Job Related Fitness Tests

for

Police Officer Specialist Posts

Report to the Police Advisory Board of England & Wales

22nd January 2010

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Appendices

Acknowledgement

The Police Advisory Board of England and Wales sponsored Fitness Working Group would like to thank all those police forces, officers and staff who kindly volunteered to take part in this study, and for their willingness to contribute to the data collection process.

Executive Summary

1. Introduction and background

1.1 In delivering policing services to the communities of England and Wales, police officers undertake a number of specialist roles that require a varying degree of physical fitness to be able to undertake the role operationally, and to achieve the requirements of the Integrated Competency Framework (ICF) defined for each role.

1.2 In 2003 the PABEW commissioned a working group to advise on the development of national job related fitness standards for recruits to the service, for specialist posts and for officers in service. The working group recommended a job related fitness test (JRFT) standard for recruits which was adopted by the service in 2004 (HOC 43/2004).

1.3 In 2007 the working group was reformed to develop national job related fitness standards for specialist posts with the following terms of reference:

- To provide evidence based recommendations on the job related fitness testing requirements (JRFT) for specialist police officer roles.
- To provide recommendations as to how JRFT can be conducted fairly and consistently. In addition, also to provide guidance on how to deal with those who do not meet the required identified standard.
- To provide JRFT guidelines that meet the requirements of anti-discrimination legislation.
- To provide a structured timetable of work to provide best practice guidelines to the service, via the Rewards and Recognition Group, on JRFT for specialist roles.

1.4 The full remit for the working group is shown in Appendix 4.

1.5 The reformed Fitness Working Group (FWG) was tasked with driving this work forward. The National Police Improvement Agency provided funding for external consultants to assist in this work and, after a process of external tendering, Lilleshall Consultancy Services (LCS) were contracted to undertake a data gathering exercise across the service, analyse the results and produce appropriate recommendations to the FWG. LCS had developed the JRFT for recruits and their proposal, which was accepted, was to build on this work to develop national standards for specialist roles by evaluating the endurance and strength demands experienced by police officers undertaking training for specialist roles.

1.6 The newly formed FWG included representatives from:

- Association of Chief Police Officers

- Superintendents Association
- Police Federation
- Her Majesty's Inspectorate of Constabulary
- Specialist Fitness Advisors
- National Policing Improvement Agency

1.7 The FWG defined the specialist police officer roles to be examined as follows:

- Chemical, Biological, Radiological and Nuclear Unit (CBRN)
- Method of Entry (MOE)
- Dog Handler (DH)
- Mounted Branch (MB)
- Police Cyclist (PCY)
- Police Support Unit (PSU)
- Air Support (AS)
- Police Divers (PD)
- Marine Police Unit (MPU)
- Marine Police Unit (Tactical Skills) (MPUTS)
- Authorised Firearms Officer (AFO)
- Armed Response Vehicle (ARV)
- Dynamic Intervention Authorised Firearms Officer (DIAFO)

1.8 During 2007 the FWG undertook a survey of the current fitness tests in place for the above roles across the forces of England and Wales. A high degree of inconsistency and variation was found in the fitness standards applied in selecting police officers for the above roles. As a consequence the service was potentially vulnerable to legal challenge on selection processes that lacked an obvious defined relationship to the physical requirements and demands of the operational role. In addition, the service was failing to capture best practice in job-related fitness testing for specialist roles.

2. <u>Data gathering exercise</u>

2.1 A total of 17 police forces took part in the data gathering exercise on a voluntary basis. The list of forces involved is shown in appendix 2 . The range of forces clearly represents the range of operational policing environments across England and Wales.

2.2 During 2008/9 data was gathered from 301 police officers in specialist roles, consisting of 248 males and 53 females.

2.3 The data gathering exercise aimed to capture data from officers undertaking training exercises, following national training guidelines, as they closely replicate the 'real-life' physical demands of the specialist role and are based upon operational scenarios.

2.4 Data gathered during the training exercises was then compared to data gathered during the Multi-Stage Fitness Test (MSFT) which had earlier been undertaken by the same officers.

2.5 The MSFT requires an individual to run back and forth continuously from one line to another, 15 metres apart, in time to an electronic bleep. The run is gradual and progressive, and the pace increases with each new level. An ever-increasing running speed has to be maintained until the required pass mark is reached. The test is finished when the individual has reached the point of volitional exhaustion and/or can no longer keep up with the bleeps.

2.6 The MSFT is currently also used for initial recruits to the service at a nationally agreed pass level of 5.4.

2.7 Physiological data gathered and compared during the operational training and MSFT included:

- Peak heart rate.
- Heart rate at the point of completing 4 shuttles on level 5 of the MSFT.
- Highest mean heart rate attained for a period of 4 minutes.
- Time in Zone: the length of time during the training for which the heart rate was below the level attained at 4 shuttles on level 5 of the MSFT, and the time for which it was elevated, during the training exercise, above this level.

2.8 Comparison of the data gathered from the operational training and during the MSFT has made it possible to recommend minimum MSFT pass standards for each specialist police office role examined by the FWG.

2.9 This method will ensure, as far as is possible, that an officer who passes the MSFT recommended standards, shown in table one, has the physiological capacity to enable them to cope with the operational fitness demands of the relevant specialist activity.

2.10 The dynamic strength test consists of a push and pull test, at a pre-set resistance, on a Concept II DYNO machine. In a seated position, an individual firstly has to complete three warm up pushes, followed by five maximum pushes. This procedure is followed by three warm up pulls, followed by five maximum pulls. The mean of both the five maximum push and pull scores is recorded, respectively.

2.11 It has not been possible to define an appropriate strength test required for each role. The FWG considered that it was important to retain a strength test element and as a default the standard required for new recruits is recommended for all specialist roles. The full rationale behind this decision can be found on page 60 of this report.

Table 1: The Recommended JRFT Endurance and Strength Standards

Unit	Recommended Standard (Level : Shuttle)	Dynamic Strength	
		Push	Pull
Marine Police Unit	5 : 4	34kg	35kg
CBRN	5 : 4	34kg	35kg
Method of Entry	5 : 4	34kg	35kg
Dog Handler	5 : 7	34kg	35kg
Mounted Branch	5 : 7	34kg	35kg
Police Cyclist	5 : 8	34kg	35kg
Police Support Unit	6 : 3	34kg	35kg
Air Support	6 : 4	34kg	35kg
Police Divers	6 : 8	34kg	35kg
Marine Police (Tactical Skills)	7 : 2	34kg	35kg
Authorised Firearms Officer	7 : 6	34kg	35kg
Armed Response Vehicle	9 : 4	34kg	35kg
Dynamic Intervention AFO	10 : 5	34kg	35kg

3. Recommendations

The PABEW is asked to consider the following recommendations:

1 (a) The Police Service adopts the standards in table one for the specified specialist police office roles as the only standard.

(b) The Service is given an 18 month period to implement the new standards if approved.

(c) The standards, if approved, are used in selecting officers for the specialist roles and for any subsequent in-post testing.

(d) Any approved pass at the recommended level for a role is 'time limited' linked to a regular re-test programme.

2 A post implementation review, if the standards are approved, 12 months from the start date.

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RESEARCH INTO FITNESS FOR THE POLICE SERVICE

Contract No. 4500004177

JANUARY 2009

CONDUCTED FOR THE NATIONAL POLICING IMPROVEMENT AGENCY

BY

Lilleshall Consultancy Services

CONTENTS

ACKNOWLEDGEMENTS

Lilleshall Consultancy Services would like to acknowledge the support and guidance from all members of the NPIA Fitness Working Group in undertaking and completing this report.

In particular we would like to acknowledge and thank Paul Buckle, from the Metropolitan Police, and Jon Cumberbatch, from Staffordshire Police, for their invaluable assistance in co-ordinating venues and data collection for the duration of the study.

Finally, LCS would like to thank all of the Police Forces and Police Officers who volunteered to take part in the study, and for their willingness to contribute to the data collection process.

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EXECUTIVE SUMMARY

A total of 275 Police Officers from 15 Police Forces took part in this study, consisting of 223 males and 52 females. Heart rate and blood lactic acid data were collected during a range of activities designed to replicate the demands of 10 specialist unit activities. All officers were also required to undertake the MultiStage Fitness (MSFT) test component of the Job Related Fitness test, during which heart rate data were collected at 15 second intervals. Comparison of the physiological data collected during the simulated training and the MSFT made it possible to recommend minimum pass standards for the MSFT which will ensure that officers who pass the test have the physiological capacity that enables them to cope with the demands of the relevant specialist activity. A summary of the current and recommended minimum standards is shown in the table below:

UNIT	CURRENT STANDARD (Level:Shuttle)	RECOMMENDED STANDARD (Level:Shuttle)	CHANGE (SHUTTLES)	CHANGE VO2 mls/kg/min	PREDICTED VO2 max
ASU	5 : 4	6 : 4	+ 8	+2.4	37.4
CBRN	5 : 4	5 : 4	0	0	35.0
MoE	5 : 8 (6 : 0)	5 : 4	- 4	- 1.1	35.0
PCY	5 : 4	5 : 8	+ 4	+ 1.1	36.1
DH	5 : 4	5 : 7	+ 3	+ 0.8	35.8
MB	5 : 4	5 : 7	+ 3	+ 0.8	35.8
PSU	5 : 4	6 : 3	+ 7	+ 2.2	37.2
SFO	10 : 2	10 : 5	+ 3	+ 1.1	50.8
ARV	9 : 4	9 : 4	0	0	46.0
AFO	7 : 9 (8 : 0)	7 : 6	- 3	- 0.8	41.0

The strength component of the JRFT is currently a simple push-pull routine using the Concept II Dyno machine. However, it has become apparent that the manufacturers are

withdrawing this machine from production, and hence threatening the long term viability of the test. In the Lilleshall report of 2004, a comprehensive review of functional strength tests indicated that this test was best suited for use in the Police Service's JRFT. LCS continue to support this view, despite reviewing an alternative option currently used by the Police Service of Northern Ireland. Hence the recommendations for future strength testing, made by LCS are that the NPIA should consider

1. The longevity of the Concept II Dyno unit, including options for on-going service and repair, and the potential for replicating a similar machine with a different manufacturer.
2. Canvassing views from a range of manufacturers on the design of an alternative job-specific strength assessment unit, bearing in practicalities of cost, servicing and ease of use.
3. The current minimum standards on the Concept II Dyno are used for all officers in specialist units, and will determine their capacity to undertake the training required for the necessary specialist activities.

SECTION 1: INTRODUCTION

Background and assumptions

This study has focussed on the physical demands faced by Police Officers undertaking specialist roles within the Police Service, and compared these demands with those elicited by the current Job Related Fitness Test (JRFT), which all officers are required to undertake, and pass, before serving as Police Officers.

The aerobic component of the JRFT is the 15m version of the MultiStage Fitness test, and the basic minimum pass standard – the completion of 4 shuttles on level 5 of this test – is applied to 6 of the 10 specialist units assessed as part of this study. This standard is based on the study conducted by the Lilleshall Sports Injury and Human Performance Centre, (Brewer et al, 2004), following an evaluation of the demands of Officer Safety Training, and has subsequently been widely adopted by Police Forces throughout the UK. The remaining 4 specialist roles assessed as part of the present study have applied minimum standards on the 15m shuttle run test which exceed the basic minimum standard by varying amounts.

Prior to undertaking the study, the Project Consultants have made the following assumptions, which underlie the science, methodology and conclusions that have been reached in this report:

- The current "basic" JRFT standard for the 15m MultiStage Fitness test (the completion of 4 shuttles on level 5 of the test) remains as the minimum standard for all Police Officers, and the standard for a specialist role will not drop below this level, regardless of the demands of that activity. However, dependent on the demands of a specialist role, the minimum standard could be increased where appropriate.

- The minimum standards will remain the same for males, females, ethnic groups and age categories, and be based on the demands of the job alone.

- The Home Office have a "duty of care", and a legal responsibility, to ensure that the demands of the fitness test imitate, as closely as possible, the demands of the specialist roles.

The remainder of this report will provide a description of the methodology used in this study, a review of the current scientific literature that focuses on the demands of specialist job-related activities that are pertinent to this study, a review of the results, and final conclusions.

Timescale

The study was conducted over a seven month period, from May 2008 to November 2008.

Brief

The Brief set for LCS was to identify minimum JRFT standards for Police Officers undertaking specialist activities within their line of work. This was to focus on an evaluation of the existing endurance and strength components of the JRFT, based on the demands experienced by Police Officers during simulated training activities. Officers from a range of forces, demographically representative of the Police Service, were to be used. Simulated training activities were primarily used as a means of replicating the demands faced within the specialist activities to be assessed.

SECTION TWO: REVIEW OF LITERATURE

There is a relatively small amount of published scientific literature focussing on the job-specific demands faced by those either in the Police Force, or occupations that are broadly comparable. However, those that there are have tended to focus on the need to ensure that individuals are "fit" for the tasks that they are required to undertake, whilst recognising that in many roles, the "spikes" of intense physical activity are very short (in time duration) when compared to the significant length of time when the physical demands are low.

In 1992, Hoover reported on the increasing tendency for police agencies to establish "job simulation" tests, based on a series of exercises and demands that appeared to replicate the demands of the job. Whilst these can seem to be "job related" to an observer, Hoover cautioned against the lack of any benchmarked, scientifically validated standards for such tests. The study by Brewer et al (2004), agreed with this view, concluding that simulated test batteries are difficult to validate, and whilst they may superficially appear to be "job related", fail to identify the specific causes of poor performance.

Since minimum pass standards for physical tests are now used as part of the pre-employment selection criteria for Police Officers, it is important to note the findings of a study in 2002 by Shepherd and Bonneau. They identified the need for gender equality in recruitment processes, referring to Human Rights Tribunals requiring non-discriminatory standards when hiring employees. Whilst the authors recognised the controversy that can be caused by a higher proportion of female officers failing to meet a set standard, when compared to males, (due largely to physiological characteristics such as lower levels of haemoglobin, lung capacity and muscle mass), they crucially pointed out that female recruits should have every opportunity of meeting a realistic minimum standard if given the appropriate level of advice and support in their training. In other words, a realistic minimum standard, based on the demands of the job, should be attainable for

males and females who have the opportunity to, and take responsibility for, training and well being, and this is a preferable route to one that sets differential standards that discriminate between males and females. It should be noted that the UK's discrimination legislation requires that there should be no unlawful discrimination against job applicants on the grounds of their sex, race, religion, disability, sexual orientation, belief or age. Direct discrimination would occur if there were differing standards for individuals from different groups (e.g. males and females, or different age groups). Although direct age discrimination may be justified, it cannot be justified under the other equality strands. Indirect discrimination can occur in circumstances where a fitness test would place members of one group at a disadvantage when compared to members of another group, (e.g. females compared to males, or older individuals compared to younger individuals). Indirect discrimination may be justified in these circumstances if it can be shown that the fitness test is a proportionate means of achieving a legitimate aim. The legislation also allows employers to undertake positive action for people from under-represented groups.

Following the assessment of Officer Safety Training (OST) techniques conducted by Police Forces across the UK, the 2004 Lilleshall study (Brewer et al), recommended that the JRFT remained as a robust and valid measure for Police Officers, with the caveat that the measure of Grip Strength be removed from the test battery. The study also recommended that within the aerobic component of the test (the 15m Multistage Fitness test), the minimum standard remained at the completion of 4 shuttles on Level 5 of the test (resulting in a predicted maximum oxygen uptake value of 35.0 mls/kg/min), since this was found to be equivalent to the demands elicited by OST for male and female Police Officers of all ages and ethnic backgrounds. This study also reviewed the "Dyno Test", based on equipment produced by Concept II, which is used within the JRFT to evaluate dynamic strength, particularly in the upper body. Whilst identifying the need for further research into specific body-weight related minimum standards, Brewer et al recommended that the existing minimum standards for the push and pull components of this test remained the same. The 2004 Lilleshall study also recommended that the JRFT

was underpinned by an environment of the best possible consistency, (in testing and OST), and remedial support, for those who failed to meet the minimum standards, together with the embedding of a culture that gave Police Officers the opportunity to partake in physical activity as part of their working lives.

A comprehensive review of the literature relating to functional fitness tests in working environments is contained in the 2004 Lilleshall report. The present study assumes that the rationale for fitness testing is now embedded within the Police Service, and that a further review to explore justification for this is not required. The study uses techniques for the measurement of fitness (Ramsbottom et al, 1988) and the use of heart rate for predicting work rate (Cooper, 1968), that are well established. It combines these physiological measures with advances in technology and telemetry to measure the "real time" physiological demands of the JRFT and simulated training activities.

SECTION THREE : METHODOLOGY

For purposes of comparison and standardisation, the same procedures and protocols adopted by the Lilleshall Sports Injury and Human Performance Centre in 2004 were adopted in this study.

A total of 15 Police Forces took part in the study, and data were collected from 275 subjects, consisting of 223 males and 52 females. Exact demographic details of the volunteers is provided in the Results section of this report.

The Police Forces who contributed subjects to the study were as follows:

Metropolitan Police Service
Devon and Cornwall
North Wales
West Midlands
Staffordshire
Cleveland
Strathclyde and Lothian Borders
South Yorkshire
West Yorkshire
Avon and Somerset
Greater Manchester Police
Merseyside
Durham
Northumbria
Cambridgeshire

Simulated training activities were chosen as the best means of evaluating the demands placed upon Police Officers undertaking specialist roles. Whilst it is recognised that these may not always exactly replicate the "real world" scenarios that could be encountered, it was agreed in advance of the study that for practical purposes this would offer the best means of collecting robust data on large groups of individuals.

Volunteers reported to the assessment venues approximately 60 minutes before the commencement of the assessment session. All officers then received a verbal briefing from LCS staff on the nature of the data collection, and the rationale behind the work.

Officers were asked to complete a basic health assessment questionnaire and to sign a disclaimer acknowledging voluntary participation in the study, and an acceptance of any risks that could be involved.

All officers were then asked to wear a heart rate monitoring strap (Polar Team System), which was activated automatically once in contact with the skin. Once activated, heart rate data were recorded by the Polar Heart rate strap at 15 second intervals, and stored on an internal memory chip.

On randomly selected officers, a small sample of capillary blood was collected from either the thumb or finger tip, and analysed for lactic acid prior to commencement of the physical activity. Blood was analysed immediately, and disposed of in conjunction with health and safety guidelines.

Once the heart rate straps had been applied, and blood samples collected, LCS observers commenced a "real time" diary of physical activity, so that heart rate could be compared to activity / exercise being undertaken.

Initially, all Police Officers were required to undertake the 15m endurance Multistage Fitness test (MSFT) used as part of the JRFT, to volitional exhaustion. Heart rate was monitored throughout, and the test continued beyond the required minimum standard, (the completion of 4 shuttles on level 5), which is required for all non-specialist roles. In all cases, the test was conducted indoors on a non slip surface, and overseen by either a member of LCS staff, or a Police Service Physical Training Instructor. Officers from specialist units where the minimum standards exceed the basic level were encouraged to achieve and where possible surpass their respective minimum pass standards.

Heart rate data from the 15m MSFT were used to determine the heart rate at the point of completing 4 shuttles on level 5, and peak heart rate, normally found towards the very end of the test close to the point of exhaustion.

At the end of the shuttle run test, randomly selected offers again had capillary blood samples taken for the immediate determination of lactic acid levels.

After a period of recovery lasting approximately 60 minutes, the same officers were asked to commence a programme of specialist training appropriate for their role. In many cases this also required either wearing or carrying the specialist equipment that is essential for undertaking the role. This training was overseen by Police Service training officers, with no input from LCS staff. At no point were the training officers asked to make any modifications to the training protocols to take into account the data being collected.

One exception to the use of simulated training activities for the collection of data was with officers in the Air Support Unit. In this case, officers had heart rates monitored during daily flying activities.

It is well established that heart rate correlates positively and closely with work rate and oxygen uptake (Cooper, 1968). Whilst there is some suggestion that anxiety can elevate the heart rate response to exercise, (Falaschi et al, 2003), it is believed that this is relatively short term and transient, and hence unlikely to have any significant impact on the data collected, bearing in mind that the "like for like" comparison of the MSFT and specialist training meant that all officers were in similar situations for both physical aspects of the study. Whilst "real life" situations may elevate heart rate due to anxiety, and hence place additional strain on the cardio-vascular system, the short term nature of this elevation previously alluded to means that this is unlikely to justify a need to increase the minimum standard on the MSFT in order to take this into account.

For the purposes of this study, four distinct measures of heart rate were used to compare the physiological demands of the MSFT with those of specialist training, namely:

- Peak heart rate
- Heart rate at the point of completing 4 shuttles on level 5 of the MSFT
- Highest mean heart rate attained for a period of 4 minutes (Mean4)
- Time in Zone (TiZ): the length of time during the training for which heart rate was below the level attained at 4 shuttles on level 5 of the MSFT, and the time for which it was elevated (during the training) above this level.

The higher the TiZ above the minimum standard on the MSFT, the more it indicates that the training is stressing the officers to a level above that experienced during the JRFT. Conversely, if little or no time is spent with training heart rates exceeding those at the minimum standard, it indicates that the demands of the test exceed those of the training.

Peak heart rate is normally only attained for a relatively short period of time compared to the overall duration of exercise, and can give an "artificial" indication of the demands experienced. Since four minutes is known to equate to the longest period of time for

which an individual can exercise entirely aerobically, and equates to the approximate length of time needed to complete 4 shuttles on level 5 of the MSFT, it was felt that the comparison of Mean4 heart rate during the MSFT, and the highest mean 4 minute heart rate during the training activities, would provide a valid comparison of the aerobic demand of both the MSFT and the most physically demanding aspects of the training. This technique was successfully used in the 2004 Lilleshall study.

Randomly selected individuals had further capillary blood samples collected for determination of lactic acid after the specialist training. On these individuals, lactic acid levels were compared at rest, after the MSFT and after the specialist training. Lactic acid levels are known to increase after high intensity, anaerobic ("without oxygen") activity, and as such will provide a comparison of the anaerobic demands of the MSFT and the specialist training activities.

Following the completion of the MSFT and specialist training activities, all officers returned their heart rate monitors to LCS staff, and the data stored on these was subsequently downloaded and analysed. In compliance with data collection procedures, individual identities were protected at all times.

All officers received a de-brief from LCS staff and the police training officers, and were supervised for a reasonable period of time after the assessment session to ensure there were no adverse responses to the training.

Data have been collected and analysed using standard statistical procedures. Where necessary, t-tests have been undertaken to compare data collected during the MSFT with that collected during the training, to determine whether statistically significant differences exist.

Where there has been a need to identify changes in minimum standards, regression analysis has been used to predict the work rate / minimum standards on the MSFT needed to replicate the demands of the specialist activity.

SECTION FOUR: RESULTS

A total of 275 Police Officers participated in this study, and their demographic details are shown in the tables below:

Table 1. Subject numbers

	n	%
MALE	223	81.1
FEMALE	52	18.9
TOTAL	275	100

Table 2: Age Profile.

	<19	20-29	30-39	40-49	>50	Disabled
N	0	48	102	119	6	2
%	0	17.5	37.1	43.3	2.1	0.8

Table 3: Ethnic Origin

White	Mixed	Asian	Black	Chinese
269	6	0	0	0

Table 4: Specialist Units

Unit	Total	Males	Female
Authorised Firearms Officer (AFO)	47	38	9
Armed Response Vehicle (ARV)	47	32	15
Specialist Firearms Officer (SFO)	24	23	1
Police Support Unit (PSU)	43	34	9
Chemical, Biological, Radiological, Nuclear (CBRN)	26	23	3
Dog Handler (DH)	17	14	3
Mounted Branch (MB)	10	5	5
Air Support Unit (ASU)	18	16	2
Method of Entry (MOE)	23	19	4
Police Cyclists (PCY)	20	17	3

Based on data provided by the NPIA, these demographic results suggest that the number of males, females and ethnic personnel assessed in this project was proportional to the numbers found within the Police Service.

LCS based all calculations and recommendations on a need to ensure that the minimum possible time was spent during the training / specialist activity with heart rates higher than those experienced at the minimum pass standard in the MSFT. Whilst it will never be possible to prevent heart rates from occasionally peaking at levels over and above those attained at the minimum standards, the duty of care required by the Police Service is such that this should be kept to a minimum, whilst at the same time ensuring that the minimum standard does not greatly exceed the demands of the specialist activity / training. Hence any changes recommended for the minimum standards have been based on a need to ensure that the demands of the MSFT are as close as possible to those experienced during the specialist activity.

Furthermore, it should be noted that the majority of the data are from training activities, and as such the recommendations for minimum fitness standards reflect the level of fitness deemed to be sufficient for the specialist training activities. The final decision on whether officers are fit enough, and competent enough, to carry out operational duties will rest with the professional trainers administrating the training.

Where heart rate traces are presented, it should be noted that the main initial "peak" at the left of the trace represents the subject's heart rate during the MSFT, with the remainder of the trace representing the heart rates experienced during the specialist activity.

Specialist Units: Physiological comparisons between the 15m MultiStage Fitness test and Simulated training.

Air Support Unit (ASU)

18 subjects were assessed, consisting of 16 males and 2 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	178	189	163
Training	-	169	143

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

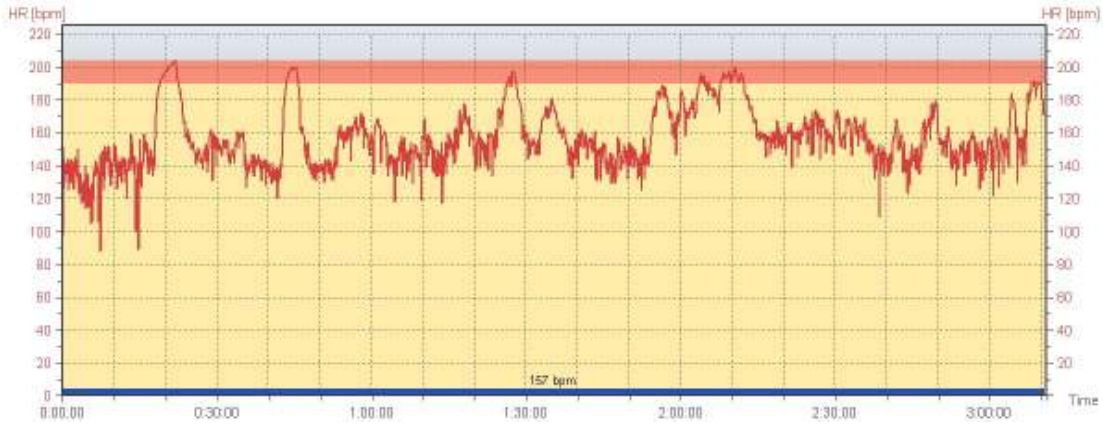
TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

	TiZ <5:4	TiZ>5:4
Minutes	153	3
% training time	98	2

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject.



Conclusion

The TiZ data, and the Mean4 heart rate data, for this group of specialist officers, indicates that there is a small but significant time during the training where physiological stresses exceed those attained at the point of completing the minimum standard of 4 shuttles on level 5 of the MSFT. It should be noted that this finding is not consistent across all officers assessed, and consequently the mean data are distorted by a small number of officers whose heart rates remained at very low levels throughout the training. The reason for this appears to be dependent on the type of training / data collection undertaken, with lowest values observed during “real life” air surveillance activities.

Further analysis of the data indicates that the need to increase the minimum standard for this group is small, since the peak heart rate data indicate that the stress of the MSFT is generally close to that attained during the specialist activity, with the exception of certain rigorous activities undertaken during training (for example pole climbing, climbing to platforms). However, based on the data collected, elevating heart rate by an additional 5 beats per minute at the point of the minimum pass standard would ensure that the demands of the training are closer to equating with those experienced during the training for this specialist activity. Regression analysis of the heart rate response to the MSFT indicates that in order to elevate heart rate by an additional 5 beats per minute, the minimum pass standard should be increased from 4 shuttles on level 5 of the test, to 4 shuttles on level 6, equivalent to a predicted VO2 max of 37.4 mls/kg/min.

Recommendation: The minimum standard on the MultiStage Fitness test is increased to the point of completion of 4 shuttles on level 6 for all ASU officers

Chemical, Biological, Radiological, Nuclear (CBRN)

26 subjects were assessed, consisting of 23 males and 3 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	169	186	152
Training	-	155	132

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

	TiZ <5:4	TiZ>5:4
Minutes	113	0
% training time	100	0

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject

The table below shows lactic acid data for this group before and after the MSFT, and after the training.

	Pre MSFT	Post MSFT	Post training
Lactic Acid mmol/l	3.9	13.4	3.6

Conclusion

The heart rate, lactic acid and TiZ data for this group of specialist officers all consistently indicate that the physiological demands of attaining the minimum pass standard in the MSFT (4 shuttles on level 5), is either equivalent to, or exceeds that, experienced during

training. This finding is consistent across all officers observed during the study. Based on these results, there is no indication that the minimum pass standard needs to be changed, since officers achieving the minimum standard should posses the necessary fitness and physiological characteristics to equip them for the specialist activity they are undertaking

Recommendation: The minimum standard on the MultiStage Fitness test remains at the completion of 4 shuttles on level 5 for all CBRN officers

Method of Entry (MoE)

23 subjects were assessed, consisting of 19 males and 4 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

Note that the minimum standard for the specialist group is the attainment of the start of level 6 on the MSFT, hence additional data for this point are shown throughout these results.

	Heart rate at 5:4 (bpm)	Heart rate at 6:0	Peak heart rate	Mean4 HR
15m MSFT	171	174	191	152
Training	-	-	165	122

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4
TiZ>6:0 : length of training time heart rate above that at the start of level 6

	TiZ <5:4	TiZ >5:4	TiZ >6:0
Minutes	214	0	0
% training time	100	0	0

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject

Conclusion

The heart rate and TiZ data for this group of specialist officers all consistently indicate that the physiological demands of attaining the minimum pass standard in the MSFT (the start of level 6), is either equivalent to, or exceeds that, experienced during training. This finding is consistent across all officers observed during the study. Based on these results, there is no indication that the minimum pass standard needs to be changed, since officers achieving the minimum standard should posses the necessary fitness and

physiological characteristics to equip them for the specialist activity they are undertaking. Furthermore, there is no evidence from these data that the demands of the training exceed those of the basic minimum standard of the completion of 4 shuttles on level 5. Hence, consideration should be given to the reduction of the minimum standard from the start of level 6, to 4 shuttles on level 5, since the data do not indicate that this higher level is warranted.

Recommendation: The minimum standard on the MultiStage Fitness test should not be raised, and consideration should be given to a reduction in the current standard applied to this specialist group, to the completion of 4 shuttles on level 5 for all MoE officers

Police Cyclists (PCY)

20 subjects were assessed, consisting of 17 males and 3 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	174	190	157
Training	-	168	145

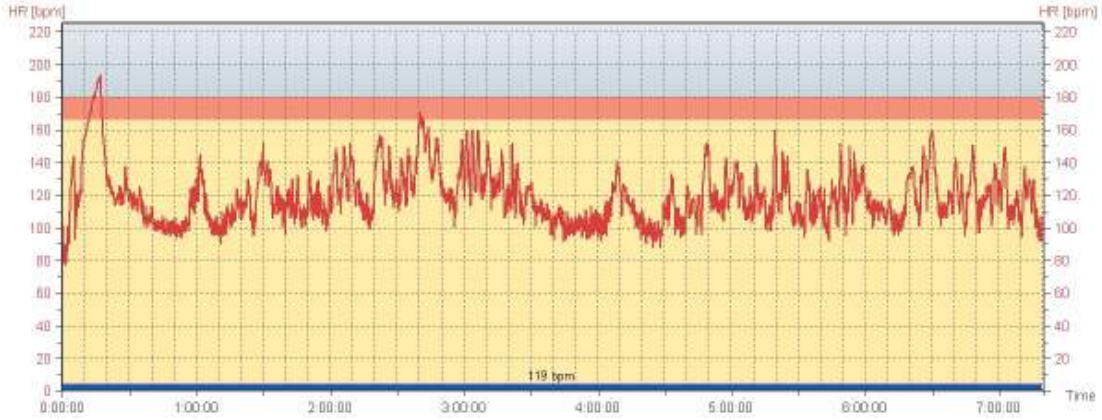
The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

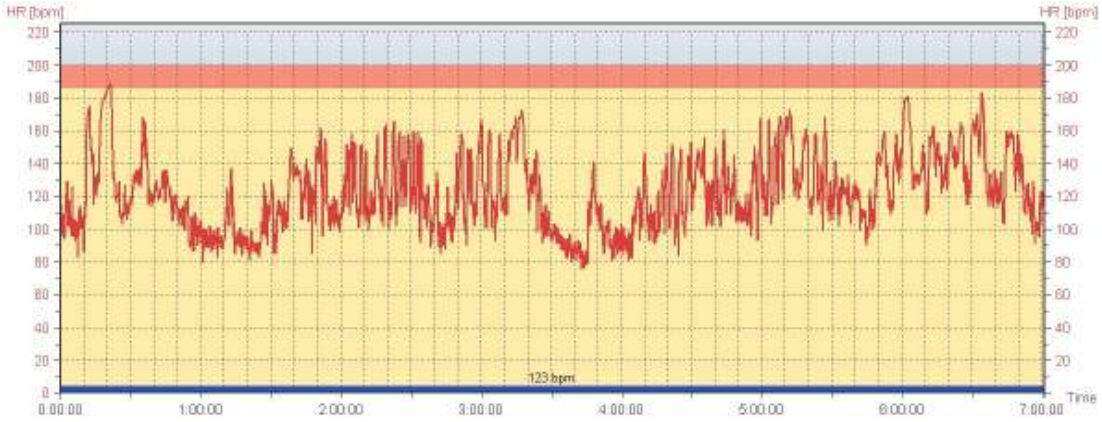
	TiZ <5:4	TiZ>5:4
Minutes	330	3
% training time	99	1

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject



Female subject



Conclusion

The TiZ data, and the Mean4 heart rate data, for this group of specialist officers, indicates that there is a very small but significant time during the training where physiological stresses exceed those attained at the point of completing the minimum standard of 4 shuttles on level 5 of the MSFT. It should be noted that this finding is not consistent across all officers assessed, but clearly the physical demands faced by PCY's can varying significantly throughout the course of a working day.

Further analysis of the data indicates that the need to increase the minimum standard for this group is small, since the peak heart rate and lactic acid data all indicate that the

stress of the MSFT is generally close to that attained during the specialist activity, with the exception of certain rigorous activities undertaken during training. However, based on the data collected, elevating heart rate by an additional 3 beats per minute at the point of the minimum pass standard would ensure that the demands of the training are closer to equating with those experienced during the training for this specialist activity. Regression analysis of the heart rate response to the MSFT indicates that in order to raise the demands of the test to increase heart rate by an additional 3 beats per minute, the minimum pass standard should be increased from 4 shuttles on level 5 of the test, to the completion of all 8 shuttles on level 5, equivalent to a predicted maximum oxygen uptake (VO2 max), of 36.1 mls/kg/min

Recommendation: The minimum standard on the MultiStage Fitness test is increased to the point of completion of 8 shuttles on level 5 for all PCY officers

Dog Handlers (DH)

17 officers were assessed, consisting of 14 males and 3 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	170	184	152
Training	-	159	143

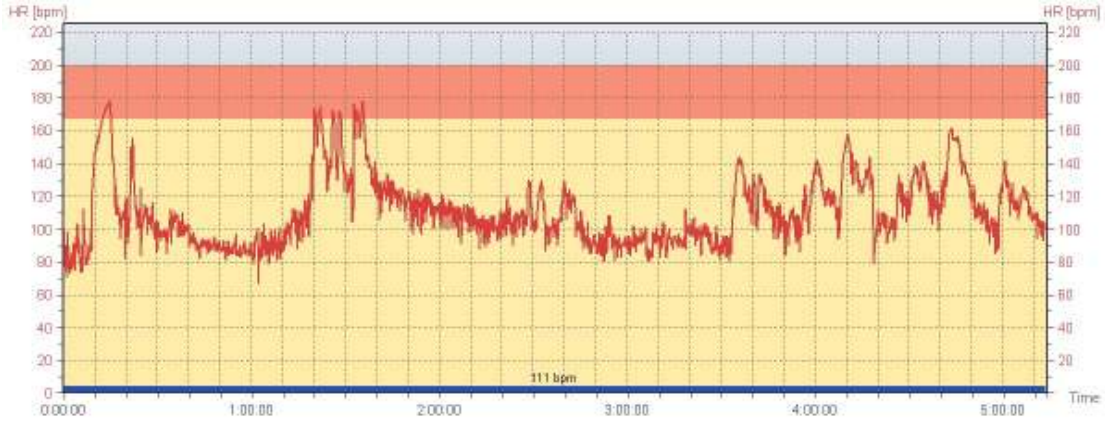
The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

	TiZ <5:4	TiZ>5:4
Minutes	174	1
% training time	99.5	0.5

Examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject



Female subject

The table below shows lactic acid data for this group before and after the MSFT, and after the training.

	Pre MSFT	Post MSFT	Post training
Lactic Acid mmol/l		12.0	6.4

Conclusion

The TiZ data, and the Mean4 heart rate data, for this group of specialist officers, indicates that there is a very small but significant time during the training where physiological stresses exceed those attained at the point of completing the minimum

standard of 4 shuttles on level 5 of the MSFT. It should be noted that this finding is not consistent across all officers assessed, with 5 out of the 17 assessed experiencing some physical demands during the training that exceeded the minimum requirement of the MSFT.

Further analysis of the data indicates that the need to increase the minimum standard for this group is small, since the peak heart rate and lactic acid data all indicate that the stress of the MSFT is generally close to that attained during the specialist activity, with the exception of certain rigorous activities undertaken during training. However, based on the data collected, elevating heart rate by an additional 2 beats per minute at the point of the minimum pass standard would ensure that the demands of the training are closer to equating with those experienced during the training for this specialist activity. Regression analysis of the heart rate response to the MSFT indicates that in order to increase the demands of the test consistent with an elevation in heart rate of 2 beats per minute, the minimum pass standard should be increased from 4 shuttles on level 5 of the test, to the completion of 7 shuttles on level 5, equivalent to a predicted maximum oxygen uptake (VO2 max), of 35.8 mls/kg/min

Recommendation: The minimum standard on the MultiStage Fitness test is increased to the point of completion of 7 shuttles on level 5 for all DH officers

Mounted Branch (MB)

10 officers were assessed, consisting of 5 males and 5 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	165	185	149
Training	-	167	147

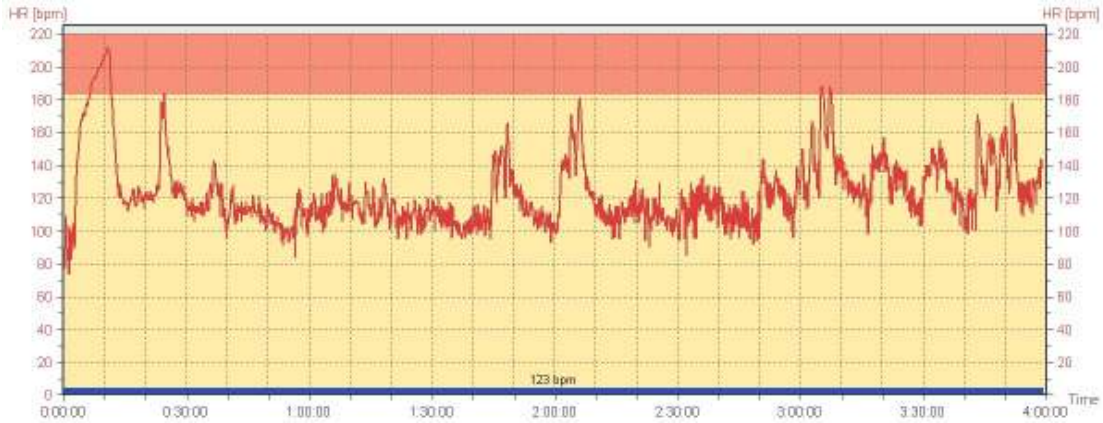
The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

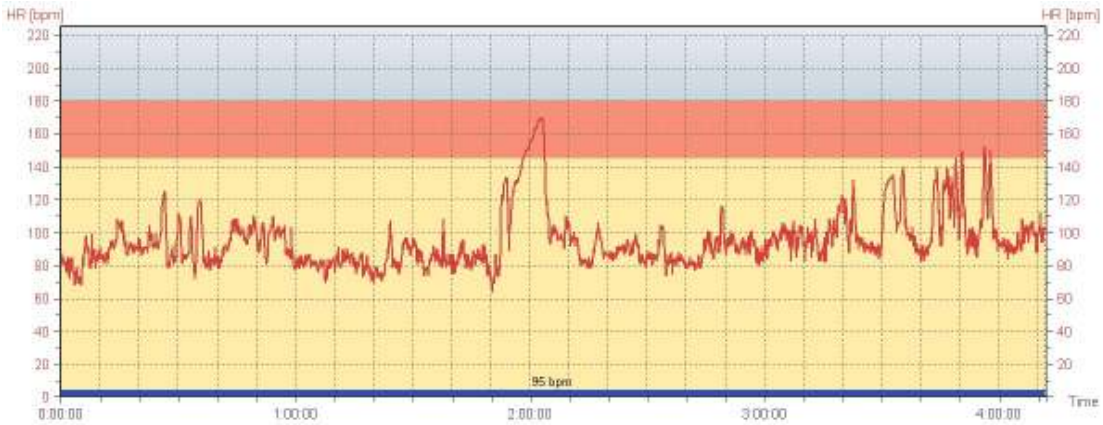
	TiZ <5:4	TiZ>5:4
Minutes	161	1
% training time	99.4	0.6

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject



Female subject



The table below shows lactic acid data for this group before and after the MSFT, and after the training.

	Pre MSFT	Post MSFT	Post training
Lactic Acid mmol/l		12.4	5.0

Conclusion

The TiZ data, and the Mean4 heart rate data, for this group of specialist officers, indicates that there is a very small but significant time during the training where physiological stresses exceed those attained at the point of completing the minimum

standard of 4 shuttles on level 5 of the MSFT. It should be noted that this finding is not consistent across all officers assessed, with 5 out of the 10 assessed experiencing some physical demands during the training that exceeded the minimum requirement of the MSFT.

Further analysis of the data indicates that the need to increase the minimum standard for this group is small, since the peak heart rate and lactic acid data all indicate that the stress of the MSFT is generally close to that attained during the specialist activity, with the exception of certain rigorous activities undertaken during training. However, based on the data collected, elevating heart rate by an additional 2 beats per minute at the point of the minimum pass standard would ensure that the demands of the training are closer to equating with those experienced during the training for this specialist activity. Regression analysis of the heart rate response to the MSFT indicates that in order increase the demands of the test consistent with an elevation in heart rate of 2 beats per minute, the minimum pass standard should be increased from 3 shuttles on level 5 of the test, to the completion of 7 shuttles on level 5, equivalent to a predicted maximum oxygen uptake (VO2 max), of 35.8 mls/kg/min

Recommendation: The minimum standard on the MultiStage Fitness test is increased to the point of completion of 7 shuttles on level 5 for all MB officers

Police Support Unit (PSU)

43 subjects were assessed, consisting of 34 males and 9 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	169	184	152
Training	-	172	156

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

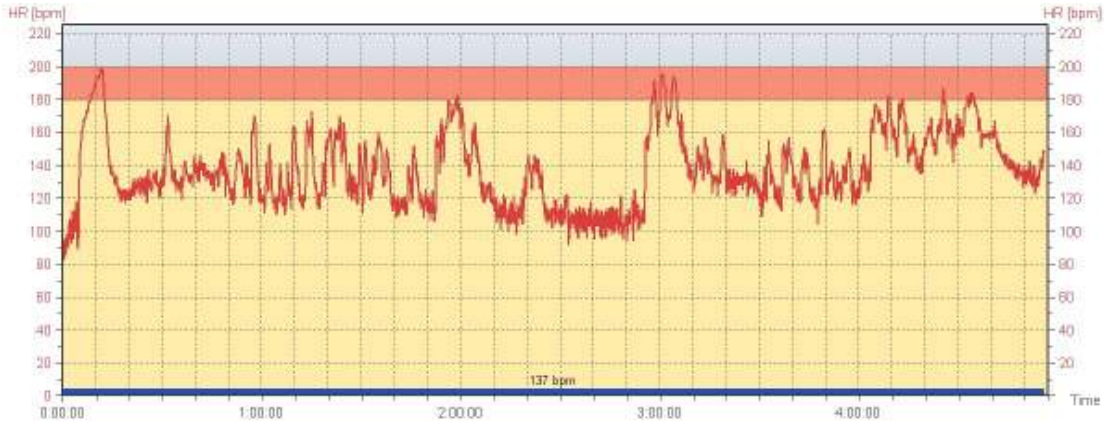
TiZ <5:4 : length of training time heart rate below that at 5 shuttles – level 4
TiZ >5:4 : length of training time heart rate above that at 5 shuttles – level 4

	TiZ <5:4	TiZ>5:4
Minutes	207	2
% training time	99	1

Examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject



The table below shows lactic acid data for this group before and after the MSFT, and after the training.

	Pre MSFT	Post MSFT	Post training
Lactic Acid mmol/l		12.7	6.4

Conclusion

The TiZ data, and the Mean4 heart rate data, for this group of specialist officers, indicates that there is a very small but significant time during the training where physiological stresses exceed those attained at the point of completing the minimum

standard of 4 shuttles on level 5 of the MSFT. It should be noted that this finding is not consistent across all officers assessed, and is largely as a reflection of the different types of training that PSU officers were required to undertake.

Further analysis of the data indicates that the need to increase the minimum standard for this group is small, since the peak heart rate and lactic acid data all indicate that the stress of the MSFT is generally close to that attained during the specialist activity, with the exception of certain rigorous activities undertaken during training.

It was of interest to note that the highest heart rate values attained for the majority of PSU officers came during the 500m shield run. As observers, LCS have based the recommendations for minimum standards on the need to ensure that officers have the necessary fitness to complete this run. However, on the basis that all officers have already successfully passed a fitness test, a "secondary test", in the form of a 500m shield run, would not seem to be relevant or warranted. Indeed, since this run does not appear to have been scientifically validated, any officer "failing" to complete the course in the required time could well have due course for complaint. On the assumption that officers have successfully achieved a relevant minimum pass standard in the JRFT, the NPIA should give consideration to the long term relevance and validity of the 500m shield run for PSU officers.

However, based on the data collected, elevating heart rate by an additional 5 beats per minute at the point of the minimum pass standard would ensure that the demands of the training are closer to equating with those experienced during the training for this specialist activity, and that the amount of training time spent above the 4 shuttle / level 5 heart rate is minimised. Regression analysis of the heart rate response to the MSFT indicates that in order to raise the demands of the test to increase heart rate by an additional 5 beats per minute, the minimum pass standard should be increased from 4

shuttles on level 5 of the test, to the completion of all 3 shuttles on level 6, equivalent to a predicted maximum oxygen uptake (VO2 max), of 36.1 mls/kg/min

Recommendation: The minimum standard on the MultiStage Fitness test is increased to the point of completion of 3 shuttles on level 6 for all PSU officers. The NPIA should also consider the long term relevance and validity of the 500m shield run for PSU officers.

Specialist Firearms Officer (SFO)

24 officers were assessed, consisting of 23 males and 1 female. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

Note that the minimum standard for this specialist group is the attainment of 2 shuttles on level 10 of the MSFT, hence additional data for this point are shown within these results.

	Heart rate at 5:4 (bpm)	Heart rate at 10:2	Peak heart rate	Mean4 HR
15m MSFT	161	184	185	145
Training	-	-	178	156

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

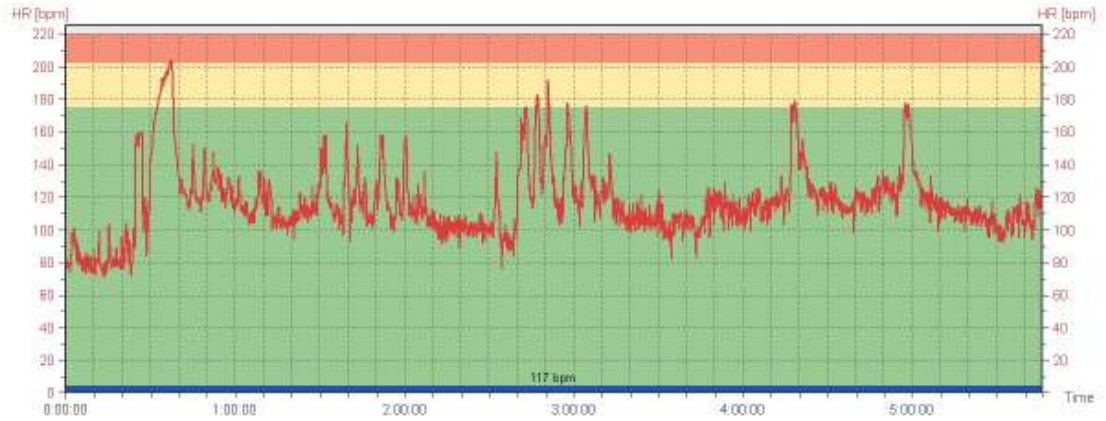
TiZ <5:4 : length of training time heart rate below that at 4 shuttles – level 5
TiZ >5:4 : length of training time heart rate above that at 4 shuttles – level 5
TiZ >10:2 : length of training time heart rate above that at 2 shuttles - level 10

	TiZ <5:4	TiZ >5:4	TiZ >10:2
Minutes	185	6	1
% training time	96.3	3.1	0.6

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject



Conclusion

The data collected on these specialist officers clearly show that the physical demands of their training significantly exceed those elicited by the “normal” minimum standard (4 shuttles on level 5), and warrant a higher standard to ensure that officers have the necessary level of physical fitness, and the data show that the demands on these officers are higher than those experienced by all other specialist officers.

A relatively high proportion of time is spent at heart rates close to those elicited at the pass mark of 2 shuttles on level 10 which is currently applied to this group, with just

under 1% of total training time spent at a heart rate in excess of that attained at 10:2. However, it should be noted that closer analysis of the data show that these latter heart rates only occur during one specific form of training – the training run, simulated rapid intervention training, and exertion shoot in protective gear, which is a core and compulsory component of the training for this specialist group of officers. Hence, based on the data observed, there is justification in making a slight increase in the minimum standard, from 2 shuttles on level 10, to 5 shuttles on level 10, of the MSFT. If this is applied, there will be only minimal times when the exertion of the training of SFO's exceeds that of the minimum standard in the MSFT. Should the exertion run in protective gear not be a compulsory part of SFO training at some point in the future, the data collected indicate that the minimum standard could be reduced to the completion of all shuttles on level 8 of the Multistage Fitness test, decreasing the heart rate demand of the MSFT by approximately 10 beats per minute.

It is important to highlight the issue of "pre selection" with this group, which will have almost certainly contributed to the high work rates seen in the training phase of the assessment. Since all officers assessed will have previously met the minimum 2 shuttles on level 10 pass standard, it follows that they will have high fitness levels which therefore enable them to perform at a high work rate during the training. Had the minimum entry standard into this specialist unit been lower, the performances in the training would also have been lower. Hence the pre-existing high standard of minimum fitness is influencing the training performances.

Recommendation: Assuming that the exertion run, simulated rapid intervention training, and exertion shoot, in protective body gear is a compulsory part of SFO training, the minimum standard on the MSFT should be increased slightly, to the completion of 5 shuttles on level 10, equivalent to a predicted maximum oxygen uptake of 48.8 mls/kg/min. If this is not the case, the minimum standard could be

decreased to the completion of all shuttles on level 8, equivalent to a predicted maximum oxygen uptake of 44.3 mls/kg/min.

Armed Response Vehicle (ARV)

47 officers were assessed, consisting of 32 males and 15 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

Note that the current minimum standard for this specialist group is the attainment of 4 shuttles on level 9 of the MSFT, hence additional data for this point are shown within these results.

	Heart rate at 5:4 (bpm)	Heart rate at 9:4	Peak heart rate	Mean4 HR
15m MSFT	165	182	184	151
Training	-	-	166	147

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

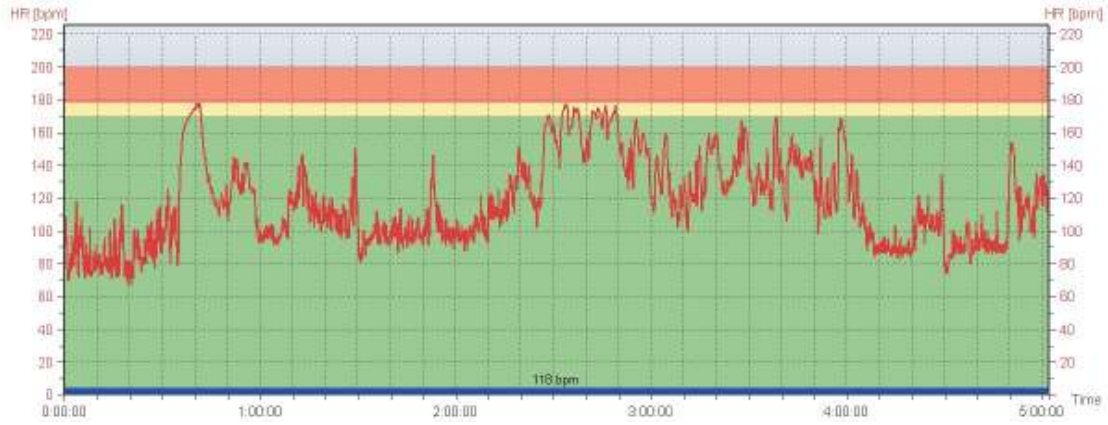
TiZ <5:4 : length of training time heart rate below that at 4 shuttles – level 5
TiZ >5:4<9:4 : length of training time heart rate between that at 4 shuttles on level 5, and 4 shuttles on level 9
TiZ >9:4 : length of training time heart rate above that at 4 shuttles on level 9

	TiZ <5:4	TiZ >5:4<9:4	TiZ >9:4
Minutes	196	4	0
% training time	98.0	2.0	0

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject

Female subject



The table below shows lactic acid data for this group before and after the MSFT, and after the training.

	Pre MSFT	Post MSFT	Post training
Lactic Acid mmol/l		12.0	3.0

Conclusion

The data collected on these specialist officers clearly show that the physical demands of their training significantly exceed those elicited by the "normal" minimum standard (4 shuttles on level 5), and warrant a higher standard to ensure that officers have the necessary level of physical fitness.

A relatively high proportion of time is spent within the heart rate zone between the basic minimum standard of 4 shuttles on level 5, and the current minimum standard of 4 shuttles on level 9. The majority of the data within this zone comes from officers engaging in a dog track training exercise, followed by a simulated offender pursuit. Other less strenuous training performed on other groups did not elicit such high heart rates.

Based on the data collected and observations of the various types of training, whilst there is evidence to justify the existing minimum standard, there is no evidence to suggest any need for it to be changed, either through an increase or a decrease. Reducing the minimum standard from its current level would introduce an environment where the physical demands of the training (in particular offender pursuits), elicited a physiological response greater than that experienced in the Multistage Fitness test.

Recommendation: The minimum standard for ARV officers remains at the current level, the completion of 4 shuttles on level 9 of the MultiStage Fitness test.

Authorised Firearms Officer (AFO)

47 officers were assessed, consisting of 38 males and 9 females. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

Note that the minimum standard for this specialist group is the attainment of all shuttles on level 7 of the MSFT, hence additional data for this point are shown within these results.

	Heart rate at 5:4 (bpm)	Heart rate at 10:2	Peak heart rate	Mean4 HR
15m MSFT	166	180	185	151
Training	-	-	157	133

The next table shows the Time in Zone (TiZ) in both minutes and as a percentage of total training time. The higher the TiZ above the level 5 – shuttle 4 heart rate, the greater the stress of the training.

TiZ <5:4 : length of training time heart rate below that at 4 shuttles – level 5
TiZ >5:4<7:9 : length of training time heart between 4 shuttles – level 5 and 9 shuttles on level 7.
TiZ >7:9 : length of training time heart rate above that at 9 shuttles - level 7

	TiZ <5:4	TiZ >5:4<7:9	TiZ >7:9
Minutes	214	3.5	0
% training time	98.4	1.6	0

Typical examples of a male and female heart rate trace showing heart rates attained during the MSFT and training are shown below.

Male subject.

Female subject

Conclusion

None of the data collected show evidence for a pass standard exceeding the current minimum standard of the completion of all shuttles on level 7 of the MSFT. At no time were training heart rates observed that were above the minimum standard. However a significant proportion of overall training time was spent with heart rates within the zone between the current "basic" minimum standard, and that of the completion of all shuttles

on level 7. Neither the peak heart rate data or mean4 heart rate data show any justification for a new standard that exceeds the current minimum standard.

Nevertheless there is strong evidence to suggest that the demands of the training exceed the basic minimum standard of 4 shuttles on level 5. Based on the results, it could be argued that the current AFO minimum standard is marginally too high, since none of the officers monitored achieved heart rates during their training that were significantly higher than those attained during the JRFT, although a number did get close to this value. Whilst retaining the existing standard would ensure that all officers who attained the minimum standard have a level of fitness that equips them for the rigours of their training, the data indicate that this would also be achieved if the minimum standard were decreased by three shuttles to the completion of 6 shuttles on level 7.

Recommendation: That the minimum standard on the MultiStage fitness test should be reduced from the current level, to the completion of 6 shuttles on level 7.

SUMMARY RECOMMENDATION TABLE

UNIT	CURRENT STANDARD (Level:Shuttle)	RECOMMENDED STANDARD (Level:Shuttle)	CHANGE (SHUTTLES)	CHANGE VO2 mls/kg/min	PREDICTED VO2 max
ASU	5 : 4	6 : 4	+ 8	+2.4	37.4
CBRN	5 : 4	5 : 4	0	0	35.0
MoE	5 : 8 (6 : 0)	5 : 4	- 4	- 1.1	35.0
PCY	5 : 4	5 : 8	+ 4	+ 1.1	36.1
DH	5 : 4	5 : 7	+ 3	+ 0.8	35.8
MB	5 : 4	5 : 7	+ 3	+ 0.8	35.8
PSU	5 : 4	6 : 3	+ 7	+ 1.1	37.2
SFO	10 : 2	10 : 5	+ 3	+ 1.1	50.8
ARV	9 : 4	9 : 4	0	0	46.0
AFO	7 : 9 (8 : 0)	7 : 6	- 3	- 0.8	41.0

SECTION FIVE: STRENGTH ASSESSMENT

It is acknowledged that strength is a fundamental requirement of Police Officers during both their standard daily activities, and within specialist roles. However, it should be recognised that the nature of the strength required is influenced by an almost infinite number of variables, many of which cannot be controlled. The activities requiring strength range from simply lifting one's own body weight from a sitting to a standing position, lifting heavy equipment, to grapping with an offender. Because of the variables involved and the "three dimensional" nature of many strength movements, it is impossible to quantify the exact nature of the strength that will be required in the variety of situations that officers will encounter, and indeed comparison of the strength component in many sporting activities makes it clear that the assessment of functional strength is still something that remains challenging at best.

In the 2004 Lilleshall report, it was recommended that the Grip Strength test be removed from the battery of tests used as part of the Job Related Fitness Test. This was for two reasons:

1. Scientific data suggested that this test was no longer relevant to the functional strength needed for Police Officers.
2. A better test was available, in the form of the Concept II Dyno, enabling strength to be assessed during both extension and flexion of the upper body whilst in a sitting position. Minimum standards were recommended for this test.

Subsequently, it has become apparent that the equipment used for the Concept II Dyno test (ie the Dyno itself), is to be discontinued by the manufacturers, which presents a medium to long term challenge for the assessment of strength in Police Officers. Hence, LCS were asked to review potential alternative pieces of equipment and other possible options, and to make recommendations on the future of strength testing for the specialist

roles assessed as part of this project. However, it should be noted that whilst this project is addressing strength assessments for specialist roles, the implications of the withdrawal from manufacture of the Concept II Dyno have implications for the entire Police Service, not just specialist units.

Mechanical Institute Technologies Push / Pull Device

A device designed and built by Mechanical Institute Technologies (MIT) in Northern Ireland has, for some time, been used to assess strength within the Police Service of Northern Ireland, and the West Midlands Police Service. The devices use an "isokinetic" principle to assess maximum force produced with the arms and upper body whilst in a standing position, pushing and pulling on a handle which slides back and forth along a supporting frame. The velocity at which the handle slides remains constant, regardless of force applied (hence the term "isokinetic"). This prevents acceleration of the handle "away" from the force that is applied, and as a consequence allows maximum force to be applied and recorded. Whilst isokinetic testing can allow for the measurement of peak force throughout a movement range, it is seldom encountered in real life situations, where acceleration, deceleration and lateral movements are common. A force transducer is housed within the handle, linked to a PC to record force.

LCS understand that there are approximately 9 of these machines currently in operation in the Police Service of Northern Ireland, and the West Midlands, and are used by these forces as part of a test battery to evaluate the fitness of Police Officers.

During the course of this project, LCS visited Northern Ireland to meet with representatives of the PSNI, and MIT. LCS were accompanied on this visit by Paul Buckle, Head of Physical Education at the Metropolitan Police. A number of observations resulted from this visit:

1. MIT may lack the resources to mass produce and – importantly – maintain and service large numbers of these machines, particularly if they were based in the mainland UK.
2. MIT may, (currently), be unable to produce large volumes of the machine in a timescale needed to effectively imbed them into the fitness testing battery of mainland UK Police Forces.
3. MIT would need to positively explore the option of franchising the manufacture of the machine by other companies, who might be better placed to mass produce and service them.
4. A "due diligence" investigation of MIT would be essential to guarantee the necessary financial and governance assurances that would be needed to justify long term investment in equipment and support.
5. Prior to the meeting with MIT, it was indicated that the cost of each individual unit would be in the region of £18,000 (eighteen thousand pounds). It now appears that this cost is likely to be closer to £31,000 should large numbers be ordered off MIT, and that significant economies of scale would not be forthcoming.

Further concerns are raised over the testing protocols and minimum pass standards. Whilst is it fully appreciated that the data collected are measured accurately, and involve dynamic movements, it is clearly very difficult to objectively establish minimum standards for movements where a large number of external variables can influence force applied or required. The minimum standard for passing the strength test using the MIT unit is based on the force needed to push and pull an "average" Northern Ireland male, divided by two on the assumption that these movements would be undertaken by two Police Officers together. Factors such as test familiarisation, stance, and height of individual undertaking the test are not taken into account, and whilst it could be argued that this is also true of the "real world", the need to provide a fair and equitable environment for all Police Officers to undertake a test has to be considered. Whilst the test has stood up to scrutiny in employment tribunals in Northern Ireland, this does not guarantee that further

challenges will be unsuccessful should the units be introduced to a wider number of Police Forces.

Having reviewed the available literature and equipment, LCS continue to support the findings of their 2004 report, which recommended that the Concept II Dyno test remains the most effective and practical means of assessing strength in Police Officers.

Furthermore, whilst it is accepted that certain roles encountered by specialist units do require activity-specific strength requirements, having reviewed all options and the scientific literature, we believe that it is impossible to set robust minimum standards for specific strength tests, based on the variables encountered, and the currently available equipment and practical considerations.

It is therefore recommended that the existing minimum standards for the Job Related Fitness test (34 kg / 35 kg) remain in place for all Officers in specialist roles, and that consideration is given to utilising the Concept II Dyno for a period of 2-3 years. In this period, consideration should be given to:

1 The longevity of this unit, including options for on-going service and repair, and the potential for replicating a similar machine with a different manufacturer.
2 Canvassing views from a range of manufacturers on the design of an alternative job-specific strength assessment unit, bearing in practicalities of cost, servicing and ease of use.
3 There remains a need for a strength test within the JRFT, and that whilst consideration is given to Recommendations 1 and 2 above, the current minimum standards (34kg / 35 kg) that are used for the Concept II Dyno test, are retained and used for all officers in specialist units.

SECTION 6: CONCLUSION AND RECOMMENDATIONS

The MultiStage fitness test is widely used as a measure of aerobic fitness in a number of fitness and work-based environments. As the test progresses, the increasing aerobic demand placed on the cardio-vascular system make it a simple to use and valid measure of aerobic fitness, with clear and objective fitness requirements for successive levels of the test. The data collected from this study have made it possible to compare the physiological demands of the MultiStage fitness test with those experienced by police officers during specialist activities. Since it is accepted that the Police Service have a duty of care to ensure that the minimum standards that officers need to reach in order to pass the test replicates the demands of the specialist activities, it has been possible for LCS to compare the data collected, and based on analysis of the results, recommend appropriate minimum standards for the test. In the majority of cases, this has resulted in slight but significant modifications in the pass standard, and it is therefore recommended that the standards proposed in the Summary Recommendation table (p 48), are adopted.

The long term relevance and validity of the shield run for PSU officers should be considered, and dropped as a "pass or fail" test should the new revised fitness test standards be adopted.

The assessment of strength for functional tasks such as those encountered by Police Officers has been discussed in Section 5, and the recommendations are re-produced here:

In considering the future of strength testing as part of the JRFT, the NPIA should consider:

1 The longevity of the Concept II Dyno, including options for on-going service and repair, and the potential for replicating a similar machine with a different manufacturer.
2 Canvassing views from a range of manufacturers on the design of an alternative job-specific strength assessment unit, bearing in practicalities of cost, servicing and ease of use.
3 Continue to use the basic minimum standards on the Concept II Dyno for all officers in specialist units, which should be seen as the minimum requirement to undertake training for specialist activities.

SECTION SEVEN: REFERENCES

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RESEARCH INTO FITNESS FOR MARINE AND DIVING SPECIALIST POLICE UNITS

Addendum to Contract No. 4500004177

OCTOBER 2009

CONDUCTED FOR THE NATIONAL POLICING IMPROVEMENT AGENCY

BY

Lilleshall Consultancy Services

CONTENTS

EXECUTIVE SUMMARY

A total of 26 Police Officers from 5 Police Forces took part in this study, consisting of 25 males and 1 female. Heart rate data were collected during a range of activities designed to replicate the demands of 3 specialist unit activities, namely the Marine Police Unit, (MPU), the Marine Police Tactical Skills Unit, (MPTSU), and the Marine Police Diving Unit, (MPDU). All officers were also required to undertake the MultiStage Fitness (MSFT) test component of the Job Related Fitness test, during which heart rate data were collected at 15 second intervals. Comparison of the heart rate data collected during the simulated training and the MSFT made it possible to recommend minimum pass standards for the MSFT which will ensure that officers who pass the test have the physiological capacity that enables them to cope with the demands of the relevant specialist activity. A summary of the current and recommended minimum standards is shown in the table below:

UNIT	RECOMMENDED STANDARD (Level:Shuttle)	PREDICTED VO2 max
MPU	5 : 4	35.0
MPTSU	7 : 2	40.0
MPDU	6 : 8	39.0

SECTION 1: INTRODUCTION

Background and assumptions

This study has added to the data and recommendations presented by Lilleshall Consultancy Services in its final report to the NPIA in January 2009. It focuses on 3 further specialist groups, namely Marine Police Unit, (MPU), Marine Police Tactical Skills Unit, (MPTSU), and Marine Police Diving Unit, (MPDU). The methodology and assumptions remain similar to those used in the January 2009 LCS report, and on the basis of the data collected and subsequent analysis, recommendations are made on minimum standards for the MultiStage Fitness component of the Job Related Fitness Test for each specialist group.

Timescale

The study was conducted over a three month period, from July 2009 to September 2008.

SECTION TWO : METHODOLOGY

For purposes of comparison and standardisation, the same procedures and protocols adopted by the Lilleshall Consultancy Services in their 2009 report to the NPIA were used in this study.

A total of 5 Police Forces took part in the study, and data were collected from 26 subjects, consisting of 25 males and 1 females. Exact demographic details of the volunteers is provided in the Results section of this report.

The Police Forces who contributed subjects to the study were as follows:

Metropolitan Police Service
West Yorkshire
Northumbria
Kent
Hampshire

Volunteers reported to the assessment venues approximately 60 minutes before the commencement of the assessment session. All officers then received a verbal briefing from staff on the nature of the data collection, and the rationale behind the work.

Officers were asked to complete a basic health assessment questionnaire and to sign a disclaimer acknowledging voluntary participation in the study, and an acceptance of any risks that could be involved.

All officers were then asked to wear a heart rate monitoring strap (Polar Team System), which was activated automatically once in contact with the skin. Once activated, heart

rate data were recorded by the Polar Heart rate strap at 15 second intervals, and stored on an internal memory chip.

Initially, all Police Officers were required to undertake the 15m endurance Multistage Fitness test (MSFT) used as part of the JRFT, to volitional exhaustion. Heart rate was monitored throughout, and the test continued until the point of volitional exhaustion for each individual.

Heart rate data from the 15m MSFT were used to determine the heart rate throughout the test, and to find each individual's peak heart rate, normally found towards the very end of the test at the point of exhaustion.

After a period of recovery, the same officers were asked to commence a programme of specialist training appropriate for their role. In many cases this also required either wearing or carrying the specialist equipment that is essential for undertaking the role. This training was overseen by Police Service training officers, with no input from LCS staff. At no point were the training officers asked to make any modifications to the training protocols to take into account the data being collected.

It is well established that heart rate correlates positively and closely with work rate and oxygen uptake (Cooper, 1968). Whilst there is some suggestion that anxiety can elevate the heart rate response to exercise, (Falaschi et al, 2003), it is believed that this is relatively short term and transient, and hence unlikely to have any significant impact on the data collected, bearing in mind that the "like for like" comparison of the MSFT and specialist training meant that all officers were in similar situations for both physical aspects of the study. Whilst "real life" situations may elevate heart rate due to anxiety, and hence place additional strain on the cardio-vascular system, the short term nature of this elevation previously alluded to means that this is unlikely to justify a need to increase the minimum standard on the MSFT in order to take this into account.

For the purposes of this study, four distinct measures of heart rate were used to compare the physiological demands of the MSFT with those of specialist training, namely:

- Peak heart rate
- Heart rate at the point of completing 4 shuttles on level 5 of the MSFT, the basic minimum standard for all officers entering the Police Service.
- Highest mean heart rate attained for a period of 4 minutes (Mean4)

Peak heart rate is normally only attained for a relatively short period of time compared to the overall duration of exercise, and can give an "artificial" indication of the demands experienced. Since four minutes is known to equate to the longest period of time for which an individual can exercise entirely aerobically, and equates to the approximate length of time needed to complete 4 shuttles on level 5 of the MSFT, it was felt that the comparison of Mean4 heart rate during the MSFT, and the highest mean 4 minute heart rate during the training activities, would provide a valid comparison of the aerobic demand of both the MSFT and the most physically demanding aspects of the training. This technique was successfully used in the 2004 and 2009 Lilleshall studies. In the 2009 LCS report, "Time in Zone" data were used to assess the length of time when officers had heart rates that exceeded those attained at level 5:4 of the MSFT. However, the data have shown that this is not a relevant measure for these specialist activities, since in cases where the heart rates exceeded those at 5:4, the time that this occurred for made the determination of a "time in zone" figure impractical. This will be further discussed within the data presented for each specialist unit.

Following the completion of the MSFT and specialist training activities, all officers returned their heart rate monitors to LCS staff, and the data stored on these was subsequently downloaded and analysed. In compliance with data collection procedures, individual identities were protected at all times.

Where there has been a need to identify changes in minimum standards, regression analysis has been used to predict the work rate / minimum standards on the MSFT needed to replicate the demands of the specialist activity.

SECTION THREE: RESULTS

A total of 26 Police Officers participated in this study, and their demographic details are shown in the tables below:

Table 1. Subject numbers

	n	%
MALE	25	96
FEMALE	1	4
TOTAL	26	100

Table 2: Age Profile.

	<19	20-29	30-39	40-49	>50
N	0	0	4	20	2
%	0	0	12	80	8

Table 3: Specialist Units

Unit	Total	Males	Female
MPU	16	15	1
MPTSU	4	4	0
MPDU	6	6	0

Specialist Units: Physiological comparisons between the 15m MultiStage Fitness test and Simulated training.

MARINE POLICE UNIT

16 subjects were assessed, consisting of 15 males and 1 female. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	167	177	155
Training	-	137	130

Conclusion

The peak and mean heart rate data consistently show that the demands of completing 4 shuttles on level 5 of the MSFT exceed those experienced when undertaking the training activities for this specialist group of officers. Therefore there is no evidence to suggest that the minimum pass standard should be different to the minimum standard required for all Officers on entry to the Police Service.

Recommendation: The minimum standard on the MultiStage Fitness Test remains as the completion of 4 shuttles on level 5 of the MSFT for this group of specialist officers.

MARINE POLICE TACTICAL SKILLS UNIT

5 male subjects were assessed. A comparison of the heart rate (HR) response to the MSFT and Simulated Training, (including the swimming activity), is shown in the table below. Data for the ladder climb at the end of the training are presented separately.

	Heart rate at 5:4 (bpm)	Peak heart rate	Mean4 HR
15m MSFT	174	187	152
Training (excl ladder climb)	-	145	132
Ladder Climb	-	183	-

Conclusion

The heart rate data for this group of specialist officers indicate that there are times during their training when the peak heart rates attained exceed those seen at level 5:4 of the MSFT. In all cases, the heart rates attained during the ladder climb towards the end of the test do peak exceed, albeit very briefly, those seen during the MSFT. The impact of short term elevations in heart rate on the body cannot be underestimated, and it is crucial that individuals have a level of cardio vascular fitness which can cope with this. The short term elevation in heart rates will be due to a combination of the physical exertion and upper body effort that is required, and peaks at 9 beats per minute above the heart rate achieved at 5:4 on the MSFT, but less than the peak heart rate achieved at the end of the MSFT. Analysis of the heart rate data during the MSFT indicates that completing an additional 14 shuttles beyond the minimum entry standard, ie completing 2 shuttles on level 7 of the test, would result in a physical effort equating to that seen during the training exercise. This would elevate the heart rate by an additional 9 beats per minute compared to the rate at level 5 shuttle 4 on the MSFT, and thus equate to the heart rates

observed during the training activities. It should be noted that all officers assessed exceeded 7:2 when completing the MSFT as part of this project.

Recommendation: The minimum standard on the MultiStage Fitness test should be increased to completion of 2 shuttles on level 7, for this group of specialist officers.

MARINE POLICE DIVING UNIT

6 male subjects were assessed. A comparison of the heart rate (HR) response to the MSFT and Simulated Training is shown in the table below.

	Heart rate at 5:4 (bpm)	Peak heart rate
15m MSFT	169	186
Training (excl ladder)	-	146
Ladder		176

Conclusion

As with the Marine (Enhanced) unit, the data from officers within this specialist unit show that during the majority of their training, heart rates consistently remained below those observed at the basic entry level 5:4 on the MSFT. However, in all cases, there are brief periods of time when heart rates exceed those seen at 5:4, and these occur during the ladder climb. The impact of this elevation in heart rate on the body reflects the physical effort that is required, and it is crucial that officers have the capacity to cope with this, despite the very brief time that this effort and elevation is experienced. Analysis of the heart rate response to the MSFT shows that the minimum standard for the MSFT should be at a point 12 shuttles beyond the minimum entry standard, at the completion of all 8 shuttles on level 6 of the test, thus replicating the physical demands observed during the training activity. All officers assessed during this study achieved this standard.

Recommendation: The minimum standard on the MultiStage Fitness test should be increased to the completion of all 8 shuttles on level 6 of the MSFT.

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Equality Impact Assessment

1. Introduction

1.1 The discrimination legislation prohibits both direct and indirect discrimination.

1.2 Direct discrimination occurs where an employer treats someone less favourably on one of the protected grounds (age, disability, race, religion/belief, sex or sexual orientation). Direct discrimination cannot be justified except under the age discrimination legislation.

1.3 Different fitness standard for people from different groups would therefore result in direct discrimination.

1.4 Indirect discrimination can occur where an employer imposes an apparently neutral provision, criterion or practice as a condition of employment, that would put persons of one group at a particular disadvantage compared to persons of another group, and the employer cannot show that the provision, criterion or practice is a proportionate means of achieving a legitimate aim.

1.5 Therefore, any differential impact of a fitness test standard on people from any of the protected groups needs to be quantified and considered in the light of the requirements of the indirect discrimination legislation. Any differential impact needs to be justified as being a proportionate means of achieving a legitimate aim.

1.6 The group considered that the requirements of each specialist role are set out in the Integrated Competency Framework (ICF). The training specification for each role has been established under the ICF. The acquisition of this training standard was therefore deemed to be appropriate and necessary in order to perform the role against which any disparate impact needed to be considered.

2. Validation Assessment

2.1 To determine the impact of the recommended standards, a validation assessment was carried out during the period June to September 2009. In total 1231 officers currently performing specialist roles from 21 forces were tested to the new recommended standard (table 1) for. A significant number of these officers were performing in more than one specialism, so the overall data set for the endurance and dynamic strength elements was 1772 and 1545, respectively.

2.2 The police services used in the validation assessment are listed below with the data set number displayed in brackets:

Cambridgeshire (2)	Hampshire (4)	North Wales (15)
City of London (14)	Hertfordshire (142)	SOCA (111)
Cleveland (38)	Kent (11)	South Wales
Cumbria (36)	Leicestershire (1)	South Yorkshire (92)
Devon & Cornwall (43)	Merseyside (52)	Staffordshire (83)
Dorset (30)	MPS (379)	Surrey (36)
Gloucestershire (31)	Northumbria (70)	West Yorkshire (2)

All data sets are presented in tables 1 to 10 (Appendix 1)

Endurance – Gender Impact

2.3 The overall pass rate for the endurance element was 94%, with over 90% of women and 96% of men achieving the pass standard. There were few or no women tested in respect of ASU, MPU and PD&MPU. There were differences between the pass rates of men and women in the following areas:

- MOE 0.3% difference in favour of women
- DH 3.9% difference in favour of women
- PSU 3.5% difference in favour of men
- DIAFO 10% difference in favour of men
- AFO 16% difference in favour of men
- ARV 17.1% difference in favour of men

2.4 Following the data analysis of the validation assessment, the pass rates for 10 out of the 13 specialist areas are so minimal as to cause no concern regarding disproportional impact between the sexes. The endurance pass rate was very high, at close to 100% for both male and female officers from the CBRN, MOE, DH, MB, PCY and MPU, which is most likely due to the JRFT standard being set at or close to the minimum standard of 5.4. These 6 areas of specialist policing will make up the majority of tests if these standards are implemented. However the FWG considered that the 3 firearms-related specialisms (AFO, ARV and DIAFO) required some further examination and explanation.

2.5 The recommended JRFT standards for firearms are the highest compared to the other specialist units, and therefore lower pass rates were to be expected. The 3 JRFT standards that resulted in the lowest pass rates of under 90% for both male and female officers were for AFO, ARV and DIAFO, (with the exception of the AFO unit for the male officers). The pass rate decreases, for both female and male officers, with every increasing MSFT level; fewer officers pass the DIAFO standard than the ARV standard, and fewer officers pass the ARV standard compared to the AFO standard.

2.6 Up to now, some police services have used different methods of fitness testing and standards for firearms officers; and some forces currently use a lower pass standard than the recommended ARV standard. All forces currently have

a JRFT standard below that of the recommended DIAFO standard, with many using 10.2 as the pass level. Consequently, some officers may have had lower fitness levels than the recommended JRFT pass standards on the day they were fitness tested. Moreover, some officers may not have run the JRFT endurance element before, or not for many years, which may have caused a failure to reach the required level. However, in all cases, through managed action and support, via a tailored and structured training programme set specifically to increase aerobic capacity, the pass rate for both male and female officers could be increased.

2.7 The DIAFO standard returned the lowest percentage pass rate, however, based on direct observation and feedback from some Physical Training Instructors it appears that some firearms officers stopped running prematurely before reaching the recommended DIAFO pass standard of 10.5. This was evidenced in the 38.6% (17 out of 44) of DIAFO failures reaching a level of 10 or above. This may have unintentionally skewed the data, but nevertheless, It is highly likely that as the difference between the standard 10.2 and 10.5 is only 12 seconds, most of the officers involved would have been able to reach the 10.5 level.

2.8 A point worth emphasising is that the recommended endurance standards were set based on direct heart rate data from role training events. In all cases specialist unit training instructors were responsible for ensuring that the training events were typical and closely resembled the more physical demanding activities of the role. For example, DIAFO were measured simulating a dynamic entry, up 10 flights of stairs wearing approximately 16kg of protective kit; Marine Police Unit (TS) were measured wearing full body armour whilst climbing a caving ladder, and Dog Handler were measured wearing full body armour whilst tracking over fields for over a mile. Therefore officers failing the recommended endurance standard would most likely struggle physically in achieving and performing a role related training event. Equally, and more importantly, as the training events used in the research replicated real and potential role activities, officers failing the JRFT endurance standard could jeopardise operational success and be placed at a greater risk with respect to their own safety.

2.9 The FWG considered that as the recommended standards had been based upon the identified physical requirements of each role, the identified disproportionate impact between the sexes was likely to be justifiable against the requirements of the indirect sex discrimination legislation as being a proportionate means of achieving a legitimate aim.

Endurance - Racial Impact

2.10 The endurance pass rates across all ethnic groups indicate no disparate impact. The low pass rate of 50% for the ethnic groups 8 - 11 for ARV cannot be substantiated due to very low overall number taking the fitness test from this group (n=4).

Endurance – Disability Impact

2.11 One officer disclosed an (unidentified) disability, but recorded a pass for both the endurance and dynamic strength components of the JRFT.

Endurance - Age Impact

The overall pass rate decreased with each age banding from the 20 - 29 group through to the 50> group, as would be expected. Again, the firearm levels showed the greatest differential as compared to other specialist units. However, the FWG considered that the fitness test standards needed to identify the standard required to undertake the role and that this should be the same irrespective of age, or any other characteristic

Dynamic Strength

2.13 One failure from 1540 dynamic strength results was recorded, which is less than 0.1%. Therefore the results for the dynamic strength element of the JRFT indicate that the recommended standard for push and pull (34 and 35kg) has no disparate impact with respect to ethnicity, gender, disability or age. A greater number of officers passing the dynamic strength element, across all specialist units should be observed with the recommended minimum push and pull standard.

3. Conclusions

3.1 The validation exercise indicated that the recommended standards for endurance are likely to have a disproportionate adverse impact on women and on older officers in particular specialist roles. However, the FWG considers that the recommended JRFT standards have been set using scientific and objective methods. Any officer failing the recommended standards is likely to be at an increased safety risk, and may fail to fulfil the identified physical demands of the training and therefore, the role. Notwithstanding that the tests put older candidates and the firearms tests put women candidates at an apparent disadvantage, the FWG considers that the test standards are an objective assessment of the training/role requirements and likely to constitute a proportionate means of achieving the aim of assessing suitability for the role, under the requirements of the indirect discrimination legislation.

3.2 Although the strength test results returned virtually a 100% pass rate, the strength test standard recommended is the same for police recruits and ensures that officers from all specialist units have at the very least the minimum proscribed level of strength to undertake role related training and the role itself.

3.3 The FWG considered that the standards recommended should not be increased or altered by the adoption of additional tests or testing regimens. In addition, officers should be given sufficient support in order for them to increase their fitness capacity, where necessary, to meet with the recommended JRFT standards.

Appendices

Appendix 1: Equality Impact Assessment Tables

Appendix 2: Forces That Took Part in the Data Gathering

Appendix 3: Specialist Policing Roles/Duties Definitions

Appendix 4: Terms of Reference

Appendix 5: Membership of the PABEW Fitness Test Working Group

Appendix 1 : Equality Impact Assessment Tables

Endurance & Dynamic Strength - Raw Data Set

Table 1 displays the pass and failure rates for the total number of officers who participated in the endurance element of the JRFT.

Table 1 (endurance)

	AFO	**ARV**	**DIAFO**	**CBRN**	**PSU**	**DH**	**MOE**	**ASU**	**MB**	**PCY**	**MPU**	**PD&MPU(ts)**	**Total**
Pass	248	205	128	150	305	83	341	16	38	128	22	7	1671
% Pass	96.1	85.4	74.4	100	99	96.3	99.7	100	100	96.2	100	100	94.0
Fail	10	35	44	0	3	3	1	0	0	5	0	0	101
% Fail	3.9	14.6	25.6	0	1	3.7	0.3	0	0	3.8	0	0	6.0
	AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	M(b)	PD&MPU(ts)	TOTAL
Sum	258	240	172	150	308	86	342	16	38	133	22	7	1772

NB: PD&MPU(ts) - Police Divers and Marine Police Unit Tactical Skills

Table 2 displays the pass and failure rates for the total number of officers who participated in the dynamic strength element of the JRFT.

Table 2 (dynamic strength)

	AFO	**ARV**	**DIAFO**	**CBRN**	**PSU**	**DH**	**MOE**	**ASU**	**MB**	**PCY**	**MPU**	**PD&MPU(ts)**	**Total**
Pass	178	205	156	137	291	77	320	10	37	133	0	0	1544
% Pass	99.4	100	100	100	100	100	100	100	100	100	N/A	N/A	99.9
Fail	1	0	0	0	0	0	0	0	0	0	0	0	1
% Fail	0.6	0	0	0	0	0	0	0	0	0	N/A	N/A	0.1
	AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	M(b)	PD&MPU(ts)	Total
Sum	179	205	156	137	291	77	320	10	37	133	0	0	1545

Endurance – Gender/Age/Ethnicity/Disability Data Set

Table 3 displays the gender specific total number and % pass rates for all officers who participated in the endurance element of the JRFT.

Table 3 (gender-endurance)

Gender		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&MPU(ts)	Total
Female Pass	No. %	21 81.0%	13 69.2%	9 66.7%	7 100%	31 96.8%	10 100%	30 100%	0 N/A	17 100%	30 93.3%	1 100%	0 N/A	169 89.9%
Male Pass	No. %	237 97.5%	227 86.3%	163 76.7%	143 100%	276 99.3%	77 96.1%	312 99.7%	16 100%	21 100%	103 97.1%	21 100%	7 100%	1603 94.8%

**39 Officer's data was not included in table 5 due to them not disclosing their ethnicity on the consent form.*

Table 4 displays the age specific total number and % pass rates for all officers who participated in the endurance element of the JRFT.

Table 4 (age-endurance)

Age		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&MPU(ts)	Total
<19 Pass	No. %	0 N/A	0 N/A	0 N/A	0 N/A	1 100%	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	1 100%
20-29 Pass	No. %	19 100%	24 87.4%	12 91.7%	35 100%	98 98.0%	3 100%	110 100%	0 N/A	3 100%	50 96.0%	0 N/A	0 N/A	354 97.7%
30-39 Pass	No. %	127 95.3%	113 91.2%	77 76.6%	72 100%	136 99.3%	18 100%	155 99.4%	6 100%	5 100%	55 94.5%	4 10%	3 100%	771 94.9%
40-49 Pass	No. %	108 97.2%	99 80.8%	82 70.7%	40 100%	60 100%	37 97.3%	74 100%	7 100%	20 100%	24 100%	18 100%	4 100%	573 91.8%
50> Pass	No. %	3 75.0%	4 25.0%	1 0%	3 100%	6 100%	3 100%	3 100%	3 100%	3 100%	4 100%	0 N/A	0 N/A	34 85.3%

Table 5 displays the ethnicity specific total number and % pass rates for all officers who participated in the endurance element of the JRFT.

Table 5 (ethnicity-endurance)

Ethnicity		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&M PU(ts)	Total
1-3 Pass	No.	250	225	167	149	295	60	326	16	31	112	22	7	1660
	%	96.4%	85.7%	75.4%	100%	99.0%	98.3%	99.7%	100%	100%	95.6%	100%	100%	94.5%
4-7 Pass	No.	4	2	0	1	2	1	5	0	0	6	0	0	21
	%	100%	100%	N/A	100%	100%	100%	100%	N/A	N/A	100%	N/A	N/A	100%
8-11 Pass	No.	2	1	0	0	3	0	8	0	0	8	0	0	22
	%	50.0%	0%	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	N/A	N/A	90.9%
12-14 Pass	No.	2	1	0	0	0	0	3	0	0	6	0	0	12
	%	100%	100%	N/A	N/A	N/A	N/A	100%	N/A	N/A	100%	N/A	N/A	100%
15-16 Pass	No.	0	1	0	0	1	0	0	0	0	1	0	0	3
	%	N/A	100%	N/A	N/A	100%	N/A	N/A	N/A	N/A	100%	N/A	N/A	100%

**54 Officer's data was not included in table 6 due to them not disclosing their ethnicity on the consent form.*

Table 6 displays the disability specific total number and % pass rates for all officers who participated in the endurance element of the JRFT.

Table 6 (disability-endurance)

Disability		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&M PU(ts)	Total
No Pass	No.	258	240	172	149	301	61	342	16	31	133	22	7	1732
	%	96.1%	85.4%	74.4%	100%	99.0%	98.4%	99.7%	100%	100%	96.2%	100%	100%	94.3%
Yes Pass	No.	0	0	0	1	0	0	0	0	0	0	0	0	1
	%	N/A	N/A	N/A	100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%

**39 Officer's data was not included in table 7 due to them not disclosing their ethnicity on the consent form.*

Dynamic Strength – Gender/Age/Ethnicity/Disability Data Set

Table 7 displays the gender specific total number and % pass rates for all officers who participated in the dynamic strength element of the JRFT.

Table 7 (gender-dynamic strength)

Gender		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&MPU(ts)	Total
Female Pass	No. %	15 93.3%	10 100%	9 100%	7 100%	30 100%	9 100%	28 100%	0 N/A	17 100%	30 100%	0 N/A	0 N/A	155 99.4%
Male Pass	No. %	164 100%	195 100%	147 100%	130 100%	261 100%	68 100%	292 100%	10 100%	20 100%	103 100%	0 N/A	0 N/A	1390 100%

Table 8 displays the age specific total number and % pass rates for all officers who participated in the dynamic strength element of the JRFT.

Table 8 (age-dynamic strength)

Age		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&MPU(ts)	Total
<19 Pass	No. %	0 N/A	0 N/A	0 N/A	0 N/A	1 100%	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A	1 100%
20-29 Pass	No. %	16 100%	22 100%	14 100%	35 100%	96 100%	3 100%	107 100%	0 N/A	3 100%	49 100%	0 N/A	0 N/A	345 100%
30-39 Pass	No. %	88 98.9%	99 100%	65 100%	64 100%	129 99.3%	16 100%	145 99.4%	2 100%	5 100%	56 94.5%	0 10%	0 100%	670 99.9%
40-49 Pass	No. %	71 100%	81 100%	77 100%	36 100%	53 100%	31 100%	66 100%	5 100%	19 100%	24 100%	0 100%	0 100%	463 100%
50> Pass	No. %	3 100%	3 100%	0 NA	2 100%	5 100%	2 100%	2 100%	3 100%	3 100%	4 100%	0 N/A	0 N/A	27 100%

**39 Officer's data was not included in table 9 due to them not disclosing their ethnicity on the consent form.*

Table 9 displays the ethnicity specific total number and % pass rates for all officers who participated in the dynamic strength element of the JRFT.

Table 9 (ethnicity-dynamic strength)

Ethnicity		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&M PU(ts)	Total
1-3 Pass	No.	171	190	151	136	278	51	304	10	30	112	22	7	1433
	%	99.4%	100%	100%	100%	100%	100%	100%	100%	100%	95.6%	100%	100%	99.9%
4-7 Pass	No.	4	2	0	1	2	1	5	0	0	6	0	0	21
	%	100%	100%	N/A	100%	100%	100%	100%	N/A	N/A	100%	N/A	N/A	100%
8-11 Pass	No.	3	1	0	0	3	0	8	0	0	8	0	0	23
	%	100%	100%	N/A	N/A	100%	N/A	100%	N/A	N/A	100%	N/A	N/A	100%
12-14 Pass	No.	1	1	0	0	0	0	3	0	0	6	0	0	11
	%	100%	100%	N/A	N/A	N/A	N/A	100%	N/A	N/A	100%	N/A	N/A	100%
15-16 Pass	No.	0	1	0	0	1	0	0	0	0	1	0	0	3
	%	N/A	100%	N/A	N/A	100%	N/A	N/A	N/A	N/A	100%	N/A	N/A	100%

**54 Officer's data was not included in table 10 due to them not disclosing their ethnicity on the consent form.*

Table 10 displays the disability specific total number and % pass rates for all officers who participated in the endurance element of the JRFT.

Table 10 (disability-endurance)

Disability		AFO	ARV	DIAFO	CBRN	PSU	DH	MOE	ASU	MB	PCY	MPU	PD&M PU(ts)	Total
No Pass	No.	179	205	156	136	284	52	320	10	30	133	0	0	1505
	%	99.4%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	94.3%
Yes Pass	No.	0	0	0	1	0	0	0	0	0	0	0	0	1
	%	N/A	N/A	N/A	100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100%

**39 Officer's data was not included in table 11 due to them not disclosing their ethnicity on the consent form.*

All percentages within this data have been rounded up or down to the nearest decimal place. Many officers within this assessment are dual trained in a variety of specialist areas; hence this will account for any apparent minor discrepancies within the total percentage pass rates for specific data sets.

Appendix 2:

Forces That Took Part in the Data Gathering

- Avon and Somerset Constabulary
- Cambridgeshire Constabulary
- Cleveland Police
- Devon and Cornwall Constabulary
- Durham Constabulary
- Greater Manchester Police
- Hampshire Constabulary
- Kent Police
- Merseyside Police
- Metropolitan Police Service
- Northumbria Police
- North Wales Police
- South Yorkshire Police
- Staffordshire Police
- Strathclyde Police
- West Midlands Police
- West Yorkshire Police

Appendix 3:

Specialist Policing Roles/Duties Definitions

Chemical, Biological, Radiological or Nuclear (CBRN)

Officers trained as Chemical, Biological, Radiological or Nuclear responders are required to respond in full personal protective equipment to a terrorist incident involving the use of Chemical, Biological, Radiological or Nuclear material. They will be required to wear a CR1 suit, which has three layers including a carbon layer, rubber outer gloves and boots together with a respirator. They will be subjected to potentially high body temperatures with an inability to remove any of their kit without first being decontaminated. Their vision, hearing and ability to communicate effectively will be restricted and they must be capable of administering to themselves an anti-nerve agent in the form of a combo pen. Tasks at a CBRN incident will range from cordon duties to body recovery.

Method of Entry (MOE)

Method of entry officers have the responsibility to forcefully gain rapid access to a property through an entrance or exit point, which is normally the front or back door. An instrument called an enforcer, which weighs 16kg is used to force doors open at the mid, low and high section. Depending on the security of the door, several forceful blows with the enforcer may be necessary.

Dog Handler (DH)

Dog Handler officers use their dogs to detect bank notes, drugs, explosives and even human beings, and for assisting in making an arrest. In addition dog handler officers may be called upon for a pre-planned search operation, or for patrolling urban neighbourhoods or fields and woodland.

Mounted Branch (MB)

Mounted Branch officers are deployed for general patrolling duty and more specifically for public order type events such as controlling crowds at sporting events, demonstrations and public ceremonies. Ancillary responsibilities include grooming, saddling and mucking out the stables.

Police Cyclists (PCY)

Police cyclist officers are used in a patrolling capacity and also for pursuits, which at times could be over undulating terrain and involve the ascent and descent of steps and the negotiation of obstacles.

Police Support Unit (PSU)

Officers in a PSU role are used to provide assistance at public order events, such as demonstrations and protests and/or to assist in the arrest of violent persons. There is a level one and level two PSU officer role. Level one PSU officers are called upon to deal with more specialist operations, such as containment of violent persons, and rapid entry to premises. Level two PSU officers are generally used for pre-planned public order events. PSU officers are can be expected to wear full body protective uniform, and carry an 8kg full body length (long) shield.

Air Support (AS)

Air Support Unit officers are used as observers from the air in police helicopters. There is a height and weight restriction for role eligibility. The role is diverse and can entail gathering observational information and evidence for public order disturbances, suspect escape situations, and for pre-planned security events. At times a rapid deployment from the patrol base to the helicopter is required depending on the urgency and nature of the call out.

Police Divers (PD)

Police Divers are specifically trained to carry out searches underwater, and are regularly used in major crime enquiries for the recovery of evidence (normally in the form of weapons), and searches for missing vulnerable persons.

Marine Police Unit (MPU)

Marine Police Unit officers, using specially equipped vehicles, carry out high visibility security patrols and are able to respond to waterborne incidents and emergencies. Other tasks include intercepting vessels, checks of river infrastructure and vulnerable locations and the recovery of bodies from the river or other waterway.

Marine Police Unit (Tactical Skills) (MPUTS)

Marine Police Unit Tactical Skills officers carry out additional tasks to that of an MPU officer, which can include vulnerable ship escorts, intelligence led police and multi-agency operations, and dynamic vessel boarding gaining access by rope or caving ladder.

Authorised Firearm Officer (AFO)

Authorised Firearms Officers provide a tactical response commensurate with their firearms training. There are also a range of additional roles for which officers will receive specific firearms tactical training. In the context of this report an AFO could cover tasks such as providing a static guard, general armed patrol i.e. airport guard/patrol, protecting a principle, and surveillance.

Armed Response Vehicle (ARV)

The primary role of an Armed Response Vehicle is to provide an immediate mobile armed response to spontaneous firearms incidents, in order to safeguard the public. This includes identifying, locating and containing the subject. In addition to the primary role response, ARV officers could be used on pre-planned operations.

Dynamic Intervention Authorised Firearms Officer (DIAFO)

The role of a Dynamic Intervention AFO involves the dynamic entering of a structure with the intention to: arrest a subject(s) and at the same time secure readily disposable evidence; reduce the opportunity for the subject(s) to present a threat to life; save the life of hostages by neutralising the threat posed by hostage takers.

Appendix 4

Fitness Testing - Statement by Police Advisory Board for England & Wales

At its quarterly meeting on 30 January 2003, members of the Police Advisory Board for England and Wales had a wide-ranging discussion of fitness testing for the police service, stimulated by a paper on the operation of recruitment fitness tests submitted by the Police Federation of England and Wales. While differences of view were expressed on various issues, there was broad agreement that:

- fitness standards should be job- and competence-related
- fitness testing should be carried out consistently across forces and be non-discriminatory.

It was agreed that a review should be conducted by a special working party of the Joint Working Group on Organisational Health, Safety and Welfare (JWGOHSW), on which all constituent organisations of PABEW would be represented. The Working Party would have the following terms of reference:

> To provide PABEW, for consideration and decision at its meeting on 16th April 2003, with:
>
> 1. A recommendation for an interim solution as to the type and level of fitness required at recruitment on the best evidence currently available, based on an assessment of job and competence requirements
> 2. A recommendation as to how the recruitment fitness test (based on the interim solution at 1 above) should be conducted fairly and consistently and what the response should be to those who do not meet the standard
> 3. A recommendation (with timetable to progress) of the further work that will be needed to:
>
> (a) assess fully, and validate, the required standards and test
> (b) establish the type and level of job- and competence-related fitness required for specialist roles and how to test fairly and effectively for them
> (c) establish the possible need for, and forms of, ongoing support and assessment of the fitness and health of police officers.

Michael Penny
PABEW Independent Secretary
10 February 2003

Appendix 5

Membership of the PABEW Fitness Test Working Group

PABEW MEMBERS

ACPO

Derek Bonnard, Bsc(Hons) Dip(Cantab)
Deputy Chief Constable of Cleveland Police

Linda Van Den Hende
ACPO Business Area Coordinator

Police Superintendents Association of England & Wales

Archibald I Torrance, BSc. FCMI
Chief Superintendent
Chair HR Business Area

Police Federation Of England and Wales

Paul Davis
Secretary Operational Policing Sub-Committee.

Jayne Monkhouse
Independent Equality Advisor working with the Police Federation

National Policing Improvement Agency.

Claire Curneen
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Specialist Advisors

Paul Buckle, MSc BSc (Hon) Cert Ed RPH (Nutr)
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Jonathan Cumberbatch, MSc BSc (Hons) PGDIP GCE
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Wellness Manager Devon and Cornwall Constabulary