theory includes seeking social support as an independent factor, with problem-solving and avoidance being very similar to the respective problem- and emotion-focused strategies identified by Lazarus and Folkman (1984). The following section will only focus on seeking social support and Avoidance, as problem solving can be viewed similar to Problem-focus coping as discussed above.

2.4.8.3 Seeking Social Support

The social coping dimension is evident in many coping measures, due to the fact that social support has emerged as a central concept in coping research, as pointed out in a review by Cohen and Wills (cited in Latack & Havlovic, 1992).

Seeking social support is one of the three coping strategy domains identified by Amirkhan (1990, 1994), in conjunction with problem-solving and avoidance. These strategies reflect, to a degree, the approach-and-avoidance dimension, particularly the problem-versus emotion-focused dichotomy proposed by Folkman and Lazarus (1980).

Seeking social support is seen as an independent strategy in this context (Amirkhan, 1990, 1994). The role that social support may play in generating coping strategies has been explicitly highlighted lately (Latack, 1989; Thoits, 1986b).

The crucial importance of human contact, reflected by the seeking social support construct, has also been addressed in the literature by such dispositional constructs as the need for belonging (Fromm, 1941) and the need for security (Sullivan, 1953). The behavioural taxonomy of Horney (1945), in particular, identifies tendencies to move against (problem-solving), move away (avoidance), or move towards (seeking social support) for the purpose of alleviating anxiety (Amirkhan, 1994).

The seeking social support strategy apparently identifies a primitive need for human contact in times of stress, for reasons beyond whatever material help, advice or distraction that contact might provide (Amirkhan, 1990). This is important to note, as seeking social support is not, in this context, seen as a coping resource but a coping strategy.

In a study conducted by Pretorius and Diedricks (1994) on students at the University of the Western Cape regarding problem-solving appraisal, social support and the stress-depression relationship, results of the study suggests that appraisal of problem-solving skills is one of those individual characteristics that impacts on the functioning of social support. In general, the significant main and buffering effects for social support indicated by the regression analyses seem to suggest that self-appraised effective problem solvers enjoy both the health-sustaining and stress-reducing functions of social support. Self-appraised ineffective problem solvers, on the other hand, only experienced the health-sustaining benefits of social support as indicated by the significant main effects in the regression model. This suggests that even in the absence of stress, social support serves an important health sustaining function in terms of mental health for both self appraised effective and ineffective problem solvers. The one important conclusion that could be drawn is that for both groups social support, independently of level of stress, can contribute to psychological well-being. The stress-reducing function of social support within the stress-coping paradigm, however, seems to be dependent on what has been referred to as cognitive appraisal (Coyne, Aldwin & Lazarus, 1981; Heller & Swindle, 1983). According to Lazarus and Folkman (1984) cognitive appraisal refers to an evaluation of both what is at stake (primary appraisal) and what coping resources are available (secondary appraisal). Social support can broaden the individual's interpretation of the stressor during primary appraisal and broaden the number of coping options during secondary appraisal (Shumaker & Brownell, 1984).

This research by Pretorius and Diedricks (1994) confirms the expectation that this is more likely to happen in the case of self-appraised effective problem solvers. As part of effectively dealing with the stressor, effective problem solvers are able to evaluate the stressor and to recognise social support as an additional coping option. Pretorius and Diedericks' (1994) research findings also point to the need for more clearly delineating the different types of support. It was found that the moderating effect in the case of effective problem solvers was different for different kinds of social support. In the case of satisfaction with support it was found that those with higher levels of satisfaction experience less depression under conditions

of high stress. On the other hand, those with higher levels of support experienced more depression. This seems to indicate that there are conditions under which support (and in this case network size) may not be useful and that quality of support is more important than mere quantity.

It could be concluded that the subjective experience of support (i.e. satisfaction) is better able to moderate the negative effects of stress than the mere presence of support providers. One possible explanation for this could be the concept of diffusion of responsibility. Drawing on the findings from pro-social research, Shumaker and Brownell (1984) suggest that in the case of large and dense social networks, providers of support may be less likely to offer support when their responsibility for assistance is shared with others. It may be that effective problem-solvers are more likely to recognise that the large network does not necessarily translate into more effective support. Consequently, this aspect of support (network size) is not considered as part of their problem-solving strategy in dealing with stressors. Despite the limitations of the study (sample and cross-sectional design) it has provided a basis for a more systematic study of the interaction between problem-solving appraisal and social support, specifically, and other environmental and individual characteristics, in general. It has also, once again, underlined the need for a multidimensional perspective of social support.

The last coping strategy to be discussed is that of Avoidance.

2.4.8.4 Avoidance

As the term implies, an avoidance coping strategy is one in which withdrawal from the stressful situation is used as a means of managing stress. It is therefore not unlike some of Freud's (1920) ego defence mechanisms, namely denial and repression. Avoidance in the context of this study also infers avoiding social contact with people, cognitive projection to happier times and behavioural avoidant strategies (Roth & Cohen, 1986).

In summary, the most popular theoretical models of the last 15 years have emphasised two predominant coping strategies, namely problem-focused and emotion-focused coping strategies. The measuring instrument which will be used in the present study, the Coping Strategy Indicator (CSI) (Amirkhan, 1990, 1994) is fundamentally based on this approach but has gone one step further and identified seeking social support as a separate coping strategy, and not as part of the emotion-focused coping strategy construct, or a coping resource (which social support as such is).

Throughout the literature on coping it has been mentioned that emotions are involved in the coping process. In the next section this relationship between coping and emotions will be discussed.

2.4.9 Coping and Emotions

Coping has to do with the way people manage life conditions that are stressful, whether in their personal or occupational lives as discussed throughout this section. To some extent, stress and coping could be said to be reciprocals of each other. When coping is ineffective, the level of stress is high; however, when coping is effective, the level of stress is low. This is just a tentative statement, because individuals who cope effectively with stress probably extend themselves more than individuals coping with stress ineffectively, so they may create more potential stress for themselves, but can usually handle it. Thus, coping is an essential feature of stress *and* emotional reactions, and if attention is not given to how it works, individuals will fail to understand the constant struggle to adapt to troubling chronic stresses and those produced by changing life conditions (Lazarus, 1999).

It is important to recognise that recent refinements of coping theory and research suggest that emotions play a significant role in how people cope (e.g. Fugate, Kinicki & Scheck, 2002). Emotions are affective responses to information or experiences that change psychophysiological states. Emotions are episodic and targeted, which means that they are relatively immediate and short-term reactions to particular events or experiences. These characteristics distinguish emotions from dispositional and/or more general forms of affect, such as negative affectivity and moods that are more persistent and lack a particular target or focus (Weiss & Cropanzano, 1996). In a work context, emotions are typically associated with brief events, but moods are commonly associated with more stable job or work features (Zohar, Tzischinski & Epstein, 2003).

Emotions are a product of the interaction between an individual and his or her environment and arise in response to stressors (Scherer, 1989). In response to negative emotions, individuals engage in distinct behavioural patterns in attempts to mediate stress and relieve unpleasantness. Coping behaviour is the attempt to deal with negative emotions and stress. Given the concept of Emotional Intelligence, individuals with higher Emotional Intelligence have the ability to effectively recognise the emotions they are experiencing at any given time,

and after recognising the emotion, effectively manage and deal with the emotions. In the case of coping, individuals with a higher Emotional Intelligence then effectively recognise the negative emotion, deal and manage it, in order to effectively cope with the stressful experience. Coping includes ongoing cognitive and behavioural efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of that person (Lazarus & Folkman, 1984). Effective, engaged coping styles have shown to be a critical component of a person's ability to adapt to, and deal with, stress. Leventhal (1990) identified the importance of emotional states and their relationships to coping ability by arguing that one must first reduce emotional distress before effective coping can take place. Many researchers have found that inordinately high levels of stress are related to high levels of negative emotion and low levels of positive emotion (Bolger, 1990; De Longis, Folkman & Lazarus, 1988; Spector, Dwyer & Jex, 1988). People tend to use coping strategies to try to restore a more favourable emotional state (Aldwin & Revenson, 1987).

In the next section the last concept of this study, namely Emotional Intelligence will be described and discussed. First, Emotional Intelligence as concept will be defined followed by models of Emotional Intelligence, and then focusing on the relationship between emotions and stress and why Emotional Intelligence is important when dealing with stress.

2.5 Emotional Intelligence

The last construct in the literature discussion is that of Emotional Intelligence. In this section the focus will be on firstly defining the concept of Emotional Intelligence, placing emphasis on the different models of Emotional Intelligence and focusing on Emotional Competencies. The chapter will conclude with a discussion on emotions and stress, and the importance of Emotional Intelligence when dealing with stress.

2.5.1 Introduction

Studies on intelligence over many years focused mainly on the adaptive use of cognition, but in recent years theorists such as Gardner (1983, 1999) and Sternberg (1985, 2002) have suggested more encompassing approaches to conceptualising intelligence. Sternberg (1985, 2002) suggests that there are other dimensions of intelligence – social intelligence, Emotional Intelligence, or practical intelligence or what scholars refer to as “street smart” – which

indicates that an individual is not limited simply because he or she has a below average academic intelligence or IQ. Although Gardner(1983) did not use the term Emotional Intelligence, his concepts of intrapersonal and interpersonal intelligences provided the basis for the conceptualisation of Emotional Intelligence. Whereas intrapersonal intelligence is the ability to understand one's emotions, interpersonal intelligence is one's ability to understand the emotions of others. In his role as consultant in organisations, Goleman (1998) found that Emotional Intelligence is twice as important as technical skills and IQ for jobs at all levels. He also reported that Emotional Intelligence plays an increasingly important role at the highest levels of a company.

The next section will focus on defining Emotional Intelligence.

2.5.2 Defining Emotional Intelligence

Emotional Intelligence has become of widespread interest to psychological research in recent years. Goleman (1995) made the concept widely popular with the publication of his influential book with the title Emotional Intelligence. However it was Salovey and Mayer (1990) who first introduced the term "Emotional Intelligence", describing it as "a type of emotional information processing that includes accurate appraisal of emotions in oneself and others, appropriate expression of emotions and adaptive regulation of emotion in such a way to enhance living" (p. 187). More recently, they amended the above definition and conceptualised Emotional Intelligence as "an ability to recognise the meanings of emotions and their relationships, and to reason and problem solve on the basis of them". This definition could be linked to problem focused coping strategies, where it has been mentioned previously that these coping strategies involves defining the problem, weighing up alternatives, and then acting on selecting the most appropriate action. It is a process in which individuals have some control over their environment. In this case Emotional Intelligence assist in this reasoning and selection of strategies.

"Emotional Intelligence is involved with the capacity to perceive emotions, assimilate emotion-related feelings, understand the information of those emotions and manage them" (Mayer, Caruso & Salovey, 2000, p. 267).

Individuals differ in the skill with which they can identify their feelings and the feelings of others, regulate these feelings, and use the information provided by their feelings to motivate adaptive behaviour. These competencies have been organised into a framework called Emotional Intelligence (Salovey & Mayer, 1990). An important aspect of Emotional Intelligence is the ability to reflect upon and manage one's emotions. In the past, emotional processes were viewed as interruptions to rational mental activities. Contemporary psychologists now realise that emotions can aid in understanding adaptive social behaviour (Salovey, Bedell, Detweiler & Mayer, 1999). Thus, Emotional Intelligence can be defined as the appraisal and expression of emotions of one's self and others; the regulation of emotions in one's self and others, and the utilisation of emotions for motivational purposes (Salovey & Mayer, 1990). Generally speaking these features of Emotional Intelligence combine to aid in an individual's ability to adapt to life's changes through the use of both rational and emotional coping skills with regard to stress. Therefore as described previously in this literature review, focusing on the importance of stress and coping it is indicated in the above sentence that Emotional Intelligence can aid individuals in the process of adaptation and coping with stressful situations.

Emotional Intelligence also involves emotional problem solving (Mayer & Geher, 1996). In order to solve emotional problems, such as stress, individuals must first become aware of their own emotions and then use that information to recognise emotions in others. This ability to recognise emotions is vital to an individual's emotional well-being, because the ability to recognise emotions in others is related to additional aspects of Emotional Intelligence including empathy and openness (Mayer & Salovey, 1993). Without the emotional mental ability to detect what other people feel, individuals would probably be less able to experience empathy and understanding toward others. Thus, Emotional Intelligence not only involves personal components (e.g. emotional insight and emotional self-management), but also encompasses interpersonal components (e.g. empathy and handling relationships).

The following section will focus on the different models of Emotional Intelligence. These models will be discussed in short.

2.5.3 Models of Emotional Intelligence

Since the emergence of the concept, there has been a debate concerning the Emotional Intelligence construct, as to whether it is best presented solely in terms of ability, or whether it does account for both ability and personality characteristics. Mayer and colleagues (Salovey & Mayer, 1990) distinguish between:

- (1) **mental ability models**, focusing on capacity for processing emotional information, and
- (2) **mixed models** that conceptualise Emotional Intelligence as a diverse construct, including aspects of personality as well as the ability to perceive, assimilate, understand and manage emotions.

These mixed models include motivational factors and affective dispositions (e.g. self-concept, assertiveness, empathy) (Bar-On, 1997; Goleman, 1995).

Salovey and Mayer (1990) consider Emotional Intelligence to encompass four domains of ability:

- perception and expression of emotion;
- assimilating emotion and thought;
- understanding and analysing emotion; and
- reflective regulation of emotion.

Goleman (1995) proposes five key areas:

- knowing one's emotions;
- managing emotions;
- motivating oneself;
- recognising emotions in others; and
- handling relationships.

Bar-On (1997) also proposes five key areas:

- intrapersonal skills;
- interpersonal skills;
- adaptability scales;
- stress-management scales; and
- general mood.

These models do not necessarily contradict one another, but it seems that they do take somewhat different perspectives on the nature of Emotional Intelligence. It has been suggested that there are individual differences in Emotional Intelligence relating to differences in an individual's ability to appraise his/her own emotions and those of others, and that individuals higher on Emotional Intelligence might be more open to internal experience and better able to label and communicate those experiences (Mayer & Salovey, 1993). As emphasised by Mayer (2001) there are generally two types of Emotional Intelligence in the published literature, the more popular Emotional Intelligence which is said to be easily acquired and learnt, out-predicts traditional measures of general intelligence (such as IQ or cognitive ability tests) and is viewed as one of the best predictors of life success. The second 'type' of Emotional Intelligence is the more scientifically based construct, which is built around the notion that Emotional Intelligence competencies (as discussed in the following section) are inter-correlated but is distinct from general intelligence. It is believed that it is this more scientifically based conceptualisation that has the potential to be of benefit to psychology, rather than the more popular "poorly" constructed concept. Based on the above sentence regarding the more scientifically based construct of Emotional Intelligence, emotional competencies are discussed in the following section.

2.5.4 Emotional Competencies

Another approach, sharing more in common with mixed models but moving beyond rigid conceptualisation of Emotional Intelligence, advocates differentiation between Emotional Intelligence (a dispositional aptitude) and emotional *competencies* (learned capabilities) (Boyatzis, 1982; Goleman, 2001). Based on a host of case studies, subjective accounts, and evaluations studies, Goleman (1998) concludes that the major qualities differentiating successful from unsuccessful executives are the competencies underlying (or presumably nested within) Emotional Intelligence. Studies have found that failing executives, apparently, have poorer emotional control, despite strengths in cognitive abilities and technical expertise (Goleman, 1998).

Under this formulation, Emotional Intelligence encompasses such characteristics as motives, traits, and aspects of one's self-image. In short, Emotional Intelligence designates the potential for individuals to become skilled at learning certain emotional responses. By contrast, emotional *competencies* are learned capabilities, based on Emotional Intelligence,

that result in outstanding performance at work (Goleman, 2001). Parallel to the distinction between *fluid* and *crystallised* ability (Matthews, Zeidner & Roberts, 2002), where

1. fluid ability is defined as the ability to find meaning in confusion and solve new problems as well as the ability to draw inferences and understand the relationships of various concepts, independent of acquired knowledge (Cavanaugh & Blanchard-Fields, 2006), and;
2. crystallised ability is to use skills, knowledge, and experience. It should not be equated with memory or knowledge, but it does rely on accessing information from long-term memory (Cavanaugh & Blanchard-Fields, 2006).

Emotional Intelligence (as a fluid ability) does not guarantee that individuals will actually manifest competent behaviour at the workplace. That is, there is no guarantee that the individual has been exposed to essential environmental experiences or learning situations and practices necessary to acquire specific emotional competencies or skills (e.g. assertiveness, service orientation, initiative). Whereas Emotional Intelligence may determine a person's potential for learning practical job-related emotional and social skills, the level of emotional competencies (as a crystallised ability) manifested by that person shows how much of that potential he or she has actually realised. It is emotional competence then that aids the learning of job-related skills and which translates Emotional Intelligence into on-the-job capabilities. For example, in order to be able to actually empathise with another's plight, one need to have learned the specific empathic skills that translate into caring and compassionate pastoral counselling, bedside-nursing, or effective psychotherapy (Cherniss & Goleman, 2001).

Within this general framework, a large array of competencies have been claimed to be critical for success in occupational settings (Cooper & Sawaf, 1997, Weisinger, 1998).

For example, Goleman (1998) lists 25 different competencies necessary for effective performance in various occupational contexts. Thus, confidentiality is seen as important for loan officers and priests, while trust and empathy appear vital for psychotherapists, social workers and marriage counsellors.

Among the specific competencies claimed to be of critical importance in a variety of occupational settings are the following:

Emotional self-awareness. This competence includes identification of emotion and understanding how emotions are related to one's goal, thoughts, behaviours and accomplishments (Goleman, 1998; Weisinger, 1998)

Regulation of emotions in the self. This competence involves intentionally eliciting and sustaining pleasant and unpleasant emotions when considered appropriate, effectively channelling negative affect, and restraining negative emotional outbursts and impulses (Boyatzis, 1982; Goleman, 1998).

Social awareness of emotions and empathy, which includes awareness of others' feelings, needs, and concerns, understanding and sympathising with others' emotions, and responding to others' unspoken feelings (Goleman, 1998; Huy, 1999; Salovey & Mayer, 1990; Williams & Sternberg, 1988).

Regulating emotions in others. This competence incorporates influencing others, effectively communicating with others, and managing conflicts (Weisinger, 1998).

Motivational tendencies, which include such components as internal strivings, attributions and need for achievement (Bar-On, 2000; Cooper & Sawaf, 1997; Goleman, 1998; Weisinger, 1998).

Character, which include trust and integrity (Cooper & Sawaf, 1997; Goleman, 1998; Weisinger, 1998).

All of these abovementioned competencies are also part of the framework by Rahim (2001) used in this study to measure the Emotional Intelligence of ATCs.

The preceding framework is not, of course, without its criticism. Thus, to some researchers, "competencies" is a confusing and ambiguous concept. Indeed, how specific competencies are related to the more overarching concept of Emotional Intelligence is uncertain.

Furthermore, it is presently unclear to what extent a number of specific competencies such as impulse control, achievement motivation, and adaptability are subsumed under regulation of emotions in self, whereas conflict resolution, teamwork, visionary leadership, and communication skills are nested within management of emotions in others (Goleman, 2001). Whether placing all such concepts under the banner of Emotional Intelligence confuses, rather than clarifies, the role of emotional competencies in the workplace and would seem a controversial point. Because the field of Emotional Intelligence remains new, many of the aforementioned concepts – which have been studied in organisational psychology for some time (often with mixed results) – are in fact better understood than this fledgling concept. Researchers are cautious, however, of being definite in making a final judgement of this approach (Goleman, 2001).

In the next section emphasis is given to the importance of emotions and stress and how they interrelate with each other, and what role emotions play in the recognition and management of stress.

2.5.5 Emotions and Stress

As long ago as 1987, two of the most prominent researchers in the field of stress, Lazarus and Folkman (1987, p. 65) wrote:

Although we have usually referred to stress, coping theory and research, we think that we should now speak less of stress and more of emotion. Stress, which primarily concerns negative person-environment relationships, cognitive appraisals and emotional response states such as fear, anger, guilt and shame, fall under a larger rubric of emotion.

Given that the models of stress are essentially theories about emotional reactions (Lazarus, 1993) and that “stress constitutes an emotional subset referring largely to emotions that are distress related” (Lazarus, 1995, p. 183), the lack of explicit attention to emotions in job stress research is disconcerting.

There is a lack of systematic treatment of the general construct of emotion within the job stress framework and, more specifically, the role that emotions play in the stress-coping process. Several reasons have been posted for the absence of an integrated model of emotions in job stress research (Briner, 1995a; Wright & Doherty, 1998). One is that there is

frequently a confusion of emotions and attitudes. The confusion of these constructs is well illustrated by Wright and Doherty (1998), using job satisfaction as an example. Their argument is that, in a search for the happy and productive employee, happiness (an emotion) becomes synonymous with job satisfaction (an attitude). Although there is an affective component to job satisfaction, and evidence of a linkage between people's evaluations of their job and their overall happiness (Diener, Suh, Lucas & Smith, 1999), researchers should nevertheless treat these as separate constructs that function at different levels of specificity, rather than regarding job satisfaction as a surrogate measure of emotional well-being.

Another reason why emotions have received less recognition in job stress research follows from the generally held belief that organisational behaviour can best be explained primarily in rational-cognitive terms (Wright & Doherty, 1998).

This "myth of rationality" based around the goal-directed nature of most organisational behaviour theory, has "encouraged the view that emotions have little to do with, and even get in the way of, the proper legitimate, and highly successful businesslike business of work" (Briner, 1995a, p. 3). Briner (1995a) also suggests, emotions may simply be more difficult to study than attitudes and other responses.

However, emotional constructs are important, even critical, to investigate in research on job stress. Pekrun and Frese (1992) have argued that "emotions are among the primary determinants of behaviour at work...and profoundly influence both the social climate and the productivity of companies and organisations" (p. 154).

Similarly, because paid employment occupies a significant portion of most people's lives, and because individuals experience a range of emotions within the employment context, efforts to understand and predict human behaviour in organisational settings would be incomplete without attention to this domain.

As Lazarus (1995) has made clear, emotions offer a rich and useful source of information about what is happening to a person. Exploring emotional processes in work settings would increase knowledge and understanding of the transaction between the individual and the environment. At one level, this entails unravelling the emotional process so that individuals

gain an understanding of the meaning behind emotion (Lazarus, 1993), in much the same way as understanding why an event is stressful (primary appraisal) has enhanced conceptualisations of the coping process. At another level, it also involves exploring whether certain work events are more likely to be associated with specific emotions, and under what circumstances emotions are a moderating factor operating between stressors and strains (Briner, 1995b).

An important step toward understanding how emotions function in work settings is to classify them into meaningful categories. Lazarus (1995), for instance, suggested that it is possible to identify 15 different emotions that can be grouped together under three headings:

negative emotions (anger, fright, anxiety, guilt, shame, sadness, envy, jealousy, disgust), **positive emotions** (happiness, pride, relief, love), and those that may best be described as **mixed** (hope, compassion, gratitude). Pekrun and Frese (1992) agree that classifying emotions according to some common underlying dimensions has considerable merit. They also argued, however, that in a work situation this type of classification may not go far enough because it does not take into account the fact that particular aspects of the job may arouse specific emotions.

Pekrun and Frese (1992) developed a schema for classifying workplace emotions into discrete categories of emotion. Their approach begins by ordering emotions into those that are positive and those that are negative. These two categories are then divided into task-related and social emotions. Task-related emotions are further divided into *process* (doing the task), *prospective* (anticipating outcomes or consequences), and *retrospective* (evaluating accomplishments). Social emotions are those that reflect the social context within which the job is performed. Each of these different categories has both positive and negative emotions associated with it. For example, among prospective task-related emotions, hope would be positive and anxiety negative.

The approaches advocated by Lazarus (1995) and by Pekrun and Frese (1992) should not be seen as being in competition with each other. Both reflect efforts to provide structure to a field of study that has received limited attention from job stress researchers.

Another approach according to Rafaeli and Sutton (1987) is to focus on those emotions displayed in satisfying role expectations and to classify these emotions according to whether they are positive or negative, and esteem enhancing or esteem degrading. Irrespective of how different schemas for classifying emotions are constructed, it is clear that the role of emotions in the stress-coping process and the management of job-related stress require more systematic attention that it has received to date.

In a recent theoretical paper Spector and Goh (2001) examined the role that emotions play in occupational stress. They employed a narrow definition of job stress “as any condition or situation that elicits a negative emotional response, such as anger/frustration or anxiety/tension” (p.196) in an attempt to overcome the broadness of previous definitions and focus on the aspect of negative emotional responses (Spector & Goh, 2001). Emotions influence how the work environment is perceived, that is, whether a particular condition is appraised as a job stressor or not (Gardner & Stough, 2002). It is emphasised by Spector and Goh (2001) that an emotional reaction follows a perceived stressor. Gardner & Stough (2002) extended this theory by suggesting that a person who is able to effectively manage and control emotions in the workplace will also perceive the stressor but will have a more appropriate emotional reaction to the situation than someone who is less able to manage and control emotions at work.

To date, in emphasising the subjective nature of stress, transactional theories (Cox, 1993), have highlighted the role of individual differences in understanding why some people cope and thrive better than others when exposed to similar circumstances. As a result, there has been numerous studies which have considered a range of personality variables and demographic factors which act to moderate the stress-strain relationship. Traditionally, research has investigated dispositional variables such as Type A behaviour (Friedman & Rosenman, 1974) positive and negative affectivity, hardiness, optimism and locus of control. In addition to personality and dispositional variables, researchers have also considered behavioural moderators such as social support and coping strategies.

In response to Lazarus and Folkman’s (1987) comments, the emergent interest in the role of importance of emotions in affecting the way in which individuals appraise and respond to a potentially threatening event or situation, attention has been drawn to the concept of

Emotional Intelligence as a potential moderating variable in the stress process. Emotional Intelligence has been the subject of much debate, particularly whether it is a true form of intelligence, a cluster of personality traits or simply little more than interpersonal skills repackaged (Woodruffe, 2001)

Emotions serve to draw attention to resources, to issues that in some way threaten the individual's integrity; whether it is physical, social or psychological. Emotions are also considered to be adaptive, as they protect the individual from physical harm, facilitate maintenance of self-identity in social settings and guide the individual toward the achievement of tasks and goals. It can also be debated that according to the JD-C model, Emotional Intelligence which flows from the management of emotions can be seen as a resource in the management of stress. The experience of stress is the manifestation of negative emotions triggered by danger, threat or challenge and which signal to the body the need to prepare for actions of defence and protection. This was first described by Cannon (1931) as the "fight or flight" response. As such emotions are primarily drive signals and it is recognised that each interaction with the environment has emotional content because every action has 'survival' consequences on one level or another. Central to all behaviour is the overriding drive towards reducing negative emotional experiences and stress, and the maintenance of an integrated 'self' (Damasio, 1994).

Now that it has been described that there is some relationship between emotions and stress this literature review can conclude with a paragraph on why Emotional Intelligence is important when dealing with stress.

2.5.6 Why Emotional Intelligence is important when dealing with stress

In a theoretical paper, Salovey et al. (1999) argue that coping is influenced by a person's Emotional Intelligence. As mentioned earlier the definition of coping can be summarised as the cognitive or behavioural efforts an individual makes to control or manage situations viewed as stressful, taxing or exceeding one's resources (Lazarus & Folkman, 1984). Salovey et al. (1999) suggest that there is a hierarchy of emotional competencies that facilitate successful coping through increasing emotional insight and disclosure, increasing the use of social support and preventing reflection. The first level of the hierarchy is made up of basic emotional skills (perception, appraisal and expression of emotion), the second level

comprises understanding and analysing emotions, and the third level is based on emotional regulation. Salovey et al. (1999) propose that the entire hierarchy of skills are required for successful coping to take place. Similarly Matthews and Zeidner (2000) suggest that adaptive coping can be conceptualised as Emotional Intelligence in action and that maladaptive coping may be attributed to difficulties in the processing and regulation of emotions and thus would be related to low Emotional Intelligence.

There are different ways in which individuals cope with stressful events, eight of which have been empirically determined by Folkman and Lazarus (1988). These are: confrontive, distancing, self-controlling, seeking social support, accepting responsibility, escape-avoidance, planful problem-solving and positive reappraisal. Amirkhan (1990) also identified three of these ways in which individuals cope that correspond to that of Folkman and Lazarus (1988). These are problem solving, seeking social support as well as avoidance. Leventhal (1990) has identified the importance of emotional states and their relationships to coping ability by arguing that one must first reduce emotional distress before effective coping can take place.

A recent exploratory study by Slaski and Cartwright (2002) investigated the relationship between health, performance and Emotional Intelligence in a sample of retail managers. Using the Bar-On EQ-I (Bar-On, 1997) the authors report that those participants who reported higher levels of Emotional Intelligence also reported less psychological strain and lower levels of occupational stress in comparison to those who reported lower levels of Emotional Intelligence. It was suggested by the authors that higher levels of Emotional Intelligence might increase an individual's resilience to stress in the workplace.

This is also the focus of this study and the result which the researcher are aiming at, to identify whether higher levels of Emotional Intelligence can be seen as a coping strategy in the way that individuals cope with stress

A study by Ciarrochi, Deane, and Anderson (2002) examined whether particular dimensions of Emotional Intelligence were useful in understanding the relationship between stress and mental health (measured by depression, hopelessness and suicide ideation). The authors examined whether the ability to regulate one's own and other's emotions 'protects' people

from the adverse effects of stress more effectively than those who are lower in emotional perception. They suggested that those participants who are lower in emotional perception would be more likely to repress or ignore their feelings and therefore would not realise the adverse effects of stress. Using a sample of university students the authors reported that emotional perception was not directly related to stress or mental health, but that it moderated the relationship between stress and depression, hopelessness and suicide ideation, and suggested that those who are more emotionally perceptive are more likely to be impacted by stress (Carriochi et al., 2002).

2.6 Summary

The nature as well as the definition of all three the constructs were discussed in detail, and related to the role of ATC. Emphasis was also placed on previous research regarding Stress, Emotional Intelligence and Coping. In Chapter 3 the Research Methodology will be discussed with specific emphasis on the research design, sample characteristics and the measurements used. Chapter 4 will report on the research results, and Chapter 5 will focus on the interpretation of the results, conclusions, limitations of the study and recommendations for future research.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Following the discussion of all the relevant theory that pertains to this study, Chapter 3 will discuss the Research Methodology used for the study.

First the research questions will be revisited, focusing on what exactly the study entails and discussing which concepts are emphasised.

Following on that, the focus shifts to the research design, which includes the survey methodology. The next section of Chapter 3 focuses on the sampling design and the procedures followed during data collection.

The Chapter concludes with a discussion of the different data analysis techniques used, and also the theory behind these techniques.

3.2 Research Question

On the basis of the literature review introduced in Chapter 2 and all the previous research done on occupational stress, experienced in the role of air traffic controller, it is safe to assume that air traffic control is a stressful job. However based on this evidence there is no specific study or studies that also include the constructs of emotions and coping into the stress literature on ATCs. As evident from the literature review, it can be said that stressful encounters elicit some emotions within individuals. The need arise to determine how these emotions influences ATCs ability in selecting appropriate coping strategies..

Based on the above discussion and previous evidence, it can be assumed that:

- (a) ATC is a stressful occupation,
- (b) certain emotions are present when being confronted with demands that exceed an ATCs resources,

- (c) Emotional Intelligence assist in recognising and managing these emotions in such a way to
- (d) select the appropriate coping strategies.

Based on this, the following research questions were asked in Chapter 1 and revisited here.

Does the amount of stress experienced and the Emotional Intelligence of the individual and their manager have an effect on coping with stress in the occupation of ATC, and if so to what extent?

The following propositions were then given:

Proposition 1:

There is a significant relationship between stress and Coping Strategies in Air Traffic Controllers.

Proposition 2:

There is a significant relationship between Emotional Intelligence and stress in Air Traffic Controllers.

Proposition 3:

There is a significant relationship between Emotional Intelligence and Coping Strategies in the management of job-related stress in Air Traffic Controllers.

After this presentation of the research question and the propositions it is important to discuss the specific research design followed in this study. A discussion relating to the research design will be presented below, with specific focus on Survey Methodology.

3.3 Research Design

3.3.1 Survey Methodology

The type of study that was performed is an empirical study with primary data collection. Given the fact that individual ATCs were the unit of analysis the researcher made use of survey research. This indicate that what was measured is empirically measurable in the physical world and that primary data was collected, thus previously existing data was not used.

Survey research is a very old research technique. It is perhaps the most frequently used research design in the social sciences. In a review of research published in the *South African Journal of Sociology* during the eighties, the survey was also identified as one of the most common “types of study” (Van Staden & Visser, 1991).

Survey research is one of the most important areas of measurement in applied social research. The broad area of survey research encompasses any measurement procedure that involves asking questions to respondents. A "survey" can be anything from a short paper-and-pencil feedback form to an intensive one-on-one in-depth interview (Trochim, 2006).

Surveys can be divided into two broad categories: the questionnaire and the interview. Questionnaires are usually paper-and-pencil instruments that the respondent completes (as used in this study). Interviews are completed by the interviewer based on what the respondent says. Sometimes, it's hard to tell the difference between a questionnaire and an interview. For instance, some people think that questionnaires always ask short closed-ended questions while interviews always ask broad open-ended ones. But questionnaires with open-ended questions (although they do tend to be shorter than in interviews) are also used and there will often be a series of closed-ended questions asked in an interview (Trochim, 2006).

Like other research designs in social scientific research, surveys have special strengths and weaknesses. Surveys are particularly useful in describing the characteristics of a large population. A carefully selected probability sample in combination with a standardised questionnaire offers the possibility of making refined descriptive assertions about a student body, a city, a country, or any other large population. Surveys, especially self administered ones, make large samples feasible. Surveys of 2 000 respondents are not unusual. A large number of responses is very important for both descriptive and explanatory analyses, especially wherever several variables are to be analysed simultaneously (Babbie, Mouton, Vorster & Prozesky, 2002).

In essence, surveys are flexible. Many questions may be asked on a given topic, giving the researcher considerable flexibility in their analyses. Although experimental design may require the researcher to commit themselves in advance to a particular operational definition of a concept, surveys allow the researcher to develop operational definitions based on actual observations (Babbie et al., 2002).

Finally, standardised questionnaires have an important strength in regard to measurement in general. It can be accepted that most concepts have an ambiguous nature. For example, one person's experience of stress is quite different from another's. Although the researcher must be able to define concepts in those ways most relevant to the research goals, the researcher may not find it easy to apply the same definitions uniformly to all subjects. The survey researcher is bound to this requirement by having to ask exactly the same questions of all subjects and having to assign the same intent to all respondents giving a particular response (Babbie et al., 2002).

Survey research also has several weaknesses. First, the requirement for standardisation just mentioned, often seems to result in the fitting of round pegs into square holes. Standardised questionnaire items often represent the least common denominator in assessing people's attitude, orientations, circumstances and experiences. By designing questions that will be at least minimally appropriate to all respondents, the researcher may miss what is most appropriate to many respondents. In this sense, surveys often appear superficial in their coverage of complex topics. Although this problem can be partly offset through sophisticated analysis, it is inherent in survey research (Babbie et al., 2002).

In many ways, surveys are inflexible. Studies involving direct observation can be modified as field conditions warrant, but surveys typically require that an initial study design remain unchanged throughout. As a qualitative researcher, for example, the researcher may become aware of an important new variable operating in the phenomenon they are studying and begin making careful observations of it. The survey researcher would probably be unaware of the new variable's importance and could do nothing about it in any event (Babbie et al., 2002).

Finally, surveys are subject to the artificiality mentioned earlier in connection with experiments. Finding out that a person gives conservative answers to a questionnaire does not necessarily mean the person is conservative; finding out that a person gives prejudiced answers to a questionnaire does not necessarily mean the person is prejudiced. This shortcoming is especially salient in the realm of action. Surveys cannot measure social action; they can only collect self reports of recalled past action or of prospective or hypothetical action (Babbie et al., 2002).

Survey research is generally weak on validity and strong on reliability. In comparison with field research for example, the artificiality of the survey format puts a strain on validity. As an illustration, people's opinions on issues seldom take the form of strongly agreeing, agreeing, disagreeing or strongly disagreeing with a specific statement. Their survey responses in such cases, then, must be regarded as approximate indicators of what researchers have in mind initially in framing the questions. This comment, however, needs to be held in the context of earlier research of the ambiguity of validity itself. To say something is a valid or an invalid measure assumes the existence of a "real" definition of what is being measured, and many scholars now reject that assumption (Babbie et al., 2002). Reliability is a clearer matter. By presenting all subjects with a standardised stimulus, survey research goes a long way toward eliminating unreliability in observations made by the researcher. Moreover, careful wording of the questions can also reduce significantly the subject's own unreliability (Babbie et al., 2002).

The following section focuses on Sampling Design, with specific emphasis on the sampling procedure and the sample characteristics of this study.

3.4 Sampling Design

The following section highlights the sampling procedure used during this study as well as the sample characteristics of the ATCs who participated in this study.

3.4.1 Sampling Procedure

Sampling methods are classified as either *probability* or *non-probability sampling*. In probability samples, each member of the population has a known non-zero probability of being selected. Probability methods include random sampling, systematic sampling, and stratified sampling. In non-probability sampling, members are selected from the population in some non-random manner. These include convenience sampling, judgement sampling, quota sampling, and snowball sampling.

The advantage of probability sampling is that sampling error can be calculated. Sampling error is the degree to which a sample might differ from the population. When inferring to the population, results are reported plus or minus the sampling error. In non-probability sampling, the degree to which the sample differs from the population remains unknown (Babbie et al., 2002).

A disadvantage of this type of sampling could be that there is no evidence that they are representative of the populations the researcher is interested in generalising to -- and in many cases it would clearly be suspected that they are not.

For this study the researcher made use of a non-probability sampling method known as convenience sampling to obtain the sample of ATCs to partake in the study.

A convenience sample is a sample where the respondents are selected, in part or in whole, at the convenience of the researcher. The researcher makes no attempt, or only a limited attempt, to insure that this sample is an accurate representation of some larger group or population. Due to the fact that there is a limited amount of ATCs in South Africa, and that it is in a way difficult to have access to the ATCs, convenience sampling had to be used to get as many questionnaires completed as possible. Compared to random sampling, where the researchers randomly selects who will complete the questionnaire, the risk is higher in getting fewer responses, due to the fact that we exclude ATCs that has not been randomly selected.

3.4.2 Sample Characteristics

The biographical and background information that was collected regarding the ATCs location, gender and age is important as it gives an indication of the composition of the population, and specific information regarding the sample. This information is depicted below in Tables 3.1, 3.2 and 3.3.

Participants of this study are all registered ATCs. These ATCs are all registered with the Air Traffic and Navigator Services (ATNS), and are actively working at airports within South Africa.

Questionnaires were completed by ATCs from OR Tambo International Airport, Cape Town International Airport and Durban International Airport.

For reasons of confidentiality the respondents were not asked to give their names. Questionnaires could be returned in sealed envelopes which were collected at their place of work, or posted to the researcher. All ATCs from the selected airports were invited to

participate, and participation was voluntary. In the Tables below, information regarding the Location, Gender and Age of the ATCs partaking in this study are presented.

Location:

Table 3.1 Location of ATCs partaking in the study

Location	Number of ATCs	Percentage of ATCs
Johannesburg	25	39.10%
Durban	21	32.80%
Cape Town	18	28.10%
Total	64	100.00%

As indicated in Table 3.1 the largest number of ATCs (25 individuals) that completed this questionnaire are employed at OR Tambo International Airport in Johannesburg. Closely followed by Durban with 21 ATCs and Cape Town with 18 ATCs completing the questionnaire. The difference in the numbers of ATCs could be contributed to the total number of ATCs working at the different airports where questionnaires were distributed. OR Tambo International Airport is by far the largest airport in South Africa and the most ATCs are working there which could directly contribute to a larger number of questionnaires being completed, followed by Cape Town as the second largest and Durban as the third largest with almost similar number of ATCs in service.

Gender:

Table 3.2 Gender of ATCs partaking in the study

Gender	Number of ATC's	Percentage of ATCs
Male	45	70.31%
Female	19	29.69%
Total	64	100.00%

As indicated in Table 3.2, the greater majority of ATCs completing the questionnaire were male (45 ATCs) and only 19 were female. This could mean that on average the occupation of ATCs are predominantly a male orientated occupation.

In previous studies on ATCs this statement are confirmed (e.g. Van der Westhuizen, 2002; Shouksmith & Taylor, 1997).

In the study by Van der Westhuizen (2002) conducted on stress in ATCs working in the civil sector and air force in South Africa, of the 96 ATC partaking in her study, 83 was male (86.5%) and only 13 female (13.5%). In another study by Shouksmith and Taylor (1997) conducted in New Zealand, of the 29 ATCs partaking in the study, 27 was male (93%) and only 2 female (7%).

Age:

Table 3.3 Age in years of ATCs partaking in the study

Age	Number of ATC's	Percentage of ATCs
21 - 25	11	17.19%
26 - 30	27	42.19%
31 - 35	16	25.00%
36 - 40	6	9.38%
> 40	4	6.25%
Total	64	100.00%

As presented in Table 3.3 the age of the ATCs completing the questionnaire varies from 21 years to over 40 years. The largest number of ATCs are between the ages of 26 and 30 years (27 ATCs; 42.19%) with 16 ATCs between the ages of 31 – 35 years.

The following section in this Chapter on the Research Methodology presents the Data Collection method, and the measuring instruments used in the questionnaires.

3.5 Data Collection

In the next section the method of data collection and the different measuring instruments used in the study will be discussed.

3.5.1 Method of data collection

As discussed in section 3.3 of this Chapter, focusing on the research design, the researcher made use of a survey, and a convenience sample.

Based on the fact that there is a limited number of ATCs in South Africa, and also that they do not particularly like completing questionnaires (C. Matthews, personal communication, 6 August 2008), the use of convenience sampling had to be employed, to get as many ATCs as

possible to complete the test battery, and not risk the chance of excluding ATCs if the researcher would have used random sampling.

A total number of 100 questionnaires were posted to the relevant airports in South Africa (OR Tambo International Airport, Cape Town International Airport and Durban International Airport). These three were selected as they were closely related to size, and therefore could be compared to each other. It would be difficult to compare the workload of an ATC working at Durban International Airport to the workload of an ATC working at George or Nelspruit Airport as it might differ greatly, and then also influence their stress levels. It has been mentioned that greater workload could contribute to higher levels of stress.

The managers distributed the questionnaires to all the ATCs and the questionnaires could be completed on a voluntary basis. In total 64 questionnaires were returned, and could be used in this study.

3.5.2 Measuring Instruments

Three major instruments were used in this study: EQ Index (EQI) (Rahim & Psenicka, 2002), Stress Questionnaire (developed by researcher based on the Job Demand-Control Model, and the Stressors of the role of ATC's) and the Coping Strategy Indicator (CSI) (Amirkhan, 1990). Each one of the measuring instruments will be discussed below.

3.5.2.1 Emotional Intelligence

Emotional Intelligence was measured using the EQ Index (EQI) as designed by Rahim and Psenicka, 2002). It consists of two separate questionnaires (one about the test-taker self and one about the test-takers' supervisor). It measures the 5 components defined by Goleman (1995) being, Self-awareness, Self-regulation, Motivation, Empathy and Social Skills.

The competencies are as follows:

1. *Self-awareness*. This is associated with the ability to be aware of which emotions, moods, and impulses one is experiencing and why. This also includes one's awareness of the effects of his or her feelings on others.

2. *Self-regulation*. This refers to the ability to keep one's own emotions and impulses in check, to remain calm in potentially volatile situations, and to maintain composure irrespective of one's emotions.
3. *Motivation*. This represents the ability to remain focused on goals despite setbacks, to operate from hope of success rather than fear of failure, delaying gratification and to accept change to attain goals.
4. *Empathy*. This refers to one's ability to understand the feelings transmitted through verbal and nonverbal messages, to provide emotional support to people when needed, and to understand the links between other's emotions and behaviour.
5. *Social skills*. This is associated with one's ability to deal with problems without demeaning those who work with him or her, to not allow one's own or other's negative feelings to inhibit collaboration, and to handle affective conflict with tact and diplomacy.

The EQI is a 60-item self report instrument. Participants respond on a seven point Likert-type scale (1 = Strongly Disagree; 7=Strongly Agree).

Special attempts were made by the test developer to make the items free from social desirability contamination. Four successive exploratory factor analyses were performed to select items for the EQI (organisational members = 65; employed management students = 365; Chamber of Commerce members = 220, MBA and employed management students = 423). After each factor analysis, the items that loaded less than 0.50 and/or loaded on an uninterpretable factor were dropped or rephrased. About 112 items were considered for inclusion in the instrument (Rahim & Psenicka, 2002).

The internal consistency reliability coefficient of the five subscales of the EQI (self-awareness, self-regulation, motivation, empathy and social skills), as assessed with Chronbach α , ranged between .58 and .95. These coefficients are satisfactory. A South African study by Rahim and Psenicka (2002) found that the Chronbach α for the five dimensions are as follows: Self awareness 0.61; Self regulation 0.83; Motivation 0.79; Empathy 0.82 and Social skills 0.84.

In this study the Chronbach α for the five dimensions within this questionnaire of Emotional Intelligence, has been divided for Emotional Intelligence (Self) and Emotional Intelligence (Manager) as both questionnaires were distributed. These questionnaires evaluated the Emotional Intelligence of the individual as well as how they perceive their manager's Emotional Intelligence. The total reliability score for Emotional Intelligence (Self) (30 items) is .932 and the total score for Emotional Intelligence (Manager) (30 items) is .976. These reliability scores are satisfactory and in line with previous studies.

In Table 3.4 the Chronbach α results for the different dimensions of Emotional Intelligence (Self) and Emotional Intelligence (Manager) are presented.

Table 3.4 Reliability statistics for the dimensions of Emotional Intelligence (Self) and Emotional Intelligence (Manager)

EQ I Dimensions	Chronbach's Alpha	N of Items	N of Items Removed
Self Awareness (Self)	0.803	6	0
Self Regulation (Self)	0.810	6	0
Motivation (Self)	0.542	6	0
Empathy (Self)	0.798	6	0
Social Skills (Self)	0.763	6	0
Self Awareness (Manager)	0.898	6	0
Self Regulation (Manager)	0.915	6	0
Motivation (Manager)	0.852	6	0
Empathy (Manager)	0.932	6	0
Social Skills (Manager)	0.925	6	0

These coefficients, as presented in Table 3.4 are all satisfactory except for that of Motivation (Self) with a low reliability. There would be no significant increase in the reliability of Motivation (Self) if an item would be removed, therefore it was not done.

Overall the total reliability score of the EQI as well as the dimensions are satisfactory.

3.5.2.2 Stress

In order to determine effectively how the main sources of stress presented in Table 2.2 in Chapter 2 are seen as demands and resources, a Likert type questionnaire was utilised. This gave the ATCs the opportunity to determine on a scale of one to seven, where seven is no demand at all and one is a great demand how they experience these stressful factors as identified in Table 2.2.

Occupational stress was measured by formulating questions on the grounds of the Job Demand-Control (JD-C) model and the Work stressors of ATCs as depicted in Table 2.2. This was done to ensure job specificity.

The main aim is to determine according to the ATCs, what they experience as highly stressful and not so stressful in their occupation.

As discussed during the literature study in Chapter 2, it was important to select items for the questionnaire on stress, which is as relevant to the ATCs' job as possible. Previous studies (Shouksmith & Taylor, 1997) also made use of a job specific measure of stress in their research comparing culture with general job stressors in ATCs.

The initial stress questionnaire consisting of 26 items were divided into 6 dimensions which are listed below:

1. Demand (4 items)
2. Operating Procedures (4 items)
3. Working Times (3 items)
4. Work Organisation (7 items)
5. Working Tools (3 items)
6. Working Environment (5 items)

Some of the items of these dimensions have been removed, to improve the overall reliability of the dimension, and are indicated in Table 3.5 below, presenting the reliability results of the dimensions.

The total Chronbach α result for the stress questionnaire (26 items) has been calculated and is .828. This is a satisfactory reliability result.

In Table 3.5 below a summary of the reliability of the dimensions related to stress is presented. These dimensions were highlighted during the discussion of the JD-C model applicable to ATCs in the literature review in Chapter 2.

Table 3.5 Reliability statistics for the dimensions of Stress

Stress Dimensions	Chronbach's Alpha	N of Items	N of Items Removed
Demand	0.813	4	0
Operating Procedures	0.571	3	1
Working Times	0.609	3	0
Working Organisation	0.804	5	2
Work Tools	0.770	3	0
Working Environment.	0.723	4	1

In Table 3.5 above the 6 dimensions of stress and their reliability statistics are presented. The reliability of these statistics is satisfactory. The reason for the removal of items of some of the dimensions is due to those items having a negative impact on the overall reliability of the specific dimension.

3.5.2.3 Coping Strategies

Coping Strategies were measured using the Coping Strategy Indicator (CSI) (Amirkhan, 1990). Respondents read a list of 33 specific coping behaviours, indicating the extent to which each was used to deal with the described event. Responses are summed to form three scales:

- Problem Solving (reflected in such items as “thought about what needed to be done to straighten things out”),
- Seeking Support (e.g. “let your feelings out to a friend”), and
- Avoidance (e.g. “watched television more than usual”).

Scoring is multidimensional and yields a coping profile for each respondent. Thus rather than pigeonholing individuals as “problem solvers” or “avoiders”, the CSI allows more complex patterns or preferences to be exhibited (Amirkhan, 1994).

The CSI has already exhibited desirable psychometric qualities: Its scales have proven to be nearly perfectly orthogonal, free from social desirability influences and internally consistent (alpha coefficients averaging .89). It has also shown good external reliability, with mean test-retest correlations of .82. And the instrument’s validity has been suggested in terms of significant co-variation with established indices of coping, personality and pathology (Amirkhan, 1994).

The total Chronbach α result (33 items) is .857. This is a satisfactory reliability result and compares well with previous studies’ reliability results.

A summary of the reliability of dimensions related to the CSI is presented below in Table 3.6.

Table 3.6 Reliability statistics for the dimensions of Coping

CSI Dimensions	Chronbach's Alpha	N of Items	N of Items Removed
Avoidance	0.778	11	0
Seeking Social Support	0.972	11	0
Problem Solving	0.779	11	0

The Chronbach α for the different dimensions as presented in Table 3.6 above for the CSI in this study is as follows:

Avoidance 0.778; Seeking Social Support 0.927 and Problem Solving 0.779.

These reliability results are all satisfactory and no items had to be removed to improve the reliability results.

In the next section the different data analysis techniques used in this study will be discussed.

3.6 Data analysis techniques

The data analyses discussion focuses on the techniques used in order to analyse and describe the results. It focuses on correlation studies and the non-parametric test of Mann-Whitney, in order to describe differences in the group.

3.6.1 Techniques used

Two types of statistical analyses were done. Mann-Whitney tests distinguish between two differentials (high and low levels of coping) and a correlation study was done to determine the relationships between the three variables (Stress, Emotional Intelligence and Coping Strategies), and the relationships between the dimensions of these variables.

Descriptive statistics were used to describe the possible relationships among the variables (Emotional Intelligence, Stress and Coping Styles).

- **Correlations**

In correlation analysis, researchers ask whether two variables covary. In other words, does Y get larger as X gets larger? For example, does the patient feel dizzy when the doctor increases the dose of a drug? Do people get more diseases when they are under more stress? Correlational analysis is designed primarily to examine linear relationships between variables (Kaplan & Saccuzzo, 2001).

A correlation coefficient is a mathematical index that describes the direction and magnitude of a relationship. Figure 3.1 shows three different types of relationships between variables

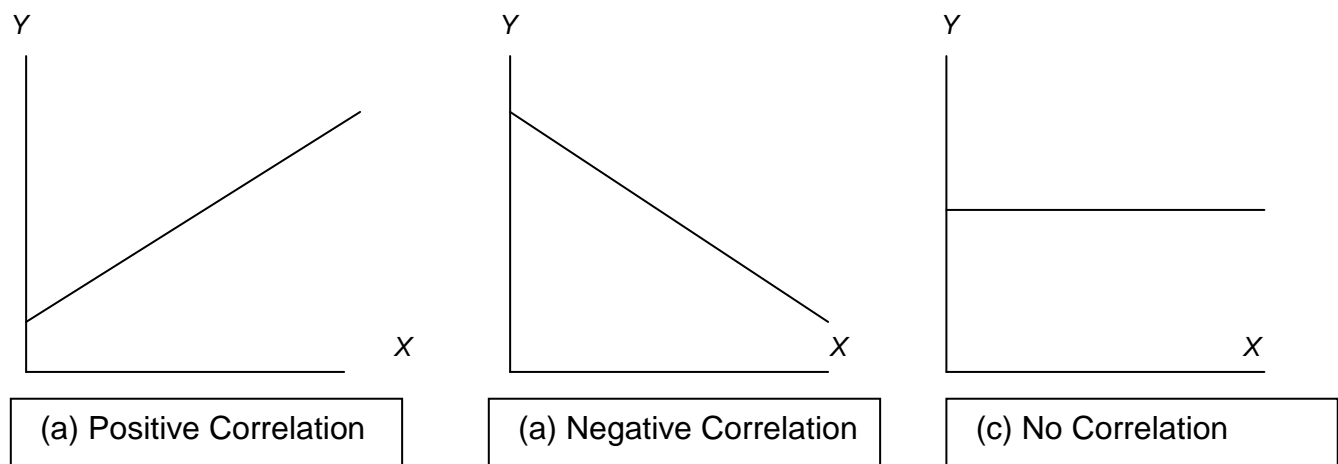


Figure. 3.1 Three hypothetical relationships: (a) positive correlation, (b) negative correlation, (c) no correlation

(Kaplan & Saccuzzo, 2001, p. 67)

Part (a) of the figure demonstrates a positive correlation. This means that high scores on Y are associated with high scores on X, and low scores on Y correspond to low scores on X. Part (b) shows negative correlation. When there is a negative correlation, higher scores on Y is associated with lower scores on X, and lower scores on Y are associated with higher scores on X. This might describe the relationship between barbiturate use and amount of activity: the higher the drug dose, the less active the patients are. Part (c) of Figure 3.1 shows no correlation, or a situation in which the variables are not related. Here, scores on X do not give us information about scores on Y. An example of this sort of relationship is the lack of correlation between shoe size and IQ. There are many ways to calculate the correlation coefficient. All involve pairs of observations: For each observation on one variable, there is an observation on one other variable for the same person (Kaplan & Saccuzzo, 2001).

The next statistical method that will be discussed is the Mann-Whitney test.

- **Mann-Whitney test**

The Mann-Whitney test is a non-parametric test for comparing the central tendency of two independent samples. It is used for testing differences between means and when there are two conditions and different subjects that have been used in each condition (Field, 2000). This test often is thought of as the distribution-free analogue of the T-test for two independent samples, although it tests a slightly different, and broader, null hypothesis. Its null hypothesis is the hypothesis that two samples were drawn at random from identical populations (not just populations with the same mean), but it is especially sensitive to population differences in central tendency (Howell, 2004).

3.7 Summary

The study will attempt to prove very useful in the current context of ATCs, as it is seen as one of the most highly stressful occupations. If the expected results are proved, stress can be better managed by the development of higher Emotional Intelligence for those job incumbents.

It is recommended that further research should be conducted on this field as there might be other relevant constructs not included yet, for example traumatic stress, and burnout.

CHAPTER 4: RESEARCH RESULTS

4.1 Introduction

In this Chapter focus will be on revisiting the aims of the study, followed by the presentation of the results based on the questionnaires completed by the ATCs in the sample.

As presented in Chapter 1, the aim and purpose of this study was to determine whether ATCs' Emotional Intelligence might have an effect on the recognition and management of stressful situations in the occupation of air traffic control. The focus is also on determining the ATCs' stress levels and their relationship with coping strategies. In other words, will higher Emotional Intelligence assist ATCs in recognising the emotions they experience while dealing with a stressful encounter. Based on this, the question is how will the management of emotions elicited by stressful encounters, assist ATCs in selecting the appropriate coping strategy to effectively deal with the stressful encounter they experience?

After completion of the survey by the participating ATCs, the data was processed to provide descriptive and comparative statistics by means of the relevant data analysis techniques as discussed in Chapter 3.

The results will be presented in terms of the dependent variable (Coping) and the two independent variables (Stress and Emotional Intelligence).

The following propositions have been given in Chapter 1 and are revisited below:

Proposition 1:

There is a significant relationship between Stress and Coping Strategies in Air Traffic Controllers.

Proposition 2:

There is a significant relationship between Emotional Intelligence and Stress in Air Traffic Controllers.

Proposition 3:

There is a significant relationship between Emotional Intelligence and Coping Strategies in the management of job-related stress in Air Traffic Controllers.

The research results were analysed and will be reported on, in three areas. The discussion will start by focusing on the means of the stress questionnaire items, in order to determine what the sample of ATCs perceived as most stressful in their occupation according to their responses on the items of the questionnaire.

This will be followed by presenting the correlation results, and then focusing on Mann-Whitney test results to determine the differences between ATCs high on coping and ATCs low on coping and how this is related to the independent variables. These results will be presented in the following paragraphs.

4.2 Mean Ratings for Stress Scores of ATCs in this sample

Mean scores for each item in the stress questionnaire was calculated in order to rank their importance as stressors. The range of item scores was between 2.4062 (Number of aircrafts under your control) and 4.7812 (Shift and night work) with an overall mean of 3.5451. These statistics are presented in Table 4.1 and 4.2. Table 4.1 indicates the mean rating of the items in the stress questionnaire and the rank those items have, according to how stressful the item is viewed by the respondent.

The following needs to be highlighted: The higher the mean rating, the less it is seen as stressful, and the lower the mean, the more stressful that item is seen. This is reflected in the ranking of each item in Table 4.1. The item with the lowest mean has the highest rating according to how stressful it is perceived by the ATCs that completed the questionnaire.

Table 4.1 Mean ratings and ranks for stress item scores

Stress Item	Ranking	Mean
1. Number of aircrafts under your control	1	2.4062
2. Peak traffic hours	4	2.5312
3. Extraneous traffic	2	2.4531
4. Unforeseeable events	3	2.5156
5. Having to work under strict time pressures	19	4.0000
6. Having to bend the rules	16	3.6875
7. Feeling a loss of control	15	3.6094
8. Fear of consequences of errors	7	3.0469
9. Unbroken duty periods	9	3.2969
10. Shift and night work	27	4.7812
11. Excessive hours of work	14	3.5156
12. Role ambiguity	23	4.2812
13. Relations with supervisors and colleagues	21	4.1719
14. Lack of control over work processes	13	3.4844
15. Inadequacies in training	11	3.4688
16. Limitations and reliability of equipment	5	2.5781
17. VDT/R/T and telephone quality	12	3.4844
18. Equipment layout	18	3.9375
19. Conditions of employment	10	3.375
20. Lighting, optical reflection	26	4.5156
21. Noise/distraction	24	4.2969
22. Micro-climate	25	4.3594
23. Bad posture	20	4.1406
24. Rest and canteen facilities	17	3.7656
25. Salary	6	2.6406
26. Public Opinion	22	4.2031
27. Insufficient appreciation of controller's skills	8	3.1719

Based on the information presented in Table 4.1, all items were judged to produce some stress, however the following items were judged to produce very little stress: Items 10 (Shift and night work), item 20 (Lighting, optical reflection), item 22 (Micro-climate), item 21 (Noise/distraction), item 12 (Role ambiguity) and item 26 (Public Opinion).

It is also of importance in this study to determine which items, however, were seen as most stressful for the ATCs completing the questionnaires. Turning to those aspects judged highly stressful, the top ten items in rank order of stressfulness, are shown in Table 4.2.

Table 4.2 Top ten stressors

Ranking	Stress Item in Sample
1	1. Number of aircrafts under your control
2	3. Extraneous traffic
3	4. Unforeseeable events
4	2. Peak traffic hours
5	16. Limitations and reliability of equipment
6	25. Salary
7	8. Fear of consequences of errors
8	27. Insufficient appreciation of controller's skills
9	9. Unbroken duty periods
10	19. Conditions of employment

As can be seen in Table 4.2 above, item 1 in the questionnaire, the number of aircrafts under your control is seen as the number one most stressful factor for the ATCs in this study. Secondly is extraneous traffic, closely followed by unforeseeable events and peak traffic hours.

The following section presents the correlation results, and focuses on the overall correlation between the three constructs as well as the correlation between the different dimensions of the three constructs.

4.3 Correlation Results

The first aim as presented in Chapter 1 was to determine whether there is a relationship between the overall results of the three constructs used in this study: Stress (as measured by the job specific stress questionnaire), Emotional Intelligence (as measured by the EQI) and Coping (as measured by the CSI). In the following section these results will be presented.

The first relationship that will be presented is between the total score of Stress, Coping and Emotional Intelligence (Self) and Emotional Intelligence (Manager). In the second part of presenting the correlation results, the different relationships between the dimensions of the constructs will be presented. As mentioned in the introduction of this Chapter, these results are presented in terms of the dependent variable (Coping) and the independent variables (Stress and Emotional Intelligence).

The relationship between the different variables was produced by means of the Pearson-coefficient.

4.3.1 The relationship between total scores of Stress, Coping, Emotional Intelligence (Self) and Emotional Intelligence (Manager)

The first proposition was to determine whether there is a relationship between stress (as measured by the job specific stress questionnaire) and coping (as measured by the Coping Strategy Indicator) in the occupation of air traffic control.

Table 4.3 below presents the correlation results for the total scores of all the constructs. In the following sections more detail will be presented regarding the relationships between the dimensions of the constructs.

Table 4.3 Correlation results for the total scores of Stress, Emotional Intelligence and Coping

		Stress	Coping	EI (Self)	EI (Manager)
Stress	Pearson Correlation	1.000	0.008	-0.102	0.159
	Sig. (2-tailed)		0.948	0.424	0.209
Coping	Pearson Correlation	0.008	1.000	0.143	-0.112
	Sig. (2-tailed)	0.948		0.260	0.376
EI (Self)	Pearson Correlation	-0.102	0.143	1.000	.356**
	Sig. (2-tailed)	0.424	0.260		0.004
EI (Manager)	Pearson Correlation	0.159	-0.112	0.356**	1.000
	Sig. (2-tailed)	0.209	0.376	0.004	

N=64; ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed)

In Table 4.3 above, it is evident that there is no significant relationship between the total scores of Coping and Stress, between Stress and Emotional Intelligence (Self) or Stress and Emotional Intelligence (Manager), nor is there a relationship between the total Correlation result of Emotional Intelligence (Self) and Emotional Intelligence (Manager) and Coping. There is however a significant relationship between the total scores of Emotional Intelligence (Self) and Emotional Intelligence (Manager) ($r = .356$; $n = 64$; $p = .004$).

In the following sections the results related to the relationships between the different dimensions of the three constructs are presented.

4.3.2 Presenting the correlation results between the dimensions of the constructs (Coping, Stress and Emotional Intelligence)

As hypothesised in Chapter 1 and revisited in the introduction of this Chapter, the three broad propositions also include the need to explore whether there are relationships between the dimensions of the different constructs (Stress, Coping and Emotional Intelligence). In the discussion of the correlation results of the dimensions it has been decided to report on the self and manager's results of Emotional Intelligence separately. These results are presented in Table 4.4 and 4.5 below. Table 4.4 focuses on the relationship between the dimensions of Emotional Intelligence (Self), the dimensions of Coping and the dimensions of Stress. Table 4.5 focuses on the relationship between the dimensions of Emotional Intelligence (Manager) and the dimensions of Coping and the dimensions of Stress.

4.3.2.1 The relationship between the dimensions of Stress and the dimensions of Coping

As presented in Table 4.4 below, it can be concluded according to these results that there is no significant relationship between the dimensions of Coping and the dimensions of Stress in this sample of ATCs. Therefore the first proposition could be rejected, based on these results. There is however a relationship within the dimensions of Coping. The dimension Problem Solving correlates with the dimension Seeking Social Support ($r = .370$; $n = 64$; $p = .003$).

Furthermore, there are also a number of correlations within the dimensions of stress in this study. The stress dimension, Demand, correlates significantly with the stress dimensions of Operating Procedure ($r = .395$; $n = 64$; $p = .001$), Working Organisation ($r = .287$; $n = 64$; $p = .022$) and Working Environment ($r = .365$; $n = 64$; $p = .003$), indicating that there is a relationship between these dimensions. The stress dimension Working Times has a relationship with Working Organisation ($r = .248$; $n = 64$; $p = .048$), and the stress dimension Working Tools, correlates with Operating Procedures ($r = .259$; $n = 64$; $p = .038$), Working Organisation ($r = .284$; $n = 64$; $p = .023$) and Working Environment ($r = .280$; $n = 64$; $p = .025$). Furthermore, Operating Procedures also indicates relationships with Working Organisation ($r = .252$; $n = 64$; $p = .044$) and Working Environment ($r = .462$; $n = 64$; $p = .000$). Lastly, it can be seen that there is also a relationship between the stress dimension Working Environment and Working Organisation ($r = .388$; $n = .64$; $p = .006$).

Table 4.4 Correlation results for the relationship between the dimensions Emotional Intelligence (Self), Coping and Stress

		PS	SSS	AVOID	SA_SELF	SR_SELF	MOT_SELF	EMP_SELF	SOCSK_SELF	DEMAND	WRKTIM	WRK TOO	OPROC	WRK ORG	WRK ENV
PS	Pearson Correlation	1.000	.370**	0.054	.329**	0.194	.284*	.410**	.260*	-0.058	-0.005	-0.017	0.061	0.128	-0.059
	Sig. (2-tailed)		0.003	0.672	0.008	0.124	0.023	0.001	0.038	0.647	0.967	0.893	0.633	0.314	0.646
SSS	Pearson Correlation	.370**	1.000	0.035	0.066	-0.175	0.063	0.122	-0.067	0.229	-0.026	0.013	0.052	0.154	0.188
	Sig. (2-tailed)	0.003		0.786	0.604	0.167	0.621	0.339	0.601	0.068	0.840	0.918	0.683	0.226	0.137
AVOID	Pearson Correlation	0.054	0.035	1.000	0.235	-0.218	0.234	-0.043	-0.081	-0.098	0.176	0.093	0.072	0.129	0.089
	Sig. (2-tailed)	0.672	0.786		0.062	0.084	0.062	0.735	0.523	0.441	0.165	0.465	0.573	0.310	0.487
SA_SELF	Pearson Correlation	.329**	0.066	-0.235	1.000	.669**	.618**	.805**	.703**	-0.132	0.117	0.142	-0.040	0.027	0.060
	Sig. (2-tailed)	0.008	0.604	0.062		0.000	0.000	0.000	0.000	0.300	0.358	0.264	0.754	0.834	0.639
SR_SELF	Pearson Correlation	0.194	-0.175	-0.218	.669**	1.000	.576**	.688**	.747**	-0.163	0.142	0.105	-0.061	0.049	-0.134
	Sig. (2-tailed)	0.124	0.167	0.084	0.000		0.000	0.000	0.000	0.198	0.263	0.409	0.630	0.703	0.291
MOT_SELF	Pearson Correlation	.284*	0.063	-0.234	.618**	.576**	1.000	.682**	.643**	-0.037	0.122	0.138	0.097	0.130	0.088
	Sig. (2-tailed)	0.023	0.621	0.062	0.000	0.000		0.000	0.000	0.773	0.336	0.275	0.446	0.305	0.489
EMP_SELF	Pearson Correlation	.410**	0.122	-0.043	.805**	0.688**	.682**	1.000	.703**	-0.196	0.059	0.163	0.011	0.066	-0.028
	Sig. (2-tailed)	0.001	0.339	0.735	0.000	0.000	0.000		0.000	0.120	0.643	0.198	0.930	0.605	0.824
SOCSK_SELF	Pearson Correlation	.260*	-0.067	-0.081	.703**	.747**	.643**	.703**	1.000	-0.149	0.041	0.193	0.093	0.018	0.035
	Sig. (2-tailed)	0.038	0.601	0.523	0.000	0.000	0.000	0.000		0.240	0.746	0.126	0.463	0.887	0.785
DEMAND	Pearson Correlation	-0.058	0.229	-0.098	0.132	-0.163	0.037	-0.196	-0.149	1.000	-0.083	-0.146	.395**	.287*	.365**
	Sig. (2-tailed)	0.647	0.068	0.441	0.300	0.198	0.773	0.120	0.240		0.516	0.248	0.001	0.022	0.003
WRKTIM	Pearson Correlation	-0.005	-0.026	0.176	0.117	0.142	0.122	0.059	0.041	-0.083	1.000	0.229	0.077	.248*	0.188
	Sig. (2-tailed)	0.967	0.840	0.165	0.358	0.263	0.336	0.643	0.746	0.516		0.069	0.543	0.048	0.136
WRKTOO	Pearson Correlation	-0.017	0.013	0.093	0.142	0.105	0.138	0.163	0.193	-0.146	0.229	1.000	.259*	.284*	.280*
	Sig. (2-tailed)	0.893	0.918	0.465	0.264	0.409	0.275	0.198	0.126	0.248	0.069		0.038	0.023	0.025
OPROC	Pearson Correlation	0.061	0.052	0.072	0.040	-0.061	0.097	0.011	0.093	.395**	0.077	.259*	1.000	.252*	.462**
	Sig. (2-tailed)	0.633	0.683	0.573	0.754	0.630	0.446	0.930	0.463	0.001	0.543	0.038		0.044	0.000
WRKORG	Pearson Correlation	0.128	0.154	0.129	0.027	0.049	0.130	0.066	-0.018	.287*	.248*	.284*	.252*	1.000	.388**
	Sig. (2-tailed)	0.314	0.226	0.310	0.834	0.703	0.305	0.605	0.887	0.022	0.048	0.023	0.044		0.006
WRKENV	Pearson Correlation	-0.059	0.188	0.089	0.060	-0.134	0.088	-0.028	0.035	.365**	0.188	.280*	.462**	.388**	1.000
	Sig. (2-tailed)	0.646	0.137	0.487	0.639	0.291	0.489	0.824	0.785	0.003	0.136	0.025	0.000	0.006	

N = 64, ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

PS = Problem Solving; SSS = Seeking Social Support; AVOID = Avoidance; SA = Self Awareness; SR = Self Regulation; MOT = Motivation; EMP = Empathy; SOCSK = Social Skills; WRKTIM = Working Times; WRKTOO = Working Tools; OPROC = Operating Procedures; WRKORG = Working Organisation; WRKENV = Working Environment

4.3.2.2 The relationship between the dimensions of Stress and the dimensions of Emotional Intelligence (Self)

The second proposition stated that there would be a relationship between stress and Emotional Intelligence (Self) and Emotional Intelligence (Manager) as measured by the EQI. It has been decided to report on the self and the manager's results of Emotional Intelligence separately. In this section focus will only be given to Emotional Intelligence (Self). This correlation is also presented in Table 4.4 above.

From the table it is clear that there is no correlation between the dimensions of Stress and the dimensions of Emotional Intelligence (Self).

4.3.2.3 The relationship between the dimensions of Stress and the dimensions of Emotional Intelligence (Manager)

As mentioned in the previous paragraph, proposition 2 also includes the relationship between the dimensions of Stress and the dimensions of Emotional Intelligence (Manager). In this section the relationship between the dimensions of Stress (as measured by the job-specific questionnaire) and the dimensions of Emotional Intelligence (Manager) (as measured by the EQI) will be presented and discussed.

As mentioned earlier it has been decided to report on the self and manager's results of Emotional Intelligence separately. Table 4.5 presents the results on the relationship between the dimensions of Emotional Intelligence (Manager) and the dimensions of Emotional Intelligence (Self).

From Table 4.5 below, it can be noted that there are several significant correlations between the dimensions of stress, and the dimensions of Emotional Intelligence (Manager).

Presented in the table below there is a relationship between the dimension of stress: Operating Procedures and the dimensions of Emotional Intelligence (Manager): Motivation ($r = .246$; $n = 64$; $p = .050$), Empathy ($r = .295$; $n = 64$; $p = .018$) and Social Skills ($r = .287$; $n = 64$; $p = .022$).

Table 4.5 Correlation results for the relationship between the dimensions of Emotional Intelligence (Manager), Coping and Stress

		PS	SSS	AVOID	SA_MAN	SR_MAN	MOT_MAN	EMP_MAN	SOCSK_MAN	DEMAND	WRKTIM	WRK TOO	OPROC	WRK ORG	WRK ENV
PS	Pearson Correlation	1.000	.370**	0.054	0.046	0.074	0.177	0.084	0.057	-0.058	-0.005	-0.017	0.061	0.128	-0.059
	Sig. (2-tailed)		0.003	0.672	0.717	0.561	0.161	0.509	0.653	0.647	0.967	0.893	0.633	0.314	0.646
SSS	Pearson Correlation	.370**	1.000	0.035	-0.036	-0.084	0.020	-0.080	-0.072	0.229	-0.026	0.013	0.052	0.154	0.188
	Sig. (2-tailed)	0.003		0.786	0.775	0.507	0.876	0.538	0.571	0.068	0.840	0.918	0.683	0.226	0.137
AVOID	Pearson Correlation	0.054	0.035	1.000	-0.077	-0.060	0.090	0.007	-0.077	-0.098	0.176	0.093	0.072	0.129	0.089
	Sig. (2-tailed)	0.672	0.786		0.547	0.639	0.480	0.954	0.544	0.441	0.165	0.465	0.573	0.310	0.487
SA_MAN	Pearson Correlation	0.046	-0.036	-0.077	1.000	.788**	.726**	.895**	.898**	0.154	-0.121	0.093	0.200	0.122	0.058
	Sig. (2-tailed)	0.717	0.775	0.547		0.000	0.000	0.000	0.000	0.226	0.342	0.466	0.114	0.338	0.650
SR_MAN	Pearson Correlation	0.074	-0.084	-0.060	.788**	1.000	.716**	.759**	.829**	-0.007	-0.003	0.056	0.177	-0.052	-0.054
	Sig. (2-tailed)	0.561	0.507	0.639	0.000		0.000	0.000	0.000	0.956	0.979	0.658	0.161	0.683	0.672
MOT_MAN	Pearson Correlation	0.177	0.020	0.090	.726**	.716**	1.000	.842**	.814**	0.023	0.062	0.069	.246*	0.119	0.015
	Sig. (2-tailed)	0.161	0.876	0.480	0.000	0.000		0.000	0.000	0.858	0.624	0.589	0.050	0.349	0.907
EMP_MAN	Pearson Correlation	0.084	-0.080	0.007	.895**	.759**	.842**	1.000	.916**	0.158	-0.033	0.030	.295*	0.147	0.050
	Sig. (2-tailed)	0.509	0.538	0.954	0.000	0.000	0.000		0.000	0.213	0.796	0.814	0.018	0.246	0.693
SOCSK_MAN	Pearson Correlation	0.057	-0.072	-0.077	.898**	.829**	.814**	.916**	1.000	0.146	-0.109	0.022	.287*	0.075	0.078
	Sig. (2-tailed)	0.653	0.571	0.544	0.000	0.000	0.000	0.000		0.249	0.360	0.863	0.022	0.556	0.541
DEMAND	Pearson Correlation	-0.058	0.229	-0.098	0.154	-0.007	0.023	0.158	0.146	1.000	-0.083	-0.146	.395**	.287*	.365**
	Sig. (2-tailed)	0.647	0.068	0.441	0.226	0.956	0.858	0.213	0.249		0.516	0.248	0.001	0.022	0.003
WRKTIM	Pearson Correlation	-0.005	-0.026	0.176	-0.121	-0.003	0.062	-0.033	-0.109	-0.083	1.000	0.229	0.077	.248*	0.188
	Sig. (2-tailed)	0.967	0.840	0.165	0.342	0.979	0.624	0.796	0.360	0.516		0.069	0.543	0.048	0.136
WRKTOO	Pearson Correlation	-0.017	0.013	0.093	0.093	0.056	0.069	0.030	0.022	-0.146	0.229	1.000	.259*	.284*	.280*
	Sig. (2-tailed)	0.893	0.918	0.465	0.466	0.658	0.589	0.814	0.863	0.248	0.069		0.038	0.023	0.025
OPROC	Pearson Correlation	0.061	0.052	0.072	0.200	0.177	.246*	.295*	.287*	.395**	0.077	.259*	1.000	.252*	.462**
	Sig. (2-tailed)	0.633	0.683	0.573	0.114	0.161	0.050	0.018	0.022	0.001	0.543	0.038		0.044	0.000
WRKORG	Pearson Correlation	0.128	0.154	0.129	0.122	-0.052	0.119	0.147	0.075	.287*	.248*	.284*	.252*	1.000	.388**
	Sig. (2-tailed)	0.314	0.226	0.310	0.338	0.683	0.349	0.246	0.556	0.022	0.048	0.023	0.044		0.006
WRKENV	Pearson Correlation	-0.059	0.188	0.089	0.058	-0.054	0.015	0.050	0.078	.365**	0.188	.280*	.462**	.388**	1.000
	Sig. (2-tailed)	0.646	0.137	0.487	0.650	0.672	0.907	0.693	0.541	0.003	0.136	0.025	0.000	0.006	

N = 64, ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

PS = Problem Solving; SSS = Seeking Social Support; AVOID = Avoidance; SA = Self Awareness; SR = Self Regulation; MOT = Motivation; EMP = Empathy; SOCSK = Social Skills; WRKTIM = Working Times; WRKTOO = Working Tools; OPROC = Operating Procedures; WRKORG = Working Organisation; WRKENV = Working Environment

4.3.2.4 The relationship between the dimensions of Emotional Intelligence (Self) and the dimensions of Coping

The third proposition, as mentioned in the introduction, states that there would be a relationship between Emotional Intelligence and Coping. In this section the relationship between the dimensions of Emotional Intelligence (Self) and the dimensions of Coping is explored. The section following this will explore the relationship between the dimensions Emotional Intelligence (Manager) and the dimensions of Coping.

As presented in Table 4.4 above, various significant relationships are apparent. First it can be noted that there is a relationship between the coping dimension Problem Solving and the coping dimension Seeking Social Support ($r = .370$; $n = 64$; $p = .003$).

There are also relationships between the coping dimension Problem Solving and the following dimensions of Emotional Intelligence (Self): Self Awareness ($r = .329$; $n = 64$; $p = .008$), Motivation ($r = .284$; $n = 64$; $p = .023$), Empathy ($r = .410$; $n = 64$; $p = .001$) and Social Skills ($r = .260$; $n = 64$; $p = .038$).

4.3.2.5 The relationship between the dimensions of Emotional Intelligence (Manager) and the dimensions of Coping

Following on the discussion above, the next focus is on the relationship between the dimensions of Emotional Intelligence (Manager) and the dimensions of Coping.

As noted in Table 4.5 there is no correlation between the three dimensions of Coping with any of the dimensions of Emotional Intelligence (Manager).

4.3.2.6 The relationship between the dimensions of Emotional Intelligence (Self) and Emotional Intelligence (Manager)

In the last correlation results that will be presented, focus is placed on the relationship between the dimensions of Emotional Intelligence (Self) compared to the dimensions of Emotional Intelligence (Manager). These results are presented in Table 4.6 below.

Table 4.6 Correlation results for the relationship between the dimensions of Emotional Intelligence (Self) and Emotional Intelligence (Manager)

		SA_SELF	SR_SELF	MOT_SELF	EMP_SELF	SOCSK_SELF	SA_MAN	SR_MAN	MOT_MAN	EMP_MAN	SOCSK_MAN
SA_SELF	Pearson Correlation	1.000	.669**	.618**	.805**	.703**	.410**	.423**	.254*	.335**	.368**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.001	0.000	0.043	0.007	0.003
SR_SELF	Pearson Correlation	.669**	1.000	.576**	.688**	0.747**	.279*	.340**	0.241	.284*	.336**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.025	0.006	0.055	0.023	0.007
MOT_SELF	Pearson Correlation	.618**	.576**	1.000	.682**	.643**	.383**	.424**	.379**	.377**	.449**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.002	0.000	0.002	0.002	0.000
EMP_SELF	Pearson Correlation	.805**	.688**	.682**	1.000	.703**	.421**	.431**	.389**	.432**	.439**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.001	0.000	0.001	0.000	0.000
SOCSK_SELF	Pearson Correlation	.703**	0.747**	.643**	.703**	1.000	.400**	.465**	.357**	.406**	.522**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.001	0.000	0.004	0.001	0.000
SA_MAN	Pearson Correlation	.410**	.279*	.383**	.421**	.400**	1.000	.778**	.726**	.895**	.898**
	Sig. (2-tailed)	0.001	0.025	0.002	0.001	0.001		0.000	0.000	0.000	0.000
SR_MAN	Pearson Correlation	.423**	.340**	.424**	.431**	.465**	.778**	1.000	.716**	.759**	.829**
	Sig. (2-tailed)	0.000	0.006	0.000	0.000	0.000	0.000		0.000	0.000	0.000
MOT_MAN	Pearson Correlation	.254*	0.241	.379**	.389**	.357**	.726**	.716**	1.000	.842**	.814**
	Sig. (2-tailed)	0.043	0.055	0.002	0.001	0.004	0.000	0.000		0.000	0.000
EMP_MAN	Pearson Correlation	.335**	.284*	.377**	.432**	.406**	.895**	.759**	.842**	1.000	.916**
	Sig. (2-tailed)	0.007	0.023	0.002	0.000	0.001	0.000	0.000	0.000		0.000
SOCSK_MAN	Pearson Correlation	.368**	.336**	.449**	.439**	.522**	.898**	.829**	.814**	.916**	1.000
	Sig. (2-tailed)	0.003	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

N = 64, ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

SA = Self Awareness; SR = Self Regulation; MOT = Motivation; EMP = Empathy; SOCSK = Social Skills

From Table 4.6 above it is clear that the dimensions of Emotional Intelligence (Self) correlate with all the dimensions of Emotional Intelligence (Manager), except for one relationship. There is no correlation between the dimension Self Regulation (Self) and Motivation (Manager).

In Table 4.6 it is also noted that there are some inter-correlations within the dimensions of Emotional Intelligence (Self) as well as inter-relationships within the dimensions of Emotional Intelligence (Manager). These inter-correlations are presented below.

There are significant relationships within the dimension of Emotional Intelligence (Self). It is presented that Self Awareness in the individual has a significant relationship with Self Regulation (Self) ($r = .669$; $n = 64$; $p = .000$), Motivation (Self) ($r = .618$; $n = 64$; $p = .000$), Empathy (Self) ($r = .805$; $n = 64$; $p = .000$) as well as Social Skills (Self) ($r = .703$; $n = 64$; $p = .000$). Self Regulation correlates significantly with Motivation (Self) ($r = .576$; $n = 64$; $p = .000$), Empathy (Self) ($r = .688$; $n = 64$; $p = .000$) and Social Skills (Self) ($r = .747$; $n = 64$; $p = .000$). Motivation also correlates significantly with Empathy (Self) ($r = .682$; $n = 64$; $p = .000$) and Social Skills (Self) ($r = .643$; $n = 64$; $p = .000$), and lastly Empathy (Self) also correlates significantly with Social Skills (Self) ($r = .703$; $n = 64$; $p = .000$).

There are also significant relationships within the dimensions of Emotional Intelligence (Manager). There is a significant relationship between Self Awareness (Man) and Self Regulation (Man) ($r = .778$; $n = 64$; $p = .000$), Motivation (Man) ($r = .726$; $n = 64$; $p = .000$), Empathy (Man) ($r = .895$; $n = 64$; $p = .000$) and Social Skills (Man) ($r = .898$; $n = 64$; $p = .000$), between Self Regulation (Man) and Motivation (Man) ($r = .716$; $n = 64$; $p = .000$), Empathy (Man) ($r = .759$; $n = 64$; $p = .000$) and Social Skills (Man) ($r = .829$; $n = 64$; $p = .000$), between Motivation (Man) and Empathy (Man) ($r = .842$; $n = 64$; $p = .000$) and Social Skills (Man) ($r = .814$; $n = 64$; $p = .000$) and lastly between Empathy (Man) and Social Skills (Man) ($r = .916$; $n = 64$; $p = .000$).

In the following section the results of the Mann-Whitney tests will be presented.

4.4 Results of between groups analysis

4.4.1 Mann-Whitney tests: the impact of high or low levels of Coping on Stress and Emotional Intelligence

Although no significant correlations were found between Stress and Coping, the current study investigated possible differences related to Coping and Stress, and Coping and Emotional Intelligence. Significant differences would possibly indicate relationships between Coping and Stress, and Coping and Emotional Intelligence. In the following paragraphs these differences will be presented by means of Mann-Whitney statistics.

4.4.1.1 Differences between ATCs high or low on Problem Solving related to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

As mentioned in Chapter 3, the differences between high or low levels of the dimensions of coping related to the other constructs were measured by means of a Mann-Whitney test. Table 4.7 below presents the results for individuals high or low on Problem Solving in relation to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress.

Table 4.7 Mann-Whitney test results comparing ATCs high or low on Problem Solving with Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
EI_SELF	PS_LOW	20	18.22	154.500	0.141
	PS_HIGH	21	23.64		
EI_MAN	PS_LOW	20	20.00	190.000	0.598
	PS_HIGH	21	21.95		
STRESS	PS_LOW	20	20.50	200.000	0.791
	PS_HIGH	21	21.48		

From the above table it is clear that there is no difference between individuals high on the dimension of Problem Solving compared to the individuals low on Problem Solving relating to their Emotional Intelligence or Stress levels.

4.4.1.2 Differences between ATCs high or low on Seeking Social Support related to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Table 4.8 below presents the results for individuals high or low on Seeking Social Support in relation to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress.

Table 4.8 Mann-Whitney test results comparing ATCs high or low on Seeking Social Support with Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
EI_SELF	SSS_LOW	19	23.50	161.500	0.207
	SSS_HIGH	22	18.84		
EI_MAN	SSS_LOW	19	20.95	208.000	0.979
	SSS_HIGH	22	21.05		
STRESS	SSS_LOW	19	17.00	133.000	0.043*
	SSS_HIGH	22	24.45		

From the above table one significant difference can be noted. There is a significant difference between ATCs high on the Coping dimension of Seeking Social Support, and ATCs low on the coping dimension of Seeking Social Support, regarding their stress levels ($U\text{-value} = 133.0000; p = .043$). It could thus be said that individuals high in Seeking Social Support also manage stress levels better.

4.4.1.3 Differences between ATCs high or low on Avoidance related to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Table 4.9 below presents the results for individuals high or low on Avoidance in relation to Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress.

Table 4.9 Mann-Whitney test results comparing ATCs high or low on Avoidance with Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
EI_SELF	AVOID_LOW	17	25.21	200.500	0.370
	AVOID_HIGH	28	21.66		
EI_MAN	AVOID_LOW	17	22.85	235.500	0.953
	AVOID_HIGH	28	23.09		
STRESS	AVOID_LOW	17	22.68	232.500	0.896
	AVOID_HIGH	28	23.20		

From the above Table it is clear that there is no difference between individuals high on the dimension of Avoidance compared to the individuals low on Avoidance relating to their Emotional Intelligence or stress levels.

4.4.1.4 Differences between ATCs high or low on Problem Solving related to the dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Table 4.10 below presents the results for individuals high or low on Problem Solving in relation to the dimensions of Emotional Intelligence (Self), the dimensions of Emotional Intelligence (Manager) and the dimensions of Stress.

Table 4.10 Mann-Whitney test results comparing ATCs high or low on Problem Solving with all dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
DEMAND	PS_LOW	20	22.40	182.000	0.453
	PS_HIGH	21	19.67		
WRKTIM	PS_LOW	20	21.15	207.000	0.937
	PS_HIGH	21	20.86		
WRKTOO	PS_LOW	20	21.70	196.000	0.714
	PS_HIGH	21	20.33		
OPROC	PS_LOW	20	21.90	192.000	0.632
	PS_HIGH	21	20.14		

Table 4.10 Mann-Whitney test results comparing ATCs high or low on Problem Solving with all dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress (Continued)

WRKORG	PS_LOW	20	20.50	200.000	0.794
	PS_HIGH	21	21.48		
WRKENV	PS_LOW	20	21.98	190.500	0.605
	PS_HIGH	21	20.07		
SA_EI_SELF	PS_LOW	20	16.98	129.500	0.035*
	PS_HIGH	21	24.83		
SR_EI_SELF	PS_LOW	20	19.28	175.500	0.367
	PS_HIGH	21	22.64		
MOT_EI_SELF	PS_LOW	20	17.22	134.500	0.048*
	PS_HIGH	21	24.60		
EMP_EI_SELF	PS_LOW	20	16.18	113.500	0.012*
	PS_HIGH	21	25.60		
SOCSK_EI_SELF	PS_LOW	20	18.38	157.500	0.170
	PS_HIGH	21	23.50		
SA_EI_MAN	PS_LOW	20	19.02	170.500	0.302
	PS_HIGH	21	22.88		
SR_EI_MAN	PS_LOW	20	18.80	166.000	0.249
	PS_HIGH	21	23.10		
MOT_EI_MAN	PS_LOW	20	18.12	152.500	0.133
	PS_HIGH	21	23.74		
EMP_EI_MAN	PS_LOW	20	18.98	169.500	0.290
	PS_HIGH	21	22.93		
SOCSK_EI_MAN	PS_LOW	20	19.35	177.000	0.388
	PS_HIGH	21	22.57		

From Table 4.10 it is noted that there are some significant differences between ATCs high or low on Problem Solving related to Self Awareness (Self) ($U\text{-value} = 129.500$; $p = .035$), Motivation (Self) ($U\text{-value} = 134.500$; $p = .048$) and Empathy (Self) ($U\text{-value} = 113.500$; $p = .012$).

4.4.1.5 Differences between ATCs high or low on Seeking Social Support related to the dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Table 4.11 presents the results for individuals high or low on Seeking Social Support in relation to the dimensions of Emotional Intelligence (Self), the dimensions of Emotional Intelligence (Manager) and the dimensions of Stress.

Table 4.11 Mann-Whitney test results comparing ATCs high or low on Seeking Social Support with all dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
DEMAND	SSS_LOW	19	18.71	165.500	0.241
	SSS_HIGH	22	22.98		
WRKTIM	SSS_LOW	19	20.34	196.500	0.743
	SSS_HIGH	22	21.57		
WRKTOO	SSS_LOW	19	21.39	201.500	0.844
	SSS_HIGH	22	20.66		
OPROC	SSS_LOW	19	21.87	192.500	0.660
	SSS_HIGH	22	20.25		
WRKORG	SSS_LOW	19	18.11	154.000	0.149
	SSS_HIGH	22	23.50		
WRKENV	SSS_LOW	19	18.21	156.000	0.159
	SSS_HIGH	22	23.41		
SA_EI_SELF	SSS_LOW	19	18.55	162.500	0.223
	SSS_HIGH	22	23.11		
SR_EI_SELF	SSS_LOW	19	22.95	172.000	0.332
	SSS_HIGH	22	19.32		
MOT_EI_SELF	SSS_LOW	19	19.92	188.500	0.591
	SSS_HIGH	22	21.93		
EMP_EI_SELF	SSS_LOW	19	18.92	169.500	0.301
	SSS_HIGH	22	22.80		
SOCSEI_SELF	SSS_LOW	19	21.84	193.000	0.674
	SSS_HIGH	22	20.27		
SA_EI_MAN	SSS_LOW	19	20.66	202.500	0.865
	SSS_HIGH	22	21.30		
SR_EI_MAN	SSS_LOW	19	21.50	199.500	0.803
	SSS_HIGH	22	20.57		
MOT_EI_MAN	SSS_LOW	19	20.21	194.000	0.694
	SSS_HIGH	22	21.68		
EMP_EI_MAN	SSS_LOW	19	21.39	201.500	0.844
	SSS_HIGH	22	20.66		
SOCSEI_MAN	SSS_LOW	19	21.21	205.000	0.917
	SSS_HIGH	22	20.82		

From Table 4.11 it is clear that there is no difference between individuals high on the dimension of Seeking Social Support compared to the individuals low on Seeking Social Support relating to the dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress.

4.4.1.6 Differences between ATCs high or low on Avoidance related to the dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Table 4.12 below presents the results for individuals high or low on Avoidance in relation to the dimensions of Emotional Intelligence (Self), the dimensions of Emotional Intelligence (Manager) and the dimensions of Stress.

Table 4.12 Mann-Whitney test results comparing ATCs high or low on Avoidance with all dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress

Variable	Group	N	Mean Rank	U-value	Significance (p-value)
DEMAND	AVOID_LOW	17	25.00	204.000	0.415
	AVOID_HIGH	28	21.79		
WRKTIM	AVOID_LOW	17	21.06	205.000	0.438
	AVOID_HIGH	28	24.18		
WRKTOO	AVOID_LOW	17	21.91	219.500	0.664
	AVOID_HIGH	28	23.66		
OPROC	AVOID_LOW	17	22.59	231.000	0.868
	AVOID_HIGH	28	23.25		
WRKORG	AVOID_LOW	17	21.68	215.500	0.597
	AVOID_HIGH	28	23.80		
WRKENV	AVOID_LOW	17	21.71	216.000	0.599
	AVOID_HIGH	28	23.79		
SA_EI_SELF	AVOID_LOW	17	25.79	190.500	0.264
	AVOID_HIGH	28	21.30		
SR_EI_SELF	AVOID_LOW	17	25.56	194.500	0.306
	AVOID_HIGH	28	21.45		
MOT_EI_SELF	AVOID_LOW	17	27.03	169.500	0.107
	AVOID_HIGH	28	20.55		
EMP_EI_SELF	AVOID_LOW	17	21.24	208.000	0.480
	AVOID_HIGH	28	24.07		
SOCSK_EI_SELF	AVOID_LOW	17	21.21	207.500	0.474
	AVOID_HIGH	28	24.09		
SA_EI_MAN	AVOID_LOW	17	21.38	210.500	0.518
	AVOID_HIGH	28	23.98		
SR_EI_MAN	AVOID_LOW	17	22.06	222.000	0.707
	AVOID_HIGH	28	23.57		
MOT_EI_MAN	AVOID_LOW	17	20.47	195.000	0.313
	AVOID_HIGH	28	24.54		
EMP_EI_MAN	AVOID_LOW	17	21.06	205.000	0.439
	AVOID_HIGH	28	24.18		
SOCSK_EI_MAN	AVOID_LOW	17	21.44	211.500	0.534
	AVOID_HIGH	28	23.95		

From Table 4.12 it is clear that there is no difference between individuals high on Avoidance compared to the individuals low on Avoidance relating to the dimensions of Emotional Intelligence (Self), Emotional Intelligence (Manager) and Stress.

4.5 Summary

The results obtained from the sample discussed in Chapter 3, were presented in this Chapter. The results focused on correlations as well as Mann-Whitney tests, and various significant correlations and differences were observed. In the next chapter, the results obtained will be discussed in detail, and further conclusions will be drawn. These results were also compared with previous research and literature.

Chapter 5 will conclude with mentioning some limitations to this study, and also some recommendations for further research.

CHAPTER 5: DISCUSSION OF RESEARCH RESULTS AND RECOMMENDATIONS FOR FUTURE STUDIES

5.1 Introduction

In this final Chapter, the research results as presented in Chapter 4, will be discussed and interpreted. The chapter will start with discussing the results of the stress items ranking, and comparing it to previous studies. This will be followed with a discussion of the correlation results in terms of the dependent variable (Coping) and the two independent variables (Emotional Intelligence of Self and Manager as well as Stress). The discussion will conclude with focusing on the Mann-Whitney test results and how individuals differ regarding effective and ineffective coping strategies selected. The chapter will end with a presentation of limitations of the study as well as recommendations for future studies.

5.2 Discussion of Research Results

In the following paragraphs focus will be on discussing the psychometric properties of the scales used, the results regarding the ranking of the stress items, the correlation results of the three constructs and their dimensions, and the differences between high levels of coping compared to low levels of coping regarding Stress and Emotional Intelligence. The next paragraph will present a discussion regarding the psychometric properties of the three scales used.

5.2.1 Psychometric Properties of Scales Used

As presented in Chapter 4, the overall reliability of the scales used in this study has been satisfactory. The dimensions of the instruments also showed satisfactory reliability, and compares well with other studies, using the same measurements.

Regarding the Emotional Intelligence Questionnaire (EQI), Rahim and Minors (2003) reported reliabilities of the sub-dimensions of the EQI ranging from .62 to .98. In a South African study by Van Staden (2007), the reliabilities for the dimensions of the EQI ranged between .84 and .94. This is in line with that of this study, with sub-dimension reliability ranging between .542 and .932.

Regarding the Job Specific stress questionnaire it is difficult to compare with other measuring instruments, as this questionnaire was specifically designed for this study. Even though the items are made up out of the main sources of stress of ATCs according to Smith (1980) and Farmer et al. (1990) the reliability of this was .828 which is highly satisfactory.

Lastly focusing on the reliability statistics of the Coping Strategy Indicator of Amirkhan (1990) the overall reliability found by the developer was .89. The overall reliability in this study is .857. These results compare well with that of Amirkhan (1990). The reliability results for the dimensions ranged between .778 and .972 which are all highly satisfactory.

In the following section the results based on the ranking of the stress items will be discussed and compared to previous studies.

5.2.2 Ranking of Stress Items and comparison to previous studies

From the ranking of the items in the stress questionnaire, ten items were listed as the most stressful for the ATCs completing the stress questionnaire in this study.

From Table 4.2 as presented in Chapter 4, it can be observed that certain items are seen as more stressful than others in this study. The single most stressful item as listed by the ATCs in this study is the number of aircrafts under their control. This is closely followed by extraneous traffic, unforeseeable events and peak hour traffic. The fifth most stressful item for ATCs is that of the limitations and reliability of the equipment they work with on a daily basis.

In a previous study, by Shouksmith and Taylor (1997) discussed in Chapter 2 they also indicated the top 5 general Job Stressors in air traffic control. The sample included ATCs from Singapore, New Zealand and Canada. The results obtained in the present study on the top 5 stressors are very similar to that obtained by Shouksmith and Taylor (1997).

In this study the Number 1 stressor as mentioned, is number of aircrafts under control. In the previous study by Shouksmith and Taylor (1997), for ATCs working in Singapore, the top stressor was the fear of causing accidents, for New Zealand as well as Canada it was Equipment limitations. Comparing the Singapore stressor with that of this study, the fear of

causing accidents could be related to the fear of consequences of errors (Ranked 7th stressful) as well. This again could refer back to the JD-C model, and the lack of control the ATC has over their environment (Karasek, 1979). An ATC does not always have control over the number of aircraft under their control, or for that matter, accidents that happen due to unforeseen circumstances. It has been mentioned that the lack of control, itself, also contributes to higher levels of stress in ATCs and that it places strain on them and their performance.

Equipment limitations were ranked first by ATCs in Canada and New Zealand according to Shouksmith and Taylor (1997) study. In this study, conducted in South Africa, the item limitations and reliability of equipment were ranked as the 5th most stressful item. Therefore once again a similarity is found between this study and that of previous studies. It has also been mentioned in the theory that ATCs have little control over the equipment they work with on a daily basis. Based on the JD-C model, a lack of control can lead to experiencing stress. ICAO (1993) has mentioned that the achievement of the full expected benefits of technological advancements requires the successful matching of individual and machine, so that the individuals do not impede technical progress because they have been given tasks beyond their coping capabilities. It could also be mentioned that in instances where the reliability of equipment are questioned, this could contribute to ATCs experiencing stress.

As mentioned in Chapter 2, all three samples of Controllers in the previous study ranked Peak traffic conditions as the Number 2 most stressful item (Shouksmith & Taylor, 1997). In the case of this study, the ATCs in this sample rated this as the 4th stressful item. Based on this it has been mentioned in the literature review, that when ATCs are under enormous pressure, for instance in periods of peak traffic, it places a lot of stress on them, as this also relates to fear of accidents, fear of consequences of errors (ranked 7th), number of aircraft under control (ranked 1st) as well as unforeseeable events (ranked 3rd). Any indecision or delay could contribute to a catastrophic loss of lives and property (California Occupational Guide Number 230, 1998).

Regarding the item ranked 2nd most stressful in this study, extraneous traffic, this could be related to all the traffic not directly associated to the task of ATC but that influences their performance, for instance smaller aircraft, vehicles on the landing strip as well as traffic

coordinated by Airports Company of South Africa (ACSA) over which the ATCs have no control. During a visit to the Air Traffic Control Tower at Cape Town International Airport, an aircraft from Air Mercy were due to depart, but had to taxi from the hangar (situated behind the airport) to the landing strip. Along this route, the aircraft had to pass through a gate operated by ACSA. The gate was broken, and ATC had to wait for a delegate from ACSA to manually open the gate, before the aircraft could be given the green light to pass through. According to Che Matthews (C. Matthews, personal communication, 6 August 2008) the ATCs has no control over the management of the gate, and this, at times, place demands on the ATC as it influences the take-off time and the rest of the scheduling for the day. As mentioned previously high demands lead to stress according to the JD-C model, and if the individual does not have the resources to cope (in this case it is factors beyond their control), this aspect will be seen as highly stressful (Karasek & Theorell, 1990).

The last similarity regarding the stress items in this study compared to that in Shouksmith and Taylor's (1997) study, is that of the general work environment, or known in this study as the conditions of employment. In this study Conditions of employment is ranked 10th and in the study for ATCs in New Zealand and Canada, they ranked general work environment as 4th and 5th stressful respectively.

As mentioned in the literature study in Chapter 2, the working environment of an ATC could contribute to them experiencing stress. Repetti (1993) concluded that "The experience of physical strain occurs only when the person judges conditions at work to be demanding" (p. 129). Therefore it could be concluded that only once an individual judge a specific stressor to be a demand, or something they do not have control over, they will experience physical strain, which then manifests in the experience of stress.

It could also be said that, just because an individual views something as not demanding, does not mean that it is not seen as a demand for others; it could be that such a person has better coping mechanisms to deal with those demands, and therefore perceive it as not exceeding his/her resources (Karasek & Theorell, 1990).

Furthermore, the four items rated as the most stressful for the ATCs in this sample, are all within the Demand dimension (Stress). This correlates with the notion of the JD-C model of

Karasek (1979), where if a demand exceeds an individual's resources to deal with that demand, the individual will experience stress. In this case, all four of these factors are seen as the most stressful items in the stress questionnaire, and thus, the ATCs do not necessarily have the coping mechanisms to deal with these demands, or it might be demand based on factors outside of their control. In this case all four demands, number of aircraft under control, peak traffic, extraneous traffic and unforeseeable events, are all factors over which they have little or no control. This once again confirm that ATC are seen as a stressful job, and based on the JD-C model, as a high strain job, where demands are high, and decision latitude or control is low.

In the following section the correlation results will be discussed based on the three propositions mentioned in Chapter 1 and revisited in Chapter 4. The findings of this study will be discussed according to those propositions

5.2.3 Discussion of Correlation Findings

Proposition 1:

There is a significant relationship between Stress and Coping in the occupation of Air Traffic Controller.

Based on this proposition, the correlation results were presented for the total score of Stress and Coping, as well as the relationships between the dimensions of Stress and the dimensions of Coping.

There was neither a significant relationship between either the total score of Coping and Stress, nor between the dimensions of Coping and Stress. Therefore the first proposition based on this correlation results is rejected, and it could be said that Stress in this study, does not influence the selection of Coping Strategies used by ATCs.

However, significant differences related to ATCs high or low on the dimension of Seeking Social Support and Stress was found during the Mann-Whitney test analysis. It could then be interpreted that there is a significant difference in the stress levels of ATCs higher in the Coping dimension of Seeking Social Support compared to those individuals low in the dimension of Seeking Social Support.

These results will be elaborated on further in Section 5.2.3 during the discussion of the Mann-Whitney test results.

As mentioned in the literature review in Chapter 2, Lazarus and Folkman (1984) proposed that an appraisal process can mediate an individual's response to stress. First, cognitive appraisal of the nature and extent to which the situation is considered to be threatening and secondly, appraisal of the range of actions that may be available to deal with the stress. In the case of this study, no relationship could be found, between the experience of stress, and the coping strategies ATCs use to manage their stress. This could in part be due, to incorrect appraisal methods used, or that some factors are beyond their control, and there is no specific action to take to deal with the stress elicited by those factors.

As mentioned in Chapter 4 there is however inter-correlations between the dimensions of Coping. There is a relationship between the dimension Problem Solving and the dimension Seeking Social Support. It could then be explained that when an individual selects the Coping Strategy of Problem Solving, he/she would also be high on the strategy Seeking Social Support.

By seeking support from others, this could assist the ATC in recognising the stressful experience, and then together decide on a plan of action and in such problem solve, and alleviate the demand placed on the individual. As mentioned in Chapter 2, in a study by Pretorius and Diedricks (1994) results of that study suggested that appraisal of problem-solving skills is one of those individual characteristics that impacts on the functioning of social support. Furthermore it is mentioned that the significant buffering effects of social support suggests that effective problem solvers enjoy both the health-sustaining and stress-reducing functions of social support.

Social support can also broaden the individual's interpretation of the stressor during primary appraisal and broaden the number of coping options during secondary appraisal. This is line with the fact that if individuals are high on Social Support, they use this during primary appraisal, in order to then also select the effective coping strategy of Problem Solving during secondary appraisal to effectively manage and deal with the stressful encounter (Brownell, 1984).

Lazarus and Folkman (1984) suggested that Problem focused coping (i.e. Problem Solving) is often used when an individual feels he/she has some control or can make an impact on his/her environment. It has been said previously that ATCs have little control over their working environment (Roske-Hofstrand & Murphy, 1998) however they still use the coping strategy of Problem Solving. It is however used together with Seeking Social Support. It could be that when an ATC thinks he/she has little control over a situation, he/she seek the support of others that may have control, or that can contribute to higher control of the situation.

This can then also relate to the Mann-Whitney test results discussed in the following section, where it has been mentioned that individuals high in Seeking Social Support experience lower levels in stress, compared to those individuals lower in Seeking Social Support.

It is therefore evident that when ATCs use the coping strategy of Problem Solving, it could be more effective in reducing stress and increasing control, if used in combination with the coping strategy of Seeking Social Support.

Proposition 2:

There is a significant relationship between Emotional Intelligence (Self) and Emotional Intelligence (Manager) and Stress in the occupation of Air Traffic Controller.

Based on the above proposition the total score of Emotional Intelligence (Self), Emotional Intelligence (Manager) as well as Stress were correlated to determine whether relationships do exist. Furthermore, correlation analyses were also evaluated between the dimensions of these three constructs.

Regarding the total score, there was a relationship between the total Emotional Intelligence (Self) score and that of Emotional Intelligence (Manager).

This could indicate that when an individual has high Emotional Intelligence he/she also perceive his/her manager as having high Emotional Intelligence, and vice versa.

Mayer and Salovey (1993) has mentioned that without the emotional mental ability to detect what other people feel, individuals would probably be less able to experience empathy and

understanding toward others. Therefore this relationship between the Emotional Intelligence of the individual and the Emotional Intelligence of the manager is of importance when individuals need to be aware of how their manager feel, and the emotions they are experiencing and vice versa, to assist each other in the management of stress, and the selection of appropriate Coping strategies.

The Emotional Intelligence of a manager can contribute to the Emotional Intelligence of an individual. An individual high on Emotional Intelligence would also like a manager to be high on Emotional Intelligence, so that together they can be aware of their emotions, regulate those emotions, and show empathy, through the use of their social skills. What is also characteristic is that individuals dealing with stress, would like of their manager to also be aware of the stress the individual experience by being Self Aware of the emotions they experience when individuals are encountering stress, that could lead to them not performing effectively, as it has been mentioned that stress influences an individual's overall performance, and psychological health. Furthermore, an individual dealing with stressful experiences would prefer a manager to show empathy, and motivate them to effectively deal with those experiences.

Buck (1972) found that those individuals who perceive their bosses to be supportive and considerate experienced less pressure at work than those who had a more "critical" boss. Levinson (1973) found individuals who were hard-driving and abrasive in nature caused more stress for other work colleagues.

This could support the fact that if managers had higher Emotional Intelligence, and presented Empathy and motivation towards their employees, it could contribute to the selection of appropriate coping strategies and lead to stress reduction in individuals.

Emotional Intelligence has also claimed to be an important factor in organisational leadership. George (2000) used the Salovey, Mayer and Caruso four branch model of Emotional Intelligence as a heuristic framework for outlining the importance of Emotional Intelligence in effective leadership. George (2000) asserts that by accurately identifying how followers feel, leaders better appraise and influence followers' emotions so they are supportive of leaders' goals and objectives, thus insuring a shared vision. Leaders can use intense emotions as signals to direct their attention to issues in need of immediate attention, and can use emotions

to prioritise demands. They can also better anticipate how well their followers will react to different circumstances and changes. This once again shows the importance of high Emotional Intelligence in both the manager and the individual, in order to work towards common goals.

Based on this, the correlation results also showed a relationship between the ATC's Stress and the way they view their Manager's Emotional Intelligence.

There is a significant relationship between the dimension of Operating procedures (Stress) and the dimensions of Emotional Intelligence (Manager) of Motivation, Empathy and Social Skills.

According to the stress questionnaire, the following items are within the dimension of Operating Procedures (Stress):

- Time Pressures;
- Having to bend the rules;
- Feeling a loss of control; and
- Fear of consequences of error

All four of these factors, are based on the demand aspect of the JD-C model as discussed in Chapter 2. Stated differently, it could be accepted that these four items place a great demand on individual ATCs performing their day to day task, and it could be said that an ATC has very little or no control over these factors.

These factors can all relate back to aspects managed by the individual's Supervisor. For instance the time pressures could be related to the rosters or time schedules set up by managers and that has to be adhered to. If the ATC does not perform certain tasks within a specific time frame it could lead to them experiencing stress. They would also see these factors as stressful if not effectively managed, and implemented by a manager. For instance, having to bend the rules and fear of consequences of error, directly relates to the individual's manager. If the individual bends the rules, and makes an error, they would definitely experience certain consequences from the side of the manager. If the manager has higher

Emotional Intelligence, they could handle this with empathy, motivate the individual to try harder, and communicate it in such a way by means of higher social skills, that the individual understands.

Lazarus and Folkman (1984) mentioned that Stress can be seen as an emotional reaction to external demands and expectations. Based on the latter, the four items (e.g. time pressures, having to bend the rules, feeling loss of control and fear of consequences of errors) are most certainly demands and tasks that might be expected from the individual's supervisor. Therefore, ATCs would like their manager to approach these issues with certain Emotional Intelligence dimensions, such as Empathy. For instance the fear of consequences of error, without doubt elicits a negative emotion within an ATC. If they know that when they make an error, certain consequences will take place, it will elicit a negative emotion. Most of these consequences will come from the manager; therefore the Emotional Intelligence of the manager is of importance when dealing with stressful experiences, based on Operating Procedures. These situations cause unusually strong emotions within the individual (Costa, 1991), and by having a manager high in Empathy, and Motivation could assist individuals to better deal with these reactions.

Furthermore a manager high in Social Skills could also better communicate needs and wants from their employees and in a way that can reduce the levels of stress within the ATC.

When the manager sees Operating Procedures as a great demand, or placing some form of stress on them, they could manage these factors better, if they are also high on the Emotional Intelligence dimensions of Motivation, Empathy and Social Skills.

French and Caplan (1973) mentioned that relationships with co-workers have also been found to induce stress, especially when poor relations exist and lead to low trust, low supportiveness, low interest in listening to and trying to deal with problems that confront the organisational member. This is related to the Emotional Intelligence dimension of Social Skills within an individual as well as their manager. The higher an individual's Emotional Intelligence related to Social Skills, the better they are able to manage relationships with co-workers, and reduce the stress that poor relationships can elicit. Also the Social Skills of the Manager is important for the relationship between individuals and their supervisors. It could

be assumed that the quality of social interactions both affect the cognitive and emotional aspects of work. There were significant relationships found between the Emotional Intelligence dimensions of Social Skills within the Self and the Manager. Therefore individuals also see it as important for their managers to be high in Social Skills.

Proposition 3:

There is a significant relationship between Emotional Intelligence (Self) and Emotional Intelligence (Manager) and Coping Strategies in the management of job-related stress in the occupation of Air Traffic Controller.

From the correlation tables it can be interpreted that there was no relationship between the total Emotional Intelligence (Self) and Emotional Intelligence (Manager) score and Coping, however there were correlations between the dimensions of Coping and the dimensions of Emotional Intelligence (Self).

There were significant relationships between the dimensions of Coping: Problem Solving and the dimensions of Emotional Intelligence (Self): Self Awareness, Motivation, Empathy and Social Skills.

Folkman et al's (1986) research has shown that the emotional state an individual is in at the beginning of a stressful encounter changes by the end of the encounter, the direction of this change depends on the coping strategy employed.

It was speculated in Chapter 2 that an individual higher on Emotional Intelligence could then select a more appropriate coping strategy at the beginning of the stressful encounter, for the reason that Emotional Intelligence assists individuals in effectively recognising their emotional states at the beginning, and interpreting these states, in order to manage the stress more effectively.

This proposition is supported by the research findings of this study, where it has been shown that ATCs high on Self Awareness (being aware of the emotions that stressful situations elicit and why), Motivation (the ability to remain focused on goals despite setback), Empathy (understanding the feelings transmitted through communication) and Social Skills (dealing

with problems without demeaning those who work with him or her) selects an effective and appropriate coping strategy such as Problem Solving.

Scherer (1989) mentioned that coping behaviour is the attempt to deal with negative emotions and stress. Given the concept of Emotional Intelligence, individuals with higher Emotional Intelligence had the ability to effectively recognise the emotions they are experiencing (through Self Awareness) at any time, and after recognising the emotion, effectively manage and deal with the emotions (by means of Motivation and Empathy). This is directly in line with the correlations found between the effective Coping Strategy of Problem Solving and the Emotional Intelligence dimensions of Self Awareness, Empathy and Motivation.

It has been mentioned that Problem Solving and positive re-appraisal led to changes in emotion from negative to positive. This could also relate to the fact that an individual high in the Emotional Intelligence dimension of Motivation, assists them to operate from hope of success rather than fear of failure, and thus re-appraising the situation as positive, and focusing on accepting change to attain goals (Bolger, 1990).

It has been speculated in Chapter 2 that Emotional Intelligence might influence the choice of coping strategies people implement to deal with negative events/stressful encounters. Petrides et al. (2007) as well as Saklofske (2007) have shown that Emotional Intelligence is positively associated with the use of adaptive coping strategies (such as Problem Solving) and negatively associated with the use of maladaptive coping strategies (such as Avoidance).

This statement supports the results found in this study, where those individuals higher on Emotional Intelligence, opted for the coping strategy, Problem Solving to deal with stressful encounters. If an ATC selects the Coping strategy of Problem Solving to deal with stressful situations, he/she would have to be high on the Emotional Intelligence (Self) dimensions of Self Awareness, Motivation, Empathy and Social Skills. It has also been mentioned that ATCs make use of Seeking Social Support to deal with stressful encounters. If an ATC is not high on the dimension of Social Skills, he/she might find it more difficult to use Seeking Social Support, as they struggle with communicating with peers and supervisors.

In a study by Engleberg and Sjoberg (2003), they found that individuals with less accurate perceptions of others' emotions (low Emotional Intelligence) had poorer social adjustment

than those with more accurate perceptions (high Emotional Intelligence). Similarly, the inability to manage one's own or others' emotional states has been shown to correlate significantly with poor social interaction skills (Lopes, Brackett, Nezlek, Schutz, Sellin & Salovey, 2004) and on a person's ability to form intimate and supportive social networks for help during times of stress (Ciarrochi et al., 2002).

Based on this it could then be said that if an individual is high on Self Awareness, Motivation, Empathy and Social Skills with regards to their Emotional Intelligence, they would be more likely to use Problem Solving as a coping strategy to manage stressful encounters.

It has been found that there is no correlation between the coping strategy of Avoidance and Stress. It could be speculated that ATCs very seldom use the coping strategy Avoidance, as this might lead to undesired outcomes. An ATC could not necessarily avoid their stress, as it could lead to death. For instance, if the consequences of error, elicit stress within an ATC, he/she could not Avoid this, as the error could have detrimental effects, therefore he/she would have to use other techniques such as Problem Solving or Seeking Social Support.

5.2.4 Discussion of Mann-Whitney Findings

From the Mann-Whitney results presented in Chapter 4, some significant findings are observed. There was a difference between ATCs high on Seeking Social Support and ATCs low in Seeking Social Support regarding their stress levels.

It could then be said that in cases where individuals are high on Seeking Social Support, they better manage stressful encounters, and have more control to deal with these demands, than individuals who are low on the dimension of Seeking Social Support.

House (1981) mentioned that organisations could assist its employees in coping with stress by building and maintaining social support groups. The unconditional support provided by these groups serves to increase an individual's self esteem and self-confidence, which both can reduce the stressfulness of situations and increase the effectiveness of the individual's coping efforts. It could also be said that when an ATC's self esteem and confidence are high, it could facilitate successful coping through increasing emotional insight and disclosure in the situation, increasing the use of social support and preventing reflection (Salovey et al., 1999)

As mentioned in the introduction, ATCs feel somewhat alienated as an occupational group. These feelings of alienation (being unappreciated, misunderstood and not respected) may be aggravated by the nature of their work. On duty they have personal interactions with only their co-workers and, perhaps, supervisors. All other communication occurs via radio. Furthermore, working alternating shifts make it difficult to interact with family or friends who work regular hours. As a result of their social isolation, work involvement and perceived mistreatment, ATCs are a cohesive and tightly knit group who hold a protective attitude toward each other. In general controllers are loyal to their peers and fiercely proud of their profession. However, these aforementioned factors contribute to a great deal of stress for the ATC (Borins, 1983). Based on this, it is clear that the ATCs do experience stress related to their communication with others. The fact that they are a tightly knit group, also supports the notion that they seek social support from others, mostly colleagues to manage the stress they experience at work.

In a study by Repetti (1993) it was found that negative social interaction at work was more predictive of increases in stress symptoms reported than objective workload, if workload perceptions were factored out. In other words it could be said that if social interactions with colleagues are negative, it could increase the prevalence of stress, and when social interactions are negative, that ATC may not be seeking social support from their peers to assist in dealing with their stress, hence the fact that they experience higher levels of stress.

There are also significant differences between individuals high and low on Problem Solving regarding some dimensions of Emotional Intelligence (Self). These dimensions are Self Awareness, Motivation and Empathy. This is in line with the correlation findings of proposition three discussed in the previous paragraphs.

Matthews and Zeidner (2000) suggest that adaptive coping (Problem Solving) can be conceptualised as Emotional Intelligence in action and that maladaptive coping may be attributed to difficulties in the processing and regulation of emotions and would thus be related to low Emotional Intelligence. This could explain this difference between individuals high on the dimension of Problem Solving compared to individuals low on Problem Solving with regard to their Emotional Intelligence. An individual high on Emotional Intelligence would be more likely to select the adaptive coping strategy such as Problem Solving.

5.3 Limitations and Recommendations

This section of the research study focuses on first identifying the limitations of this study, and then focusing on recommendations for any future studies that will be conducted on this field of positive organisational psychology, with specific emphasis on the constructs of Emotional Intelligence, Coping and Stress.

5.3.1 Limitations of the present study and Methodological Recommendations

A number of limitations of this study are worth mentioning. A first limitation could be the size of the sample. Although there is only a limited number of ATCs in the country, it is suggested to obtain a larger sample for future studies, if other airports are also included. A larger sample with more representation from all the airports in South Africa, and possibly also the South African Air force could allow for more comprehensive data analyses, and also between the different sectors in which ATCs work. It could be said that the different areas (Tower Control, En-Route and In Flight Service Station) Controllers experience different levels of stress, and it could impact on the overall level of stress experienced.

Secondly, the data for this study was conducted at a single point in time, and not over a continuous period, therefore, situational aspects could have an influence on the results on that specific day.

Lastly, as also mentioned in Chapter 1, due to the limitation in size and scope this study was truly exploratory in nature.

5.3.2 Recommendations for Future Research

It would be recommended that this study be duplicated, but to increase the sample size. The inclusion of other variables such as Burnout could be suggested.

Practical interventions should be implemented at air traffic control towers to reduce stress in Air Traffic Controllers, and to focus on developing the selection of effective coping strategies. It would also be recommended that the Emotional Intelligence of the ATCs could be developed, as this study found support for the notion that higher Emotional Intelligence could

assist in the selection of more appropriate coping strategies in order to reduce the negative effects of stress, on the ATC.

The Emotional Intelligence of the Manager could also be investigated further.

It could be suggested that an Emotional Intelligence Questionnaire could be included in a battery of tests used in recruitment and selection purposes.

5.4 Conclusions

It is without doubt to conclude that the occupation of air traffic control is a highly stressful one. Occupational stress is a complex, dynamic process in which various factors (stressors) as mentioned in the job specific stress questionnaire, and modifying variables (Coping and Emotional Intelligence) are interrelated. Whether a stressor produces an enduring health outcome or not depends on the extent to which the person perceived the condition as stressful and responds to it. His or her perception or response is affected by a number of modifying variables (in this case Emotional Intelligence), mainly by personal resources. These resources seem to become very important factors that determine the experience of occupational stress and its related effects. It was expected that subjects with high levels of Emotional Intelligence (one of the personal resources) will perceive their work environment as less stressful and they will experience less negative consequences.

Svyantek and Rahim (2002) indicate that Emotional Intelligence may be an important adaptive mechanism for helping individuals to interact with their environment, including their work environment.

From the research results it is clear that ATCs use the coping strategies of Problem Solving and Seeking Social Support, to manage stressful encounters in their working environment. It is also important for ATCs, how their manager's Emotional Intelligence influences their stress levels, based on Operating Procedures. Lastly it can be concluded that the way ATCs select their coping strategies (in this case Problem Solving and Seeking Social Support) are influenced by their Emotional Intelligence.

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