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Antarctic Personnel Selection and Training

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Abstract/executive summary (ca. 200 words):

Antarctica is becoming more and more open to the general population. Barriers to access are decreasing, and technology is enabling a safer and more home-like environment for personnel based at a number of stations. Furthermore, more international scientific collaboration is occurring each year in Antarctica (Dastidar, 2007); this, combined with greater ease of transport within the continent, means there is likely to be increasing numbers of personnel visiting bases and field camps run by other programmes.

This report looks at the issues and current practises with regards to selection, training, and transnational cooperation. It also briefly examines post-deployment adaption, and the possibility of using this for selection and training in future.

It is recommended that further research be carried out in a number of areas relating to selection and training of Antarctic personnel, specifically around the success factors of Antarctic training, the implications of ethnic diversity and international cooperation, and the reasons behind both positive and negative post-deployment adaptions.

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1. Introduction and Background

Antarctica is regarded as both an extreme and an unusual environment (Steel, 2015). Extremeness is associated with dangerous or discomforting physical characteristics, while unusualness is defined by how different the environment is compared to the home environment (Suedfeld, 1987). Both of these factors are clearly present in Antarctica – it is not a continent with an indigenous human population, nor is it an environment that humans can survive in for extended periods of time without material and organisational support . Given these factors, selecting and training personnel is crucial to ensure safe and effective operation in Antarctica.

Selection and training is further complicated by the increase in scientific international co-operation. Traditionally, each National Antarctic Programme (NAP) operates fairly autonomously; they screen, select, and train personnel who they will be responsible for in Antarctica. However, there is increasing travel and cooperation between bases and operations; personnel may be selected and trained by one NAP, but then spend time at an operation run by another NAP, thereby becoming the second NAP's responsibility.

Good practice can be shared between NAPs via both the Joint Expert Group on Human Biology and Health of the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programs (COMNAP). However, currently there are no compulsory minimum standards, nor is there a formal system for sharing relevant information on personnel. To date COMNAP has had no recorded issues related to selection and training of transnational personnel (M. Rogan-Finnemore, personal communication, December 15, 2016), but with increasing mobility, there are increasing opportunities for problems.

This report looks at current selection and training processes for Antarctic personnel, frequently referring to the practices employed by Antarctica New Zealand (AntNZ). It also discusses the benefits and the challenges of transnational Antarctic cooperation and post-deployment adaption.

2. Fit for the ice? Selecting personnel for Antarctica

2.1 Introduction

Selecting the right personnel for a job is an important decision in any workplace. It becomes even more crucial to find a suitable candidate when the job environment is set in an isolated, difficult-to-access, and remote location, where efficiency and safety rely heavily on good interpersonal cooperation. In Antarctica, where co-workers work and live together for extended periods of time without the option for a break, selecting "the right kind" of staff to fit into this restrictive and intimate setting is even more important.

This section explores current ideas and concepts about what it takes to thrive on the ice[1]. Selection criteria extend beyond the purely individual criteria and encompass contextual criteria. Information was collected both from academic literature and personal communication with relevant stakeholders in the New Zealand Antarctic programme. The analysis will be supplemented with the occasional personal observation gleaned during and after our own Antarctic deployment as part of the University of Canterbury 2016/2017 Postgraduate Certificate of Antarctic Studies (PCAS) programme.

2.2 Selecting in, selecting out: The right stuff for the ice, or stuffed on the ice?

Is there such a thing as the ideal Antarctic personality? What characteristics does an applicant need in order to succeed on the ice? These questions reflect an incomplete understanding of Antarctica as a workplace. While there are undoubtedly individual characteristics that make an applicant more likely to smoothly adapt to the harsh physical and intense social Antarctic environment[2], there are other factors at play that supersede the individual makeup of an Antarctic employee. Selection processes can help to identify those candidates that are better equipped to deal with the adversities and unique mental and physical requirements of Antarctica as a workplace. While less controllable factors such as interpersonal chemistry, group processes, and the unpredictability of the natural

[1] Note that this paper focusses on land-based Antarctic support personnel, and does not consider ship-based staff, distinguished visitors, or scientists, except where specifically referred to.

[2] For a concise overview of adverse conditions and their potential impact on Antarctic staff, see Steel (2015). Also see Palinkas and Suedfeld (2008), Palinkas (2002), and Rothblum (1990).

environment remain beyond a selection committee's sphere of influence, contextual factors are also taken into consideration when assessing an applicant.[3]

On the individual level, an applicant will be assessed on the basis of three main criteria: Task fitness, physical (or medical) fitness, and mental (or psychological) fitness.

2.2.1 Task fitness

Does the applicant possess the right work-relevant skills and knowledge, i.e. are they able to perform the required task to a satisfactory level? In a remote work environment where an employee is frequently forced to make independent executive decisions with regard to their area of responsibility, it is important to select a candidate with sound skills, an appropriate level of independence, and creative problem-solving abilities.

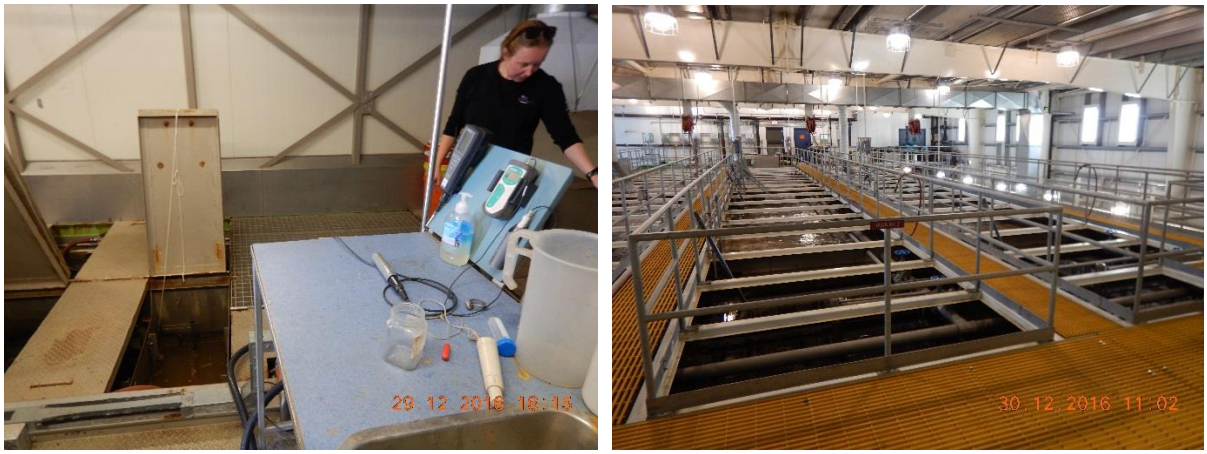

Figure 1: *Waste water treatment plant, Scott Base (left) and McMurdo (right) (photo credit: A. Herbert)*

The importance of adequate task ability or skills fitness becomes obvious when taking into consideration how interdependent work areas are in the Antarctic. For example, base engineers are responsible for the smooth operation of power and water plants. This includes the waste water treatment plant (Figure 1) and the facilities that ensure that base members have access to hot showers, laundry facilities, and potable fresh water. In a

[3] However, overall, Antarctica New Zealand's selection process is deemed to work well (J. Patterson, personal communication, January 16, 2017). The few times when an employee "had not worked out well" in the Antarctic environment, despite being a suitable candidate on paper, and having successfully passed the interview process, outside influences such as disruptions to the staff member's home life offshore were identified as the main contributing cause (G. Steel, personal communication, January 19, 2017).

confined environment, any malfunctioning of essential services that contribute to staff wellbeing is bound to cause considerable disruption and discomfort. The efficient and uninterrupted running of base activities and a productive social climate depend on the ability of individual employees to perform their tasks efficiently.[4]

2.2.2 Physical fitness

All Antarctic personnel must pass a medical exam. Being declared medically fit to operate in a harsh environment is an important requirement: in an isolated environment with limited medical facilities and the very costly, sometimes impossible option of evacuation, a frail physical status would endanger both the individual and the group as a whole. AntNZ's guideline for medical exams (see Table 1) is that a person needs to be able to look after themselves in an emergency situation.[5]

***Table 1**: Types of medical examinations employed by Antarctica New Zealand*[6]

Type	Trip duration?	Who?
24-hour medical	Up to 24 hours	Everyone
Short-term medical	Up to 10 days	Everyone
Standard medical	Over 10 days	Everyone
Deep field/winter medical	n/a	Location or winterer
Additional Exercise ECG	n/a	Anyone over 60 years

There are differences across NAPs in regards to what constitutes medical fitness, and how this is established. The British Antarctic Survey (BAS), for instance, employs an in-house

[4] Note however that there is usually sufficient expertise across the team which allows staff members to problem-solve communally if needed (J. Patterson, personal communication, January 16, 2017). This criterion is therefore arguably the most flexible. Also see Townsend (2016).

[5] P. Woodgate (personal communication, January 22, 2017) explains that this is the reason why AntNZ will, for example, not take children, or people dependent on a wheelchair or other medical equipment, to the ice.

[6] Information provided by P. Woodgate, AntNZ. Note: "Location" refers to a location that is outside the range of a helicopter that could take the patient to a medical facility. Also note that while there are medical facilities at McMurdo, AntNZ aims to avoid using them more than absolutely necessary. According to an AntNZ staff member, McMurdo staff are very cautious about administering more complex medical aid due to the American liability/malpractice policies. For this reason, McMurdo medical staff tend to err on the side of caution in regards to ordering an evacuation instead of treating a patient on site. This is another reason why

medical doctor who examines applicants, whereas the New Zealand Antarctic programme has a medical assessor who assesses applicants' medical reports that were conducted by private General Practitioners.[7] No uniform medical requirements exist across states (cf. Antarctica New Zealand (n.d.); British Antarctic Survey (2004)), and there is room for interpretation in the exam results.[8]

2.2.3 Mental fitness

An extremely important area when it comes to choosing the right candidate for an Antarctica-based position is mental fitness.[9] Research has shown that "The Big Five" personality traits (extraversion, agreeableness, openness, conscientiousness, and neuroticism; see Borman, Hanson, and Hedge, 1997, and Morgeson et al., 2007), are useful guidelines for the selection of Antarctic staff. Personality is thought to predict contextual performance rather than task performance (Borman et al., 1997). An integral part of this is disposition or motivation, which is attributed to personality (Borman et al., 1997).

Most importantly, working and living in a small-scale team over extended periods of time, in sometimes trying conditions, requires a suitable personality. What attributes can be ascribed to a candidate who is more likely to adapt well to these circumstances? Not surprisingly, for a job that depends on constructive professional and social cooperation with

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Antarctica NZ are careful to select only physically fit personnel (P. Woodgate, personal communication, January 22, 2017).

[7] P. Woodgate (personal communication, January 22, 2017) states that roughly half of Antarctica New Zealand's medical exam content is based on an applicant's medical history and half on their current medical state. Private GPs are thought to have a good understanding of a patient's medical background, and one medical assessor making the final decision is meant to ensure consistency for all applicants.

[8] Note for example that there was a wide range of physical fitness among all twenty-one PCAS participants and affiliates (all of whom had been declared medically fit for the ice). Informal comparison among some members showed that there were considerable differences in the results for the respiratory function test (peak expiratory flow rate). Some participants suspected that more bloodwork tests had been undertaken for them than for others, as laboratory rates charged at the same hospital facility varied from candidate to candidate. Doctors' reports appeared to contain differing degrees of leniency in the interpretation and recording of individuals' results (also see footnote above).

[9] Note that while scientific staff have to undergo a medical assessment before deployment, there is no such thing as a mental fitness assessment (beyond the cursory questions on the medical assessment form) for scientists. Reasons for this may include that deployment is usually shorter for scientific staff than it is for support staff, so a personality fit is (arguably) not as essential. Also, some thought should be given to the question if "mediocre scientists with great personalities" is what NAPs want to favour over "great scientists with more difficult personalities" (B. Storey, personal communication, January 24, 2017).

a limited number of co-workers, applicants need to have a high degree of social competency, i.e. the skill to interpret other people's behaviour and mood adequately and interact appropriately (Steel, 2015). Openness to new experiences, good coping skills in mentally and emotionally taxing situations, and a high tolerance for monotony are essential factors in this regard (Grant et al., 2007; Steel, 2015). In an environment that is, to a considerable degree, controlled by outside factors beyond human control (i.e. the weather) and dependent on external cooperation (i.e. the export of goods including technology and food by the NAP), an employee's ability to accept that achieving predetermined goals may not always be possible is crucial to their workplace satisfaction.

In contrast, undesirable character traits include emotional unpredictability[10], a lack of self-assertiveness, conflict-seeking behaviour, intolerance towards diversity, authority-acceptance issues, and substance abuse issues (Wooding, 2016).

2.3 The contextual fit

Beyond the professional skills, the personality attributes, and the physical abilities that an applicant brings with them, there is another area that needs to be taken into consideration when assessing a potential new employee: the contextual fit.

2.3.1 Person-Environment fit

Antarctica is a harsh and hostile physical environment. Apart from the dangers that the extreme environment itself encompasses for humans, stressors include isolation, confinement, lack of privacy, monotony, complete dependence on external supplies, limited recreational activities, and the interpersonal conflict that can arise from close cohabitation in a challenging environment.[11] Antarctica, which can be a bleak and sensually depriving

[10] For example, a staff member who is reliably grouchy or grumpy is more likely to be 'read' correctly by their colleagues, who know how to deal with them without taking the staff member's behaviour personally. This is different from a colleague whose mood swings are hard to predict, which makes social interactions taxing and difficult (Steel, 2015).

[11] Antarctica New Zealand station-based staff contracts are either six or thirteen months long. A break away from the base is not included, and would usually not be recommended either (J. Patterson, personal communication, January 16, 2017).

environment especially in winter, may not suit a person who needs significant amounts of external stimulation.

Applicants need to be aware of the realities of Antarctic deployment, and the selection process needs to entail a discussion on what this may mean for the applicant's personal circumstances.[12] An employee will be more effective and overall more content with their position if they are able to interact well with the environment and if their personal attributes match the situational environment (Awoniyi, Griego, & Morgan, 2002).

2.3.2 Person-organization fit

Good performance in a job is an outcome of the employee's values being aligned with the employing organization's values (Sarris & Kirby, 2005). In the case of AntNZ, for example, a concern for the protection of the natural environment is of paramount importance, as is an awareness of safety concerns, and the willingness to adjust to, and live in, highly regulated surroundings. This ensures the employee's own safety as well as that of their co-workers and of the Antarctic environment. Information on whether or not the employee will be a good fit for the organization will be gleaned from the interview processes (J. Patterson, personal communication, January 16, 2017; also see Borman et al., 1997).

Note, however, that homogeneity is believed to be initially beneficial for organizations because of enhanced communication and cooperation, but is thought to be hindering at later stages of a company's existence because it may negatively impact on flexibility and the ability to adapt to a changing environment (Borman et al., 1997). Organizations especially in extreme environments need a welcoming culture (Lovegrove, 2013) in order to support their employees in performing well.

2.3.3 Person-culture fit

Arguably more important than a fit into the physical environment, and similar in importance to a values-alignment, is whether the applicant fits into the social environment. Therefore,

[12] For example, if a deployed employee's family member becomes ill or passes away, it may not be possible for the employee to return home. Julie Patterson, Antarctica New Zealand's HR manager, commented that the applicant needs to discuss the potential implications of such a scenario with their family, and be prepared for what this might entail (personal communication, January 16, 2017).

the selection process needs to gauge whether the potential new staff member is likely to thrive within the existing group of co-workers.[13] Although much depends on the individual's personality and attitude, it is crucial to match an applicant to the team culture.[14]

While it is hence important to match an applicant's personality profile to those of existing group members, the question arises whether accommodating team culture may mean perpetuating certain aspects of it, possibly to the disadvantage of differing but similarly capable or skilled personalities (cf. Sarris and Kirby, 2005). However, it is uncontested that determining and evaluating an applicant's personality traits plays a major role in an organization's selection process.

2.4 Selection process and critique

Selection processes vary across NAPs (Palinkas & Suedfeld, 2008). Australia, for example, has a 24-hour-assessment centre (Australian National Audit Office, 2016; Wooding, 2016), whereas AntNZ uses a web-based recruitment and selection system to receive applications and to longlist, followed by an in-person interview and, in the case of winter staff, an online personality questionnaire. After successfully passing this, candidates then undergo psychometric and ability tests. Having applicants assessed by a psychologist during the selection process was abandoned in the mid-1990s (P. Woodgate, personal communication, January 22, 2017). Performance tests may be given by some NAPs (Grant et al., 2007).

Personality traits are important indicators for a candidate's general fit. It is believed that an applicant's personality can predict motivation and contextual job performance (Borman et al., 1997), but the overall extent of validity for predicting job performance remains contested (Kanas et al., 2009; Morgeson et al., 2007). While there are certain concerns

[13] The last question that Antarctica New Zealand's HR manager asks herself when assessing an applicant is whether she can envision them in Scott Base: "Would I want to live with that person for the next 13 months?" (J. Patterson, personal communication, January 16, 2017).

[14] As part of their selection process, Antarctica NZ use personality profiles from aspiring and existing team members to determine a good fit: "You don't want ten of the same personalities in there, and you don't want three dominant leader types in one group either. You need a good mix" (P. Woodgate, personal communication, January 22, 2017).

about the possibility of faking in self-report personality tests[15], some scientists argue that faking, i.e. the conscious misrepresentation of oneself, speak for the applicant's desire for impression management, which in itself can be seen as a desirable trait in an employee (Borman et al., 1997; Morgeson et al., 2007).

Recommendations for improving personality testing environments include the creation of an interview or testing environment that encourages trust, which in turn is more likely to elicit honesty (Morgeson et al., 2007). Allowing a candidate to elaborate on answers, using job-relevant criteria in personality tests, and including behavioural testing tools (Morgeson et al., 2007) such as observation or computer questionnaires are further suggestions for refining selection processes.

2.5 Multi-layered composition of performance: concluding remarks

Selecting staff for the ice is a complex process, in the course of which several considerations have to be taken into account. An individual needs to bring a certain set of mental, physical, and task-related attributes to perform well in an extreme environment such as Antarctica. However, favourable working conditions that are likely to enhance performance and outcome are influenced from a job and an organizational or group level as well (see Grant et al., 2007; also see Figure 2). In keeping with the isolated, sometimes unpredictable Antarctic environment and its contingencies, a job that allows for sufficient autonomy and creativity in problem-solving creates a realistic, supportive work environment. Especially in the Antarctic setting, information sharing between the hiring organization, the employee, and the employee's family or partners, is important for an open, collaborative, and safe working climate.

An individual alone does not determine performance success, nor do they shoulder the sole responsibility for overall efficiency and cohesion – rather, this is a complex process that is fed and driven by a collaborative, trusting, and supportive working environment (Steel, 2015; also see Lovegrove, 2013, and Palinkas and Suedfeld, 2008, on Antarctic leadership).

[15] Note that the topic of faking remains relevant even though there are mechanisms built into tests that correct against it. See Sjöberg (2015) who reports that correction can remove up to 90% of the effects of faking in self-report personality tests.

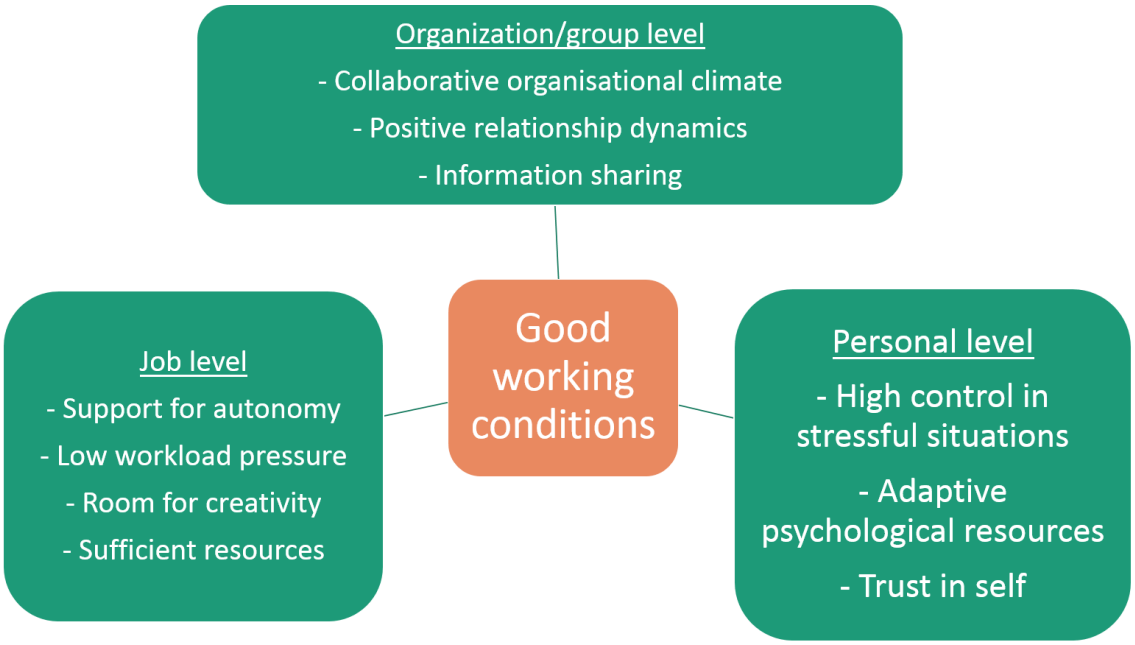

Figure 2: *Components of a supportive work environment*[16]

In summary, there are many components to an employee performing well in their professional, social, and physical environment (Figure 3). Components can be divided into individual (task fitness, medical fitness, mental fitness) and contextual (environmental, organizational, and culture or group fit) categories, but must converge in order to reach effect. Each component has mitigating factors that are reflected in its overall make-up (e.g. personality and existing or accessible support system underlie and influence the mental fitness of a candidate).

Selecting candidates that meet the individual requirements (physical, mental, and professional abilities) needs to be complemented with making sure they are also a match for the challenging conditions of Antarctica as a workplace. It is important to keep in mind that the responsibility for a successful work environment is shared among the individual, the group, and the organization.

[16] Figure composed with data from Norris, Paton, and Ayton (2012) and Awoniyi et al. (2002).

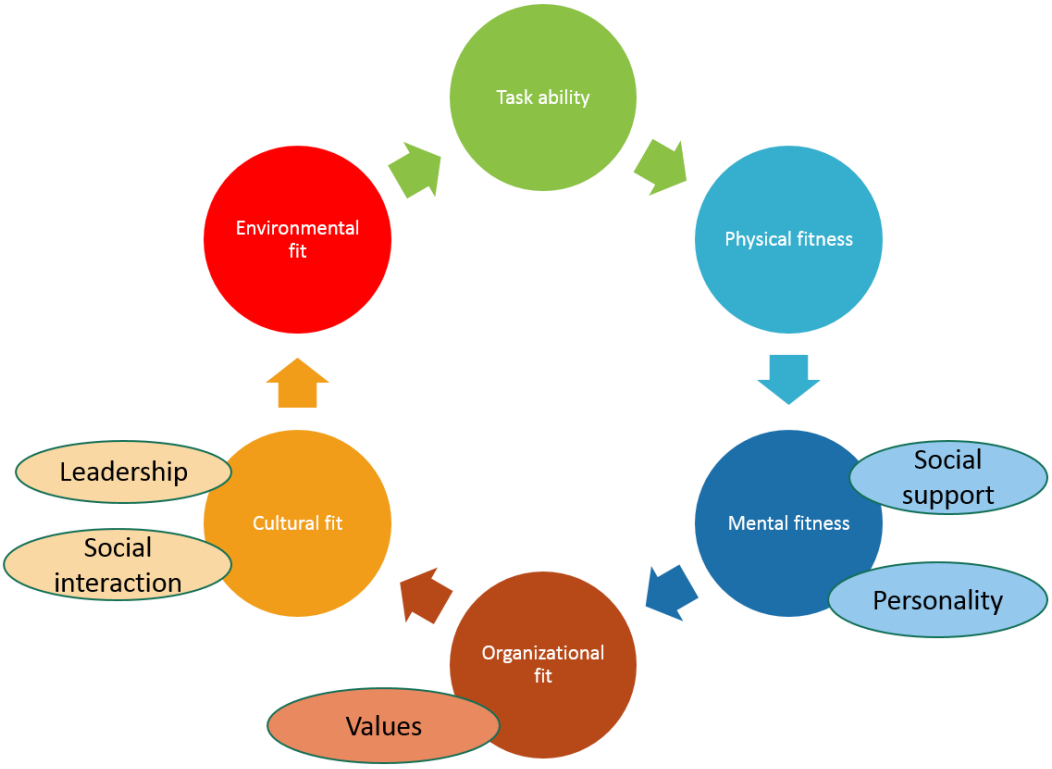

Figure 3: *Factors contributing to successfully selecting a suitable candidate*

While the perfect candidate exists only on paper, and some variables are uncontrollable (especially in group and extreme environment situations), taking into account both the individual and the contextual fit will allow the selection committee to find an applicant who is likely to succeed in Antarctica.

3. Training

Training is an intervention ensuring a person is fit for the requirements of a position. It is the most common human resource strategy to transfer skills, knowledge and attitude (Awoniyi et al., 2002). Specific training is necessary for Antarctica programmes to have successful outcomes. Wratt (1996, p. 164) states that "[w]hatever the purpose for visiting Antarctica, everyone needs effective education and training beforehand". Training is

required for working in and protecting the environment, for specific tasks, and for socio-psychological outcomes. The training needs to be appropriate, up to date, and relevant to the trainee.

3.1 Justification for Specific Training Programmes

There is a suggestion that Antarctica as a work destination is becoming less unusual (Steel, 2015), because of improvements in communications, changes to base demographics[17], and reduced isolation[18]. Yet Antarctica still has challenges that are not faced in most 'normal' occupations in New Zealand (Sanson, 2013): base work can mean shared accommodation, loss of privacy, and loss of choices (food, entertainment, and social interaction), whilst personnel in the field may also have to work in environmental extremes with a small group. Both field and base-located workers see separation from friends and family, potentially for months at time. In particular, winter-over personnel experience profound isolation and small group situations. As a result, training needs to prepare personnel for the Antarctic work environment, particularly with regard to differences they may not even be aware of before they leave home. After recruiting, training is essential for effective team and individual work, more so because outside assistance may not be available (British Antarctic Survey, 1985).

As well as the desired benefit of equipping staff for their job, pre-deployment training can also provide the employer with a better insight into individual personalities, how they behave in a group situation, and what role they feel most comfortable in. In many countries, an initial screening is held, and then an overnight training session is used for further selection. However, for cost reasons, it is common practice in the AntNZ programme to only provide training to those individuals who have been selected for their role.

[17] Both men and women are now employed.

[18] This is due to increased travel and exposure to new people.

3.2 Unusual, but Predictable

Antarctic work conditions are somewhat predictable, even if they are unique. Known stressors are the continent's remoteness, isolation, and harsh environment. Separation from family and social groups, the nature of the experience, and the length of time in Antarctica, can all impact on personnel who go there. Because of the known aspects of the environment and the work undertaken there, it is possible to plan and train for the expected, and to prepare, at least to some extent, for the unexpected (Norris et al., 2012). After compulsory field training, Johnson (1995) remarked that she was much better prepared for the unexpected after having learnt and practised the necessary skills first-hand.

Training for Antarctic deployment can be grouped into three general areas: environment, task, and socio-psychological.

3.2.1 For and In the Environment

On the Antarctic geopolitical stage, environmental care of Antarctica ranks highly. Various protocols, agreements, and polices have been made to protect the Antarctic environment. Attempts are made to minimise human impact, and training programmes include comprehensive environmental management sections for this purpose. The AntNZ training programme includes pollution prevention, waste management, biosecurity, energy use, spills, and reporting. Environmental training is not only for AntNZ staff and contractors, but for all those who visit Antarctica through the NZ portal, including scientists, artists, and media personnel.

On the other hand, field training is about keeping safe in the environment. Getting ready for Antarctic field work is like planning for an extended camping trip or a trip into space: everything needed to survive and work effectively has to be taken at the outset of the trip, with little or no opportunity to resupply. Knowledge on how to use the equipment, and what to do in an emergency is also important (Sanson, 2013). Field training has been part of the New Zealand programme for many years and includes emergency shelters, travelling over snow and ice terrain, and recognising dangers unique to the Antarctic environment (Department of Scientific and Industrial Research (DSIR) Antarctic Division, 1986). With correct training, preparedness, and precautions, Antarctica is a safe place to work (Sanson,

2013). People hired as Antarctic Field Trainers (AFTs) receive specific training and they in turn train others, to ensure they are aware of environmental hazards and outdoor survival skills.

3.2.2 Task Training

Research into the effectiveness of those working in polar regions has shown the importance of the chosen applicant being good at their work. Task ability is one of three characteristics identified for success in the polar work place (Steel, 2015). Given the high level of interest for most positions, it is expected that the successful applicant will have the technical ability to do the assigned task and will have a significant amount of prior learning. Depending on the task some specific task training may be needed. The training should be designed to encourage task ability as well as emotional stability and social compatibility — the two other elements that have been identified as determining success in polar personnel (Palinkas & Suedfeld, 2008; Steel, 2015).

3.2.3 Socio-psychological Training

The term social psychological is defined as how individuals behave in a social context (Côté & Levine, 2002). Patterson (2016) states that: "One of the biggest challenges for people is living and working away from their usual support networks". Training can be given to improve understanding of individuals' behaviour and influence on others, as well as how one's self and others are perceived. This is particularly valid when groups need to work and live together for a length of time. Studies have shown that time spent in polar regions has had positive and negative psychological impacts on personnel. Preventing or minimising negative effects can be done through awareness and training. Given the harsh environment of some Antarctic work, the isolation, and the lack of usual social groups, psychological training in coping strategies and group interaction is recommended (Palinkas & Suedfeld, 2008).

AntNZ recognises the value of such training for its staff and incorporates it into its pre-deployment training. This prepares staff for both living and working safely in Antarctica (Patterson, 2016). One element of the training termed 'Living Above the Line' is specifically about awareness in relation to living in the small social group at Scott Base (J. Patterson, personal communication, January 16, 2017). It is interesting to note that socio-

psychological training is not compulsory for all; scientists are exempt, despite some spending considerable time in the field in small isolated groups.

3.3 Appropriate, relevant and up to date

Training needs to be appropriate; inappropriate training may not only be a waste of time, diminishing the transfer of knowledge and skills, but can also be destructive. Perkins, Holtman, Kessler, and McCarthy (2000) who reviewed core team values of one of Robert Falcon Scott's expeditions, stated: "The combination of Scott's personality and his rigid training though, was a toxic mix… It created a fragmented, dispirited group that could hardly be considered a team" (p. 89).

It has been recognised that training needs to be well targeted. At one stage, the US National Antarctic Program's Education and Training programme required all participants to attend set training. This was modified and developed into more specific education and training opportunities (Penhale, 1996). Similarly the New Zealand Field (pre-deployment) Training programme has changed over the years: it was initially based in Waiouru Military Camp and Mt Ruapehu, then in the 1970s it moved to Balmoral Military Camp, Lake Tekapo (Department of Scientific and Industrial Research (DSIR) Antarctic Division, 1970), and it is now based in Christchurch. Snow and ice as well as SAR training are held in Arthur's Pass National Park.

From the cited examples above it can be seen that the content, as well as the location has changed (DSIR Antarctic Division, 1970, 1986) . Changes reflect not only the methods, with training becoming more interactive, but also the technology available for training. Pre-deployment training available for both staff and event participants now includes written material, interactive quizzes, humorous short videos, e-learning and briefings (Antarctica New Zealand, 2016). General compulsory training is not always cost effective or relevant to the trainee. For repeat employees training can be modified to meet any new needs or to update their knowledge or skills, whereas first time employees will need a broader training programme.

It is appropriate that training continues in Antarctica, as the Antarctic environment cannot be replicated in New Zealand. Awareness and understanding can be raised prior to being in Antarctica, but there is no substitute for being on site in the cold and wind to emphasise

training points on travel and survival techniques (AFT, personal communication, December 22, 2017).

Briefings are a useful way of continuing training and providing a feedback loop for both staff and event participants. On arrival at Scott Base a general briefing is given. This is an opportunity to reinforce pre-deployment training, and can include communication procedures, waste management, health and safety, and other standard operating procedures. Further daily and or weekly base staff briefings can be undertaken at which any concerns and clarifications can be discussed. These are seen as part of the on-going training opportunities (Wratt, 1996).

Some literature suggests that for the most effective training, it should be spread over a period of time, rather than in consecutive intensive sessions (Barshi, 2015). However, this needs to be balanced with cost and practicality. Informal conversations with some Scott Base staff revealed that they considered that the training they received was appropriate, especially given the high level of technical knowledge and experience that they brought with them to the role (AFT personal communication, December 23, 2017).

3.4 General Comments: Training Methods

There are various ways of transferring knowledge and skills for training purposes. Variation, feedback, building on pre-existing knowledge, and complexity, are all important to improving the training process (Healy & Bourne, 2013) AntNZ appear to acknowledge this by having a wide variety of training methods. They make use of returning staff and contractors during training sessions, giving them the opportunity to share their knowledge and perspectives (J. Patterson, personal communication, January 17, 2017). AntNZ aims to continuously improve the training programme; for example, at the end of a person's contract, feedback is sought on training.

How training is delivered is important. A common approach is team-building, which can be effective provided the activities go well for participants. If the training exercises are structured so that everyone contributes successfully, they can be used to show individual contributions, and to build confidence and optimism (Perkins et al., 2000). However, if there is a negative experience, this can have ongoing negative consequences for the individual involved (G. Steel, personal communication, January 19, 2017).

3.5 Further Research

Evolving pedagogical trends need to be incorporated into reviews of training programmes. Some general training research is relevant to training in the Antarctic, but given the unique nature of Antarctica, its remoteness and extreme environment, training needs to be specialised. There is an opportunity for further research into success factors of training for Antarctic programmes, as little research has been done to date in this area.

Ethical requirements mean the research cannot be done without participants' permission, which may lead to bias. It is also unethical to choose groups of people to train differently, with a study done on the training success. However, given the variety of training procedures undertaken by the different NAPs, (see Section 4.4,) it is possible some comparison could be made using existing practice.

Furthermore, socio-psychological training needs to be mindful of the unique challenges of working in Antarctica. One area that needs further research is whether personnel trained in socio-psychological aspects adapt better to working and living in Antarctica than those who do not receive the same kind of training (e.g. staff employed by AntNZ vs. scientists in deep field camps).

4. Transnational Considerations

4.1 Introduction

Antarctica is a continent that many consider to be for peace and science, and is one of the few places where international cooperation is considered to be one of the main objectives between governments (Gilbert, 2015). Since the International Geophysical Year (IGY) in 1957/58, this cooperation and scientific collaboration has been a focus during Antarctic research. As Antarctica is not owned by any one country, and many states have stations on the continent, transnational cooperation is common, especially with regards to scientific research.

This section examines selection and training in an international context, with different states' methods being discussed and compared. The similarities between selection and

training methods, and why NAPs use these strategies will be discussed, and then the differences between states will be explored. This section will cover the different selection and training methods, and potential issues that could arise from these differences, including differences between field work and base work, and staff and scientists. Finally, recommendations will be given to provide a way to potentially improve future international cooperative work.

4.2 Similarities

When working in such an inhospitable environment the selection and training of personnel are important aspects to Antarctic operations as those who work on the continent must be mentally and emotionally fit, and aware of the dangers that the environment constitutes. As the states involved in the Antarctic follow these principles to sufficiently prepare their personnel, many of the strategies implemented are similar to those used by other states.

4.3 Selection

Most states operating on the Antarctic continent follow a similar process when selecting their personnel, with the selection process potentially including medical tests, psychological tests, and interviews. New Zealand, Australia, the United Kingdom, and France are some of the states that conduct these types of selection tests (Wooding, 2016; L. Peck, personal communication, January 11, 2017).

The selection process in Australia is particularly complex, especially for personnel who will winter-over. After a written application and a preliminary medical screening, first-time applicants must go to a "Selection Centre" (Wooding, 2016). The Selection Centres run for 24-hours, and are designed to recreate an average day for someone in the Antarctic. They use scenarios, social events, problem-solving, and community work, in an attempt to assess how participants work in a group and prepare them for work in the Antarctic. The Australian selection process also allows applicants to opt out if they wish to. This method of selection helps to remove unsuitable applicants from the process, thus reducing the likelihood of problems in Antarctica. This is particularly important for staff who will winter-over, where the whole group must get along, and there is both logistical and financial risk if someone needed to be evacuated (Wooding, 2016).

Interviews and psychological tests are also very important to the selection process. In New Zealand, Australia, and the United Kingdom initial interviews are used to assess technical skills for those who will work as staff on base (L. Peck, personal communication, January 11, 2017; Wooding, 2016). There are also psychometric/psychological tests conducted by Australia, New Zealand, and France[19] to evaluate the applicant's mental fitness and ability to cope in an isolated environment with few people. The United Kingdom does not conduct psychological tests, but instead relies on a medical, interviews with professional Antarctic personnel, and situation questions to assess whether an applicant is mentally and emotionally suitable for the Antarctic (L. Peck, personal communication, January 11, 2017).

4.4 Training

Most NAPs that operate in Antarctica provide pre-deployment training for their personnel. This training involves topics such as survival techniques, fire safety, first aid, and search and rescue (Australian Antarctic Division, n.d.; Council of Managers of National Antarctic Programs [COMNAP] Training Expert Group, 2013). The aim of this type of training is to physically prepare the personnel for Antarctica's extreme environment, and the danger it presents. Some states also provide psychological training to prepare the personnel for the difficulties that they will face in the isolated environment. Table 2 shows the types of training and selection and which states provide them.

Table 2: *Similarities in selection and training between states*[20]

	NZ	AUS	GBR	FRA	ITA	KOPRI	UKR	JPN	ARG
Interview	✓	✓	✓	✓					
Psychological test/interview	✓	✓	✗	✓					

[19] France uses an interview with a psychiatrist, as well as intelligence and personality tests (Crocq, Rivolier, & Cazes, 1973).

[20] Due to a lack of data, only some states selection and training techniques can be shown and discussed. Blank areas indicate no data available.

Medical test	✓	✓	✓	✓					
Pre-deployment training	✓	✓	✓		✓	✓	✓	✓	✓
Psychological training	✓		✓				✓		

4.5 Differences

While most states follow similar procedures for selection and training, the breadth and standard of training varies between programmes.

According to Article 10(b) of Annex III of the Environmental Protocol, all Treaty Parties are required to provide training designed to limit the environmental impact of Antarctic operations (Richardson, 1996). While this applies to all the Parties, the interpretation of the Article is different and the extent of the training provided varies between states with little to no training being provided by some NAPs (D. Liggett, personal communication, January 24, 2017).

As previously mentioned, pre-deployment training is provided by each NAP to prepare personnel for Antarctica, but the length and detail of this training varies between programmes. New Zealand personnel who will winter over get 3-4 days of first-aid and fire-fighting training at AntNZ to prepare them (M. Rogan-Finnemore, personal communication, December 15, 2016). The British Antarctic Survey runs a one-week pre-deployment course for personnel who will be living in Antarctica for more than a month (L. Peck, personal communication, January 11, 2017). Japanese winter-over personnel receive a week of training in the mountains to prepare them (COMNAP Training Expert Group, 2013)[21]. Korea also has a week-long training course and a training facility for personnel (K. Lee, personal communication, January 17, 2017). Ukraine has specialised training that lasts from 2 weeks to 6 months depending on the profession of the person (COMNAP Expert Training Group, 2013). Argentina provides a training course for all staff, which is in two

[21] This source only mentions the types of training that other National Antarctic Programmes can be admitted into; private training for national personnel only is not included.

stages and runs for a total of 60 days. This course is theoretical and practical, and is designed to develop mental and physical skills (COMNAP Expert Training Group, 2013). These differences in training are insignificant when personnel are within their own base; but there is a potential for problems to occur when personnel from a variety of stations and training backgrounds are in one location.

4.6 Potential Issues

During transnational cooperation there is a potential for issues to arise due to the differences in training standards, especially during scientific research. The different lengths and types of training may prepare some personnel better than others. For example, the Japanese programme prepares personnel in the mountains for a week, whilst New Zealand personnel get 3-4 days. In Antarctica this could cause issues if some personnel are not as knowledgeable or skilled in some areas, such as field safety. These differences are especially important during field work where it is vital for all personnel to have a comprehensive knowledge of the environment and the dangers it poses. The differences could hinder any international operations that are being conducted on the ice.

Other issues could potentially occur due to the lack of knowledge of the other programme's training and selection process. This means that the personnel may not know to what degree the other group has been trained, and whether they are fit for the environment.

4.7 Field Work vs. Bases

These differences between training programmes are especially important during field work, where most of the international collaboration occurs. While on base, the disparities in training may not be as noticeable, but in the field it is much more significant. In the field there are more hazards and a greater degree of isolation, which means that personnel must have comprehensive training, and must be mentally and physically fit for the environment.

4.8 Scientists vs. Staff

Most of the personnel who work out in the field, and who are also involved in international collaboration, are scientists who have entered Antarctica through their national programme. Though the scientists will have been required to have a medical before going to Antarctica, the selection of scientists is usually much more lenient than that of staff (D.

Liggett, personal communication, January 24, 2017). Scientists visit Antarctica to complete their research, and are not specifically chosen by the NAPs, but usually apply for external funding. If funding is secured, then the NAPs are not in a position to replace one scientist with another. As base staff are usually on the continent for at least several months, they must go through a stricter selection process than scientists who are usually only in Antarctica for a few weeks. This relaxation of selection standards could potentially cause issues during transnational collaboration and field work, as different programmes will have different standards of selection and training. These differences could hinder operations that are done on the continent, and may affect future collaboration.

5. Post-deployment Adaption

5.1 Introduction

As already seen, there are a large number of factors to take into account when selecting staff for Antarctica, and a significant amount of work goes into assuring adequate training is given to those selected. A large body of research looks at how personnel will adapt whilst living in Antarctica (e.g. see Oliver, 1991; Steel, 2015; Taylor, 1987); however, psychological adaption upon return to normal society has largely been overlooked. Most literature looking at post-deployment adaption only considers positive or negative adjustment outcomes (Oliver, 1991; Palinkas & Suedfeld, 2008; Taylor, 1973), although some research considers what processes underlie these adaption results (Moult, Norris, Paton, & Ayton, 2015; Norris et al., 2012).

5.2 Negative or Positive Adaption?

The research on post-deployment adaption generally considers Antarctica to have a positive effect[22]; for example, Taylor (1973) found that New Zealand winter-over personnel were

[22] A positive effect meaning that the person deployed to Antarctica feels that they are in some way 'better' than they were before they went. This may represent itself in numerous ways. Conversely, a negative post-deployment adaption means that the person feels that they are in some way worse for having gone to Antarctica.

mostly more self-reliant, more practical, and more independent as a result of their Antarctic experiences. In a similar vein, Oliver (1991) found that American winter-over staff at McMurdo felt that they had grown stronger, with 93% rating their experience as positive, despite 90% needing a period of adjustment upon return home. Further evidence of positive adjustment is provided by the high number of staff who wish to return for another winter season – for example, 25% of Australians return for two or more winters (Wood, Hysong, Lugg, & Harm, 2000).

The group studied by Taylor (1973) had a variety of responses one month after returning to New Zealand, including intolerance and irritability (22%) and alarm at the speed of traffic (24%). However, twelve months after their return, the same group expressed nostalgic feelings regarding their Antarctic experience rather than concerns regarding their reaction to home life, indicating that there are distinct phases to post-deployment adaption.

5.3 Predictors of Adaption

Moult et al. (2015) categorise post-deployment adjustment into a reunification phase and a reintegration phase. The former can be thought of as the 'honeymoon' period and is generally characterised by positive feelings, such as excitement. The latter is the stage where reality hits – the initial excitement of returning home has diminished and normal routines are re-established. Their research looked at Australian personnel and evaluated them before they went, during their time in Antarctica, two months after return (reunion), and twelve months after return (reintegration). They were specifically looking at predictors of adaption – not everyone has a positive psychological outcome from spending time in Antarctica, and it may be possible to select or train personnel to improve outcomes.

Their research showed that there are predictors of both positive and negative adaption at each stage, and that these predictors depend upon the relationship status of the particular person (Moult et al., 2015). Specifically, at two months partnered personnel were more likely to experience a positive adaption if they have a high-quality relationship, but a negative adaption if they have a particularly good reunion[23]. Conversely, singletons have

[23] A high quality reunion being a predictor of negative adaption may seem counter-intuitive, but essentially boils down to 'the higher they rise, the harder they fall'.

other prediction factors, such as their length of absence[24]. There are also commonalities between the two groups, for example, the use of humour and religion was found to be an indicator of positive adaption regardless of relationship status (Moult et al., 2015).

It should be noted that this is one study, done on a single country's personnel; as a result, care should be taken about extrapolating these results to a more general perspective, and it is recommended that other Antarctic populations are studied to determine if these results can be generalised or not.

5.4 What happens in practice?

Whilst there has not been a wide body of research on the reasons behind different post-deployment adaptions, the fact that some personnel have negative adaptions, particularly in the short-term is recognised by at least some of the NAPs (J. Patterson, personal communication, January 16, 2017; L. Peck, personal communication, January 11, 2017).

AntNZ have a multi-pronged approach to improving adaption outcomes (J. Patterson, personal communications, January 16, 2017). Staff, their partners, and children all have access to an Employee Assistance Provider (EAP), both while in Antarctica, and up to six months after their return. This program offers free, confidential advice and support. AntNZ also discusses how the employee will stay engaged with family, at both the interview and the pre-deployment training; despite a lack of research, common sense says that if an employee stays involved with their family life whilst in Antarctica, it will be easier for them to reintegrate upon return. Finally, they have a publication issued to staff, entitled "There and Back". This is a guide intended for staff, as well as their family and friends and covers how to prepare and what to expect (i.e. pre-deployment information) as well as how to readjust (i.e. post-deployment adaption).

[24] An increased length of absence is a predictor for negative adaption for singletons, two months after returning home.

6. Suggested Actions and Further Research

To avoid potential issues with different standards of selection and training, it is suggested that a set of standard minimum guidelines be developed that all Antarctic programmes would refer to when selecting and training personnel, taking cultural differences into account. This would ensure all personnel are trained sufficiently and are aware of other groups' level of training during transnational cooperation. Having similar standards between NAPs would facilitate collaborative field work and research and would encourage future international collaboration.

It is also suggested that there be a secure international database with the profiles of all personnel in any given season. This database would contain their qualifications, the level of training they have received as well as any specialist training (such as diving), and any major medical issues. This database would be able to be accessed by some base staff if these personnel were to come onto their base from other stations. It would make the staff aware of the level of proficiency of anyone that participates in scientific research with their programme through international collaboration. The legal implications of this database with private information would need to be investigated further. This is partially being done through COMNAP via a database that shows what training some programmes offer, though this is voluntary and does not show what training individuals have.

A final recommendation is that further research is carried out into a number of aspects of selection and training, particularly:

- What are the implications of ethnic diversity on station personnel selection and performance?
- Do personnel who have social psychological training perform better in Antarctica than those who do not receive social psychological training?
- What are the success factors for Antarctic training schemes?
- What are the implications of international selection and training on transnational collaboration?
- Do the predictors of Australian post-deployment adaption found in the study by Moult et al. (2015) apply to a wider population?

7. Conclusions

People are an important part of modern-day Antarctica. While the natural Antarctic environment is inhospitable to human life, people are now present all year around on the continent. For NAPs, this means careful selection and training of personnel is required to ensure safe and effective operation in Antarctica.

As shown in this report, there are several factors to consider when selecting suitable candidates. In regards to personal criteria, task, physical, and mental fitness are essential. In regards to contextual criteria, the person-environmental fit, the person-culture fit, and the person-organisation fit need to be considered.

Similarly, training for Antarctica encompasses environmental, task, and socio-psychological components. These are meant to ensure that personnel have a low environmental impact, are safe in the environment, are capable of doing their job, and are mentally able to deal with Antarctic stressors.

Transnationalism is an increasing factor to consider. More international cooperation is occurring, and personnel are more frequently visiting bases or sites run by other programmes. As there are currently no internationally adopted minimum standards for selection or training, there is the potential for issues to arise. It is suggested that further research be carried out to determine if such standards are required, and also to determine the best way to share information on personnel between NAPs. Legal implications around this would need to be researched and considered.

Finally, when personnel return home, they usually require some time to readapt to 'normal' life. They also have differing long-term effects from their time spent in Antarctica, both positive and negative (or both simultaneously). It is recommended that further research be carried out in this area, as it may be possible to select and train personnel to ensure higher rate of positive post-deployment adaption.

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9. Appendix – Glossary

Neuroticism: anxiety, fear, moodiness, worry, envy, frustration, jealousy, loneliness. Stressors mean a worse response.

Task ability: knowledge, skills, practice, and expertise required to perform a task well.

Sociability: personality trait. Enjoying others' company, being friendly, amiable.

Resilience: being able to adapt positively after stressors, trauma, or difficulties. Ability to cope, emotional robustness.