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Arresting a Struggling Subject; Does the Forthcoming Police Officers Physical Fitness have an Impact on the Outcome?

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Abstract: Handling a struggling subject has been pointed out as one of the maximal physical exertions of police work. However, the relationship between general physical fitness and the ability to manage an intractable subject is only scarcely examined. Therefore, the main purpose of this study was to examine how general physical fitness correlates with the forthcoming police officers' ability to handle in a simulated arrest handling test. Nineteen male police students voluntarily agreed to participate. Four physical tests were conducted (bench press, counter movement jump, hang ups and 3000 meter running test). Scores from these tests were converted into a physical test index (physical index). Further, a simulation of handling a struggling subject during arrest was conducted. The simulation contained two takedown tests and two self-defense tests. Scores from the arresting simulation tests were also aggregated in a performance score index (arrest index). Later, the two indexes were correlated. We found a large correlation 0.547 ($p<0.05$) between the physical index and the arrest index. We also found that age was largely and moderately correlated to the physical index ($p<0.05$) and the arrest index ($p<0.1$), respectively. Although the police officers handling of a struggling subject during arrest involves a skill component related to the executing of diverse impact methods, our findings clearly show that it is also about some form of physical capability. The present study therefore highlights the importance of physical fitness within the police force.

Keywords: Endurance, occupation, police, physical demands, physical performance, strength.

INTRODUCTION

Modern police work imposes different requirements to the police officer than the previous officer had to cope with. New assignments have been given to the police, and communication and cooperation have become increasingly important to solve these tasks [1]. Thus, the operative officer spends much of the working day carrying out low intensity activity, and the occupation is therefore mainly described as sedentary [2]. However, due to regularly emerging episodes of high physical exertion the occupation can still be physically demanding. Such episodes are often occurring acute and can be stressful, critical and even life threatening for both the officer and the surrounding civilians [1, 3]. So even if the major part of the job can be executed independent of a police officers' physical fitness, some tasks still demand certain level of physical fitness to be handled and if the officer is not capable of managing these tasks as well, it can be questioned if he or she is capable of doing the job at all. Consequently, to ensure that the police officers are capable of performing their job some minimum requirements of general physical fitness ought to upheld. However, the relationship between general physical fitness and the ability to cope with physical tasks of police work is though not well known. It could thus be interesting to examine if general physical fitness affects how the police actually copes with a highly occupational specific task of physical exertion. In the everyday police job, the officer can come across a variety of physical demands and lifting, carrying, pushing, dragging, pulling and running are the most frequent physical tasks reported [4-11]. However, one of the most critical and stressful physical tasks of operative police work is getting control of a struggling suspect during an arrest [1, 6].

Even if the apprehension of a strongly intractable subject is not reported to occur frequently, it is described as the most commonly occurring maximal physical exertion in the profession [6]. Although the number of occasions reported is somewhat varying, this may be related to the inconsistencies in the content of the term "physical force" [12]. The term can be approached both broadly and narrowly, and can be described along a range according to its severity. When using a broad approach, the execution of physical force from police officers during arrest encounters is disclosed to appear in 21% and 27% [12] of all situations. In the present study, the term is narrowed and operationalized as arrest situations where physical force is applied to get control over an intractable subject, and further where the use of different kinds of weapons, pepper spray or handcuffing, or the use of

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Table 1. Descriptive Data on the Participants (Mean ± SD) (n=19)

Variables	
Standing broad jump (m)	2.55 (±0.2)
Pull ups (repetitions)	15.1 (±4.6)
Bench press (kg)	106.8 (±13.1)
3000 m running test (min.sec)	11.53 (±0.99)
Age	25.3 (±2.1)
Stature (cm)	181.5 (±5.5)
Body mass (kg)	82.4 (±7.2)
BMI*	25.0 (±1.48)

*BMI (Body mass index) was calculated as kg/m^2.

only a firm grip on a subject is not included. When these demarcations are implemented, the police officers use of physical force drops substantially and is reported only to be executed in 4.7 % of all encounters [12]. The severity of these encounters can however not be questioned. Smolander [5] presented unpublished statistics from the Finnish National Board of Labor Protection where it was shown that 40 % of all occupational accidents in the Finnish police "*occurred during the arrest of and struggle with resisting subjects*" (pp. 295-296). This emphasizes the need for upholding some level of physical fitness to cope with such episodes.

The relationship between general physical fitness and the ability to manage the maximal exertion in the police occupation is though only scarcely examined. Some studies have yet been conducted. Wilmore and Davis [13] were the first who aimed to examine if physical fitness correlated with job-specific tasks and found that the handling of a simulated arrest situation correlated with general physical ability. Similar findings were reported by Greenberg and Berger [14] who conducted basic anthropometric and strength tests and compared the results with the performance in a competitive task. The task consisted of a competition between two individuals inside a 5 feet circle where the purpose was to push or pull each other out of the circle, and it was designed to embrace the physical abilities relevant to apprehend and restrain a resisting subject during arrest. Based on the results in the general tests of strength and anthropometry, Greenberg and Berger were able to predict the performance in the competitive task. However, these studies based their conclusions on the usage of machinery or on the use of a regression model to assess the arrest performance, to the best of our knowledge the implementation of a real struggling subject in the simulation has never been done previously. Therefore, the main purpose of this study was to examine if the forthcoming police officers general physical fitness affects their ability to handle a real struggling subject during an arrest simulation test. Additionally, a second purpose was to examine if the officers physical fitness and arrest handling were affected by their age and anthropometric characteristics.

METHODS

Participants

Thirty-nine male graduate students at the Norwegian Police University College were invited to participate in the study. The inclusion criteria in the study were that every student invited had to have completed three years of education at the University College, and during these years had finished mandatory courses related both to physical training and arrest handling. Nineteen students gave their voluntarily written consent to participate. The descriptive data of these students are presented in Table **1**. All of the participating students approved the use of depersonalized data, and the study was conducted according to the Helsinki declaration, and was also approved by the leadership of the University College.

Experimental Approach to the Problem

To assess the relationship between general physical fitness and ability to perform in a simulated arrest handling situation, we used a descriptive correlative-explorative study design. Four physical tests were conducted (bench press, hang ups, standing long jump and 3000 meter running test), and scores from the different tests were converted into a physical test index (physical index). Further, a simulation of handling a struggling subject during arrest was conducted. The simulation contained two takedown tests and two self-defense tests. Scores from the four different tests of the arresting simulation were also converted into a performance score index (arrest index) and the two indexes were later correlated. All tests were carried out at the facilities of the University College. The physical fitness tests were performed in the sports facilities and the arrest simulation tests were carried out in a specially designed gym room with gymnastic mats on the floor. Further, age and anthropometric data were collected through a simple questionnaire. All participants (officers) had previously practiced the different tests, so measurement errors caused by learning effects were reduced.

Procedures

Physical Ability Tests

To assess physical ability, all the officers were tested in a bench press test (1RM) to assess maximum upper body strength, a pull-up test to measure upper body strength endurance, a standing long jump test (SLJ) to evaluate explosive power and a 3000m running test to assess aerobic endurance. The strength and power tests were performed on the same day and the 3000 meter run was performed within 7 days after. Further, in the strength and power tests the students had two attempts, but in the 3000 meter run the students were only given one attempt. When two attempts were given, the best result was used for further analysis. The officers were instructed to individually prepare themselves to each of the tests, this also implying both a general and a specific warm-up. On all tests, the students were given a score according to their performance evaluated by minimum two experienced test leaders. The possible score for each test was between 0 – 60 points on a scale of 5 points interval and where a higher achieved score implies a better performance. Further, before testing, all the equipments included were calibrated.

Bench Press

The bench press test was performed on a smith machine (gym80 International, Multi Press Station 50 mm Plate Holder, Germany), using calibrated Olympic weights (Elieko, Competition, Sweden), and a 50 cm high bench. The officers lied in a horizontal position, and lifted as much weight as they could in one repetition maximum (1-RM). The execution started when the students held the weight bar with straight elbows, then they lowered the bar controlled until it touched the chest. At the lowest point the bar had to be held still for 0.5-1.0 second, before the students pressed the bar upwards again until a fully extension in the elbow joint. To get the test approved the shoulders and the gluteus muscle had to be in contact with the bench during the whole execution.

Pull-ups

The pull-up tests were performed on a beam. The starting position was hanging vertically with straight elbows grabbing the beam with pronated grip at shoulder width (+/- one hand width). On signal the officers started the execution by pulling them upwards until the chin was above the beam, and then they lowered themselves to the starting position again, and this procedure was repeated until exhaustion. The execution had to be carried out in a controlled manner, with no kipping, swinging or explosive movements. Further, in the lowest position the elbow joint had to be fully extended before the next repetition could be performed.

Standing Long Jump

The standing long jump was executed from a wooden box, which was 2 centimeters elevated above the floor surface. The officers stood with 1-2 centimeters of their shoe-tip outside the edge of the wooden box, and then performed a countermovement jump with double spring not allowed. The landing area was covered with a rubber mat and the length of the jump was determined by the back of the heel on the rearmost foot, which was powdered in magnesium before the jump to mark the landing point. The distance between the edge of the wooden box and the landing point was then measured.

3000 Meters Run

The 3000-meter running test was conducted on a standard track and field course with 400 meters rounds with a joint start of maximal twelve students in each heat. Spiked running shoes were not permitted. Time was recorded with an ECB1 (Emit, Norway) and emiTag timing chip (Emit, Norway).

Arrest Handling Tests

To assess the officers' ability to handle an intractable subject an arresting simulation was conducted. The simulation was carried out within two weeks after the physical tests and comprised four tests; a takedown - one on one, a takedown - two on one (two officers and one subject), a self-defense struggle with an opponent and a self-defense where the officer had to get himself of herself released from different strangleholds. The tests are developed to assess the Norwegian police students, as well as the active duty Norwegian police officers, ability to apprehend and maintain a resistant subject during an arrest encounter, and are created to meet the considered physical requirements necessary for this matter. Further, the tests represent all the legal impact methods that the Norwegian police officers can use under the execution of physical force, and can thus be regarded as instruments of both training and testing. Although some of the containing methods have their origin from the Norwegian police back in the 1920s, the entirety of these tests are established based on the work of 15 specialists in 2007 [8]. Additionally, to secure minimization of risk of injuries, on both the police officer and the suspect, the tests have also been evaluated and accepted by a medical specialist appointed by The Norwegian Medical Association (NMA). During the execution the performing police officers had to wear police uniform as they use in field. In all tests the opponents (subjects) were fellow students who matched according to gender, height and weight, which was considered to make the resistant from the subject comparable from test to test.

As in the physical tests the students were given a score based on their performance. However, as the physical test scores were based on objective measures, the scores in the arrest handling simulation were related to a performance assessment made by an evaluation committee. The committee consisted of two educated and authorized instructors who were well experienced. Further, the test scores were given by a six point scale (0-60 points with 10 points interval), where a higher achieved score implies a better performance. Comprehensive information about the execution of the different impact methods, as well as the standardized evaluation criteria, of the tests are described in Lie and Lagestad [15] and in "Guidelines for execution of Arrest Technique exam [22]. The different score levels were mainly related to the opponents degree of resistance (Table **2**). In the lowest score level, the opponent was inactive and as the level became higher the resistance from the opponent became increasingly tougher: gained more speed and force, reducing distance to the officer, sudden attacks and increased frequency. On the highest level, the situation was supposed to be as realistic as possible with heavy resistance from the opponent. The officer had then to counter-attack the opponent to get control over him, and subsequently to show that control was maintained until handcuff was ready to be put on [15]. Besides this the officers were assessed by their ability to uphold their timing, and have flow and dynamics, in their execution, further that they upheld balance, were able to intake a basic stand between impacts and that they continuously faced their opponent when practicable. Furthermore, the officers started all tests at the lowest level and had to have approved one level to be able to proceed to the next. When the officer did not perform well enough, the test was stopped and he got the score at this level. Although different score levels were achieved, the total test duration was seldom longer than 10 minutes for each officer.

Takedown Tests

The takedown - one on one consisted of two sequences; one where the student tried to take control of the opponent by pulling him or her forward, and one where the student

Table 2. Opponents Degree of Resistance* Under the Different Arrest Handling Tests

Test Performed	Takedown Tests	Self-Defence Test: Release from Strangleholds	Self-Defence: Struggle
0-30 points	No movement	Small amount of force in the grip.	Standing still holding a punch pad.
40 points	Slightly movement in upper body and arms. Moderate resistance.	As above but slightly more force.	Moving around the officer in a moderate tempo on a distance between 2-4m. Sudden move towards the officer.
50 points	Moderate resistance. Try to avoid the officer.	Moderate force in the grip and push or pull the officer moderately.	Same as above but faster movement. Shorter distance (1-2m).
60 points	Move towards the police officer. Aggressive and threatening.	High rate of force in the grip, as well as in the pushing and pulling.	Full sparing fight

* The table is based on the information from the document "Guidelines for execution of Arrest Technique exam" [23].

Table 3. Pearsons' Correlations between the Investigated Variables. (n=19)

	Age	Stature	Body mass	BMI	Pindex
Age					
Stature	0.076				
Body Mass	0.086	0.724**			
BMI	0.061	0.019	0.702		
Pindex	-0.536*	-0.029	0.040	0.069	
Aindex	-0.448$^{\#}$	0.123	-0.095	-0.270	0.547*

** p<0.01, * p<0.05, $^{\#}$ p<0.1. BMI: Body mass index, Pindex: Physical index, Aindex: Arrest index.

tried to take control by pushing the opponent backward. On each score level the approval was given when the opponent laid face down on the floor, with the student on top ready to put on handcuffs. The takedown – two on one consisted of the same procedures as one on one, but with an element of cooperation between the two students.

Self-Defense – Struggle

In the self-defense struggle the students had to counterattack an attacking opponent by performing kicks and punches in different situations. At the three lowest levels the kicks and punches had to be executed towards a pad held by the opponent who as the level increased became more aggressive and moved quicker around. If the student reached the 60 point level he or she had to do a boxing battle against the opponent who now moved around and hit back.

Self-Defense - Strangleholds

In the other self-defense test the student had to release him- or herself from four different strangleholds. In the first level the student had to come out of a soft stranglehold from an opponent standing still (30 points). At the second level the grip was stronger and the opponent moved a little backwards (40 points), and at 50 points the grip was even stronger and the opponent moved forwards. If the student reached the highest level (60 points) he or she had to release him- or herself from a very hard grip, also with closed eyes which it was not possible to see if the stranglehold came from the back or the front side.

Statistics

SPSS 17.0 for Windows was used for data analyses. Both the physical fitness index and the arrest handling index were composed by summarization of the values from the four included variables. The Pearsons' product moment correlation coefficient (r) was used to calculate the correlation between the performance in the physical fitness index and the arrest handling index, and also to calculate the correlation between age and anthropometric characteristics and both these indexes. Magnitude of correlation coefficients was considered as trivial ($r<0.1$), small ($0.1<r<0.3$), moderate ($0.3<r<0.5$), large ($0.5<r<0.7$), very large ($0.7<r<0.9$) and nearly perfect ($r>0.9$) and perfect ($r=1.0$) [9]. Further, the shared variance (r2) was calculated to estimate the level of common variance between the respective variables. The $p<0.05$ level of significance was adopted for all statistical tests.

RESULTS

The results (Table **3**) show a large correlation ($p<0.05$), and a shared variance (r^2) of ~30%, between the physical index and the arrest index. Further, we found a large negative correlation between age and the physical index ($p<0.05$) with a shared variance of ~29%, and a moderate negative correlation between age and the arrest index ($p<0.1$) with a shared variance of ~20%.

DISCUSSION

In this study we found a strong correlation (r=0.547) between a general physical test index (physical index) and an arresting simulation test index (arrest index). Although causality is not scrutinized, we interpret this to indicate that some level of physical fitness could increase the ability to handle an intractable subject during an arrest encounter. To our knowledge, present method for assessing arrest handling has not been applied elsewhere. Similar findings however, as previously mentioned, were also reported by Wilmore and Davis [13] and Greenberg and Berger [14]. Thus, it seems likely that a relationship between general physical ability and the ability to apprehend a struggling subject during arrest exists. When a police officer faces an intractable subject the subject will in several manners attempt to avoid the officer's effort to get control over him or her. The subject is likely to do whatever necessary to escape, which also implies that physical force might be exerted by him or her. According to Anderson *et al.* [2], the subject can under these circumstances push, pull or even begin a fight with the officer, which again forces the officer to counterattack by applying the same methods. In fact, it was revealed by Anderson and his colleagues that police officers when struggling with an intractable subject had to push and pull the subject in 93 % of all incidents. Further, the severity of these episodes becomes clear when 72% of all occasions required medium to maximum physical effort from the officer to handle them. One possible explanation for our finding is the similarities in muscle activity between the general physical tests and the arrest handling test.

One of the main aims of the execution in the arrest simulation is to get the subject out of balance by pushing and/or pulling him/her [15]. Therefore, based on the execution of especially the pushes and the pulls during the apprehension of an intractable subject it is likely that the bench press and the pull-up tests represent characteristics of relevant muscle groups and can thereby be important factors when considering the ability to manage an arrest situation. Consequently, large muscle strength in the upper body, in particular in big muscles such as pectoralis major and latissimus dorsi, seems beneficial for police officers to uphold. Although Rhodes and Farendholtz [16] did not find strong correlations between pull-ups and push-ups and the handling of a struggling subject, this could be explained by their use of a static artificial body as the subject which makes the task somewhat unrealistic. For instance, their method excluded the possibility to differentiate the opponent's degree of resistance. This is one important element as the amount and extent of police officers use of physical force are proven to be highly related to the degree, or severity, of the resistance carried out by the subject. Terrill [12] reviled that when no resistance was shown from the subject during an arrest the officer ended up with use of physical force in approximately 20% of all encounters. On the other side, when subjects showed some form of resistance (although still not active – which was reported in too few cases to be included) 74.5% of the encounters required physical force from the officer.

Further, even though it is likely that the performances in the bench press and the pull up tests are the most influential factors affecting the arrest handling performance, the other tests included in the physical ability index might also influence. When the officer pushes and/or pulls the subject from a standing position, a higher strength and power capacity in the lower extremities are beneficial. To be able to exert physical force from the upper body the officer has to uphold a strong and balanced stance. Additionally, as the degree of resistance from the opponent increases with more, and quicker, movements and numerous sudden and unexpected attacks against the officer, the officer's ability to respond with powerful and rapid movements becomes increasingly important. Standing long jump is possibly not the most reliable method to measure power and strength in the lower extremities. The present execution is though almost identical to the execution of the free counter movement jump, with the only difference being the power-direction, a significant correlation has previously been proven to exist between the two [23]. It is therefore possible that also standing long jump had an effect on the outcome of the arrest handling. More, as the duration of the arrest simulation was up to 10 minutes it is also possible that the performance in the 3000 m endurance test is a factor that have to be taken into account. The endurance test mainly reflects aerobic capacity, but to some extent also anaerobic capacity [24], and higher endurance would make the officer better able to stay concentrated, focused, to move around, and to execute the necessary impact methods at the right time, especially as the duration of the test increases.

The officers' age was largely and moderately correlated to the physical index and the arrest index, respectively. These correlations were negative, where the aggregated performances in both indexes decreased with increased age. Relationships between decreased physical fitness and increased age are previously disclosed in the police force [1, 17]. Considering that critical situations, which demand high intensity physical involvement, do occur independent of the officer's age and physical fitness these findings are disturbing. A lowered physical fitness level related to increased age could seemingly have a negative impact on the result of the situation [3, 10]. Regarding stature, body mass and BMI correlated with the physical index and the arrest index, no significant findings were disclosed. To some extent this was surprising to us, especially the lack of correlation between stature and the performance in the arrest handling test. Even though we do not have much relevant data for direct comparison, it could be relevant to look at what is found in material arts, which in many ways are comparable to our simulated arrest test. It has been shown that the performance in material arts increases in relation to both increased body mass and a higher stature [18, 19]. Also Ghorbanzadeh *et al.* [20] found a significant correlation between stature and the performances among athletes in material art, and it was pointed that the advantages in having a high stature were due to a significant biomechanical benefit compared shorter competitors. Long upper and lower limbs imply a greater range to cover. The same benefit has been disclosed within the police as both a high stature as well as long arms were found to be advantageous in situations where the police had to use physical force [7, 21]. To be able to put people out of balance by coming from 'above' is an important factor when trying to cope with an intractable subject [15]. Further, greater body mass will make it easier to force people out of balance and make it more difficult for

the struggling subject to take physical control of police officers. Nonetheless, when this study did not find any correlations between stature, body mass and BMI and the arrest index, this may be explained by the initial matching of the officer and subjects in the study. In the test situation the opponents were persons who matched according to the officers' height and weight. This probably resulting in that the taller and the larger officers did not get the advantage as what can be expected under normal conditions.

LIMITATIONS

When interpreting the findings of the present study some limitations have to be accounted for. First, arrest handling is assessed in an artificial context and it cannot be known for certain how well this simulation reflects real police practice. Second, the performance in the arrest simulation test is, to some extent, related to the technical execution of diverse impact methods, which not necessarily are directly dependent on physical capacities. Third, for future studies a higher N can be included. This will make it possible to separate the different tests of both indexes, to give a greater understanding of which parts that especially were related to each other. Fourth, the anthropometric characteristics are based on self-reporting through a paper scheme. Future studies could include more reliable methods for this matter.

CONCLUSION

In the present study, we found a large correlation between police students' general physical capacity and their ability to handle in a simulated arrest test. To the best of our knowledge this is the first study to examine this relationship by the use of a real struggling subject to assess the arrest performance. Although we recognize that a certain level of technical skills is required to perform the arrest simulation test, we interpret our findings to reveal that a higher physical fitness affects the outcome of the arrest situation in a positive manner. For the active duty police officer to be able to master the most frequent excessive physical task of police work the importance of upholding some level of general physical fitness is thereby highlighted as significant. Further, we found a negative correlation between age and both physical fitness and the ability to perform in the arrest handling test. Together our main findings emphasize the need, and the justification, of implementing monitoring of physical fitness in the police profession to ensure the police are capable of performing their job.

CONFLICT OF INTEREST

The authors confirm that this article content has no conflicts of interest.

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Declared none.

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