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Araştırma Makalesi

Investigation of Working Capacity of Physiotherapists

Fizyoterapistlerin Çalişma Kapasitesinin Belirlenmesi

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ABSTRACT

Purpose: The aim of our study was to evaluate the working capacity of physiotherapists and to determine the effect of age on working capacity. **Material and methods:** At least 2 years experienced 45 physiotherapists who do not have injury history are included into our study. Physiotherapists are separated into three different groups according to their work experience. Work capacity of physiotherapists including grip strength, pinch strength, lifting, muscle strength, spinal range of motion evaluated. **Results:** The results of functional capacity evaluation (FCE) showed that the experienced physiotherapists had higher scores from most of the sub parameters of FCE. There were a statistically significant difference between three groups for grip, pinch, tripod and lateral pinch grip strength, upper extremity muscle strength ($p<0.05$). There were no significant differences in scores between groups for lifting and spinal range of motion results. ($p>0.05$). **Conclusion:** It has been considered that experienced physiotherapists are stronger than the inexperienced physiotherapists especially for the upper body muscle strength. Injuries in younger physiotherapists may be associated with having less muscle strength. Further studies should be planned to assess the practice settings and the work habits of physiotherapists to detailed analysis of working capacity.

Keywords: Physiotherapist; Work related musculoskeletal disorders; Functional capacity evaluation

ÖZET

Amaç: Çalışmanın amaci fizyoterapistlerin çalışma kapasitesini değerlendirmek ve yaşın çalışma kapasitesine etkisini ortaya koymakıtr. **Gereç ve yöntem:** Herhangi bir yaralanma hikayesi olmayan, en az 2 yıllık tecrübeye sahip 45 fizyoterapist çalışmaya dahil edildi. Fizyoterapistler çalışma yılları dikkate alınarak üç farklı gruba ayrıldı. Çalışma kapasitesi dahilinde kavrama kuvveti, çimdikleyici kuvvet, ağırlık kaldırma kuvveti, kas kuvveti, lumbal bölge hareket açıklığı değerlendirmeleri yapıldı. **Sonuçlar:** Deneyimli fizyoterapistlerin bir çok fonksiyonel kapasite değerlendirmesi alt parametresinden daha yüksek sonuçlar aldığı görülmüştür. Kavrama kuvveti, çimdikleyici kuvvet üçlü kavrama kuvveti ve lateral kavrama kuvveti, üst extremite kas testi sonuçları açısından üç grup arasında anlamlı bir fark olduğu bulunmuştur ($p<0.05$).Kaldırma kuvveti ve spinal bölge hareket açıklığı değerlendirmeleri açısından gruplar arasında anlamlı bir fark bulunamamıştır ($p>0.05$). **Tartışma:** Tecrübeli fizyoterapistlerin tecrübesizlere oranla özellikle üst extremite kuvveti açısından daha kuvvetli olduğu sonucuna varılmıştır. Tecrübesiz fizyoterapistlerde daha fazla kas iskelet sistemi yaralanması görülmesinin daha az kas kuvvetine sahip olmaları nedeniyle olabileceği düşünülmüştür. İleriki çalışmalar fizyoterapistlerin çalışma ortamlarını ve çalışma alışkanlıklarının detaylı analizinin de yapıldığı çalışma kapasiteleri değerlendirmelerini içeren çalışmalar planlanmalıdır.

Anahtar Kelimeler: Fizyoterapist; İşe bağlı kas iskelet sistemi yaralanmaları; Çalışma kapasitesi değerlendirmesi

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The term of "work capacity" refers to an individual's ability to perform work tasks on a safe and dependable basis. These abilities are measured and compared to task demands in order to determine the likelihood that the individual will be able to perform the tasks with reasonable safety and dependability (Matheson, Mooney, Grant ve ark, 1996). The work capacity performance based determined through a functional capacity evaluation (FCE). An FCE aims to measure an individual's physical capability to perform work related activities .The basic items of functional evaluations (lifting, carrying, bending, reaching, climbing) are compiled into a comprehensive test which results in information about the whole of work and overall ability of the worker (Isernhagen, 1992).

Occupational disability can be defined as the individual's uncompensated shortfalls in responding to work demands. The occupational disability that a person experiences after an injury is a consequence of the severity of the pathology and resultant impairment and functional limitations that are work related, compared to the individual's pre-injury work capacity (Matheson ve ark, 1996).

Work-related musculoskeletal disorders (WRMD) among health care workers are the most common occupational injury that results from a work-related event (Wilkonson, Salazar, Uhl, 1992). Activities involving patient contact and working long hours at static posture are the main causes of occupational injuries among health care workers (Nelson, Olson, 1996). The results of the studies indicate that WRMD are very common among physiotherapists, dentists and nurses (Holder, Clark, Di Blasio, 1999).

Physiotherapy profession requires the performance of many labor-intensive tasks like bending, twisting, reaching, performing manual therapy and maintaining awkward positions for a prolonged period of time (Arad, Ryan, 1986). These job-related tasks reported as contributing to WRMD in physiotherapists.

The most common WRMDs among physiotherapists has been reported in the literature are back and neck pain, upper extremity tenosinovitis and tennis elbow, wrist injuries, lower extremity varicose veins, and pes planus and thumb problems .Molumphy et al indicated that the onset of WRMD occurred most frequently within the first 4 years of professional practice. Female therapists had spinal symptoms and wrist and hand symptoms more than male therapists (Molumphy, Unger, Jensen ve ark 1985). One another issue that also affects WRMD is the working conditions of the physiotherapists which mostly affected by the culture (Darragh, Campo, King, 2012).

Work capacity of the individual must be measured in a manner that allows comparison to the work capacity of that person if the pathology had not occurred. The net loss of work capacity can be used to "rate" the disability that is attributed to the injury. This presents a difficult problem in that, prior to an injury, an individual's work capacity usually is not known. Further, because the effects of age are confounded with work capacity, this estimate must take age into account. Age-linked changes in work capacity have been studied extensively (Matheson ve ark, 1996).

In the literature the studies made to determine the extent and nature of WMSDs among physiotherapist are all self-administered questionnaires. They all mailed to physiotherapist and/or physiotherapist assistants and they were asked to complete the questionnaire (Holder ve ark,1997; Molumphy, ve ark 1985; Darragh ve ark, 2012). There is not any study that investigates the work capacity of physiotherapist before the pathology happens.

The first aim of this study was to analyse the working capacity of physiotherapists prior to injury. The second aim was to determine the working capacity difference between experienced and inexperienced physiotherapists.

MATERIAL AND METHODS

Working capacity evaluation was assessed in female physiotherapists in Hacettepe University Health Sciences Faculty Physical Therapy and Rehabilitation Department. Working capacity evaluation included spinal ROM measurement, muscle strength measurement, lifting, and grip and pinch strength measurement is evaluated with The Tracker Functional Evaluation System from J-Tech Medical. At least 2 year experienced

Table 1: Descriptive information of physiotherapists

	1st group (n=15)	2nd group (n=15)	3rd group (n=15)
Age year (Mean ± SD)	25,6±1.59	33.33±1,91	41±3,02
Years of experience (Mean ± SD)	20.61(3.0)	11,33±1,67	18,8±2.14
Working hours per week (Mean ± SD)	37±5,08	39,33±4,57	41±2,07
Working hours per day Mean ± SD	1,90±0,96	1,50±0,53	1,66±0,36
Number of patient treated per day (Mean± SD)	6,66±4,51	7,33±3,49	7,60±4,10

volunteered physiotherapists living in Ankara were included to the study. Physiotherapists with a previous injury were excluded. The study was conducted in accordance with the tenets of the Decleration of Helsinki. Informed consent to participate was obtained from all subjects.

Grip and pinch strength were measured with a grip and pinch track module. According to the American Society of Hand Therapists the proper positioning of the patient for the 5 position grip test is as follows: Seated, with the shoulder adducted and neutrally rotated, elbow flexed at 90°, forearm in neutral position, and the wrist between 0 and 30° extension and between 0 and 15° ulnar deviation. All tests are performed in position 2. Tripod, lateral and palmar pinch strengths were also measured.

The mean score of three trials was recorded (Mathiowetz, Weber, Volland ve ark, 1984).

Lifting is evaluated according to NIOSH (National Institute of Safety and Occupational Health) Lift Tasks with Lift tracker system. The arm, leg and floor static lifting postures were used to compile an isometric strength database and are summarized in the Work Practices Guide for Manual Lifting (NIOSH 1981).In the arm lifting height of the lift bar is determined by positioning the patient such that the elbows are flexed to 90 degrees with the shoulders in neutral position. The patient lifts upward without swaying backward, rising up on toes, or elevating shoulders. This test primarily stresses the elbow. In the leg lifting the height of the bar is 15 inches, and the medial malleol are placed at 0 inches. The patient should use a leg lift technique, emphasizing the quadriceps. This test primarily stresses the knee. In the floor lifting the height of the lift bar is 6 inches, and the medial malleol are positioned at 10 inches on the platform. The patient flexes the trunk and the knees to reach the lift bar. The patient lifts upward utilizing the hip, back and leg extensors. The mean score of three trials was recorded (J-tech,2005).

Muscle strength is evaluated with the Power Track II Manuel Muscle Test System. According to Dr. Lowett's test positions the resistance against the trancedure is evaluated by kilogram. Lumbar flexors-extensors, shoulder flexors-extensors, elbow flexors-extensors flexors-extensors, hip flexors-extensors, adductor-abductors, ankle dorsi flexors are evaluated.

Spinal range of motion is measured by Tracker ROM's dual inclinometer according to American Medical Association (AMA) protocols. Lumbar flexion- extension, right- left lateral rotation is evaluated (J-tech,2005).

Data Analysis

All data analyses were done with SPSS software (SPSS version 17.0; Chicago, Illinois, USA). Continuous variables were described by mean (x) and standard deviation (SD) such as age and years of experience. Categorical data such as the type of injury, the body part affected are given as counts and percentages.

The variables were investigated using visual and analytical methods to determine whether or not they are normally distributed. As the datas were not normally distributed Kruskal Wallis test were conducted to compare these parameters.

The Mann-Whitney U test was performed to test the significance of pairwise differences using Bonferoni correction to adjust for multiple comparisons. The level of significance was set at p<0.05 (Sümbüloğlu, 2000).

RESULTS

Physiotherapists are divided into three groups according to their experience years. Physiotherapists whose work experience is between 2-8 years included to the first group, 9-16 years to the second group and 17-22 years to the third group.

The mean of the age of physiotherapists in the first group is 25.6±1.59, the second group is 33.3± 1.91, and the third group is 41, 3±3.02. The average working time of physiotherapists was 4, 26± 1.53 years for the first group, 11.33± 1.67 years for the second group, 18.8±2.14 years for the third group. Table 1 shows the descriptive information of physiotherapists.

The specialty area of the physical therapists in the first group is especially working with pediatrics, the second and the third group is especially working with orthopedics (Table 2).

Functional Capacity Evaluation

Although some of them were not statistically significant, the results of functional capacity evaluation showed that the physiotherapists in the third group had higher scores from most of the sub parameters of FCE.

Table 3 shows the results of grip and pinch strength measurements. There were a statistically significant difference between three groups for grip, pinch, tripod and lateral pinch strength (p<0.05). Physiotherapists in the third group was found to have statistically significantly highest value for grip, pinch and palmar grip strength (p<0.25).

The results of the three different lifting measurements were showed in table 4.

There were no statistically significant difference between three groups for lifting measurements (p<0.05).

Scores of muscle strength test showed that physiotherapists on the third group had

Table 2. Work settings of the physiotherapists.

		1st group (n=15)		2nd group (n=15)		3rd group (n=15)	
		n	%	n	%	n	%
Work Setting	Pediatric	8	17.6	3	6.6	1	2.2
	Neurologic	3	6.6	4	8.8.	2	4.4
	Orthopedic	4	2.2	8	17.6	12	26.6

Table 3. Comparison of the grip and pinch strength measurements of the groups

	Group I Mean±SD	Group II Mean±SD	Group III Mean±SD	p
Grip strength	11.73±1.48	12.13±2.32	13.73±1.48	0.02* I-III 0.02**
Pinch strength	5.00±1.32	5.3±1.23	6.34±1.22	0.01* I-III 0.02**
Lateral pinch strength	6.22±1.49	7.11±1.04	7.28±0.81	0.03* I-III 0.04
Palmar pinch strength	5.84±1.38	6.67±1.16	6.84±0.81	0.04* I-III 0.01**

*p<0.05, **P<0.025 after bonferoni adjustment

Table 4. Comparison of the lifting measurements of the groups

	Group I Mean±SD	Group II Mean±SD	Group III Mean±SD	p
Arm lifting (kg)	33.33±15.06	35.26±17.79	39.40±19.54	0.73
Leg lifting (kg)	55.60±23.02	61.86±25.91	60.66±26.48	0.58
Floor lifting (kg)	56.13±21.34	58.13±16.95	56.73±20.87	0.53

the highest upper extremity muscle strength compared with the other groups, however difference was meaningful only for shoulder flexion and abduction strength results ($p<0,05$). For the lower extremity muscle strength there were no statistically significant difference between groups ($p>0.05$) (Table 5)

According to lumbar inclinometric measurement results there were no significant differences in scores between groups for lateral flexion, extension and flexion range of motions ($p> 0.05$). (Table 6)

CONCLUSION

The main finding of this study was that experienced physiotherapists are stronger than the younger physiotherapists.

The difference is especially due to the upper body muscle strength. There is also general consensus that as age increases, both the number of injuries and injury rates decline (Breslin, Koehoorn, Smith ve ark 2003). The lack of strength and endurance are the key factors leading to a number of musculoskeletal injuries(Lavender, Conrad, Reichelt, 2000). Performing manual orthopedic techniques, lifting or transferring dependent patients, assisting patients during gait activities carrying, lifting, or moving heavy materials or equipment were the activities which all considered as major problems for physiotherapy profession and which were mostly done by the upper extremity muscle strength. The literature reports the higher prevalence of having WRMDs at young age (Molumphy ve ark, 1985) Such injuries in younger physiotherapists may be associated with having less muscle strength than older physiotherapist. Also lack of professional experience, and the lower knowledge and skill levels people tend to have in the early years of this career are reported as the other factors of high prevalence of WRMDs (Salik, Ozcan, 2004).

Muscle strength, muscle power and functional mobility values decline with age Reduction in muscle strength and power might be associated with the reduced function in various activities of daily living (Lindle, Metter, Lynch, 1997). Muscle strength increases in the second and third decades, stable in the fourth and fifth decades and decreases after the fifth decades Avlund, Damsgaard, Osler, 2004). Murray et al evaluated knee flexion-extension by the Cybex II dynamometer in 72 physiotherapists, occupational therapists, office and hospital workers whose ages are vary between 20- 86. He divides the cases into three groups according to their ages like young (20-35), middle age (42- 61) and old (68-70). He reported that muscle strength is more rapidly decreasing in the older group than the younger one (Murray,1985). Philips evaluated upper and lower extremity muscle strength of the 100 physiotherapists whose ages are between 20 and 69. He reported that the muscle strength of the lower extremity is earlier decreasing than the upper extremity strength (Phillips, Sing, Mastaglia, 2000).According to our study upper and lower extremity total muscle strength is maximum in the third group. Physiotherapists are all using their upper extremities during their work. High effort needed activities such as transferring dependent patients, assisting patients in gait, providing manual resistance, lifting heavy and cumbersome

Table 5. Comparison of the muscle strength measurements

	Group I Mean±SD	Group II Mean±SD	Group III Mean±SD	p
Lumbar flexion	9.53±2.19	9.53±1.95	10.60±2.26	0.30
Lumbar extension	11.60±1.40	10.73±1.70	11.40±1.63	0.30
Shoulder flexion	9.40±1.91	9.26±1.38	10.93±1.57	0.01* I-III 0.03 II-III 0.02
Shoulder abduction	9.66±1.54	9.46±1.35	11.26±1.27	0.02* I-III 0.09 II-III 0.03
Elbow flexion	12.66±1.83	12.66±2.02	13.66±2.02	0.30
Wrist extension	7.00±1.85	7.66±1.49	8.06±1.16	0.16
Hip flexion	11.40±1.50	11.33±1.87	11.13±1.92	0.88
Hip extension	11.53±1.92	10.73±2.05	10.80±2.51	0.54
Hip abduction	11.46±1.80	10.46±1.68	10.73±2.52	0.38
Hİp adduction	11.00±2.67	11.20±1.89	10.40±1.80	0.57
Knee extension	11.33±1.34	10.60±1.24	10.66±2.38	0.44
Knee flexion	11.53±1.59	10.80±1.32	9.66±2.60	0.32
Dorsi flexion	7.86±1.12	8.3±1.17	7.86±2.01	0.62
Upper extremity total muscle strength	109.60±10.12	98.40±11.31	98.86±14.64	0.02* I-III0.05 II-III 0.04
Lower extremity total muscle strength	150.77±17.14	145.14±14.24	145.13±24.81	0.65

*p<0.05

equipment are used in clinical environment. This extreme use of upper extremity can be a factor of increased muscle strength of experienced physiotherapists.

Physical work demands mostly center on the strength of the worker. Within the context of strength, the worker's demonstrated lifting capacity and grasping. Studies showed that the occupation had an effect on grip force. Mathiowetz reported that grip strength reaches the highest level between 25-39 years and begins to decrease after the age of 40 (Mathiowetz, Kashman, Volland, ve ark 1985). Josty reported that while farmers worked manually had the maximum grip strength, office workers had the minimal grip strength (Josty, Tyler, Shewell ve ark 1997).In our study like the muscle strength grip, pinch, lateral ad palmar strength measurement results' of experienced physiotherapists were. The higher grip strength can be related to their

Table 6. Comparison of the lumbar range of motion

	Group I Mean±SD	Group II Mean±SD	Group III Mean±SD	p
Left lateral flexion	32.73±7.33	34.46±7.29	33.40±7.00	0.80
Right lateral flexion	26.93±5.13	28.13±8.10	28.60±7.54	0.80
Flexion	71.40±6.91	68.80±16.40	76.13±11.85	0.50
Extension	14.86±6.59	19.93±6.71	19.93±5.43	0.60

work experience like muscle strength. Additionally, because of the ages of the physiotherapists are between 30-45 years we expect the grip strength to be maximum in this group. On the other hand the experienced physiotherapists could lift more heavily than the younger therapists. But there is no statistically significant difference between the groups.

As the age increase spinal activity decreases (Melin, 1990). Einkauf evaluated flexion, extension, lateral flexion of the trunk of the 19 female physiotherapists whose ages are between 20 and 84. He demonstrated that spinal activity is decreased in sagittal and coronal planes as the age increase. Spinal activity difference is mostly seen between the younger and the older group (Einkauf, Gohdes, Jehsen ve ark, 1987). Our study also indicates that the experience of the therapists had negative effect on the spinal range of motion like reported in the literature.

One of the limitation of our study is the physiotherapists included in our study were all female. Like the other Europe countries the physiotherapy profession in Turkey is female dominant. Beside this in order to maintaining the homogeneity of the group male physiotherapist were excluded from the study. Future studies are required with a larger and different gender population to be able to determine the cause of the disability. In addition to our study an assessment of the practice settings and the work habits of physiotherapists within these settings would be helpful to detailed analysis of working capacity.

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