

A TEST OF MANIPULATION FUNCTIONS USING THE CONSTRUCTIONAL SET “MINISTAV” IN PHYSIOTHERAPY AND THE VERIFICATION OF ITS RELIABILITY

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Submitted in May, 2007

The main goal of the study was to analyse the reliability of the “Test of manipulation functions” using the constructional set Ministav. This newly carried out test is designed to test the impaired manipulation functions of the hand. The number of healthy subjects tested was 417, which was further divided into four groups according to age. The tested subjects performed 17 subtests in three trials. The outcome score is an average of these three trials. The tested criterion was the time necessary to perform each subtest. To assess the reliability of the new test, a correlation analysis using the Pearson correlation coefficient was applied. The values of reliability coefficients range, in particular subtests in given groups, from 0.14 to 0.94. The lowest average values of the reliability coefficient are seen in children ($r = 0.54$). In contrast, the highest values are reached in seniors ($r = 0.82$).

Keywords: Hand, dexterity, manipulation, test of manipulation functions, reliability.

INTRODUCTION

Manipulation is an intentionally targeted ideokinetic movement characteristic of homo sapiens able to do creative activities (Véle, 1997). The term “manipulation” is often used to mean that the hands move an object to perform the activities wanted, i. e. the object moves in the hand or between both hands or the hands are holding the object that they are moving in space (Exner, 1993). Manipulation functions are closely connected with cognitive functions of the brain. It is a complex and dynamic system comprising visual perception, space recognition, concentration, memory and executive functions (Grieve, 2000).

The impairment of manipulation functions means a severe problem for patients and may have physical, psychological and social impacts. Advances in hand therapy depend on the quality of the tests used to perform assessments. To evaluate how severe the problem is, it is necessary to use a suitable objective test that is able to disclose insufficiencies in performance, to register the improvement, stagnation or deterioration of the course of a disease. This is the only way to choose an adequate therapy and enable patients to perform daily and working activities. A hand function test should provide pertinent information about the quality and the speed of performance of the hand as the person accomplishes a task and the time required to complete that task (Aaron & Stegink-Jansen, 2003). The performance of manipulation activities is always connected with the state of CNS. This is why creative tests are able to disclose not only local impairments but also disfunctions in

concentration, memory, planning tasks, choosing strategies, etc. Such tests, nevertheless, are missing among the equipment of many therapists.

One of the most frequent tests of manipulation functions in use is the Jebsen test of hand function (Hardin, 2002). It comprises seven subtests, six of which involve manipulating objects (i. e., turning cards, stacking checkers, lifting objects) and the seventh one is a writing test (Thonnard, Plaghki, & Bragard, 1994; Hlučnicková, 1999; Hardin, 2002). Other tests are a combination of this basic test with activities of daily living (e. g. Timed manual evaluation test, Upper extremity performance test for the elderly, and the Smith hand function evaluation, to name three such tests). A further group of tests evaluates the time necessary for the performance of a simple repeated task or a number of objects manipulated in a given time (e. g. The Minnesota rate of manipulation tests, The nine-hole peg test, The functional dexterity test, The purdue pegboard test, The box and block test).

Most tests of manipulation functions are for time and economic reasons very simple and require only one kind of manipulation to be repeated (e. g. the insertion of pegs into a hole, displacing blocks from one box into another box, etc.). What is not tested is a greater number of kinds of grasp or combined grasps or coordination of both upper extremities, and no creativity is asked for within the performance of tasks and, moreover, motivation is often absent. For this reason, when using these tests we may overlook some of the present disorders of hand functions that may lead to a lack of successful of the therapy. In many such tests the statistical parameters

of a test are missing (Croarkin et al., 2004). Furthermore, these tests are not easily accessible to therapists in the Czech Republic and are very expensive. In regard to these facts, new standardised tests have been carried out. It is expected that the newly designed and carried out Test of Manipulation Functions (TMF) may be qualitatively a new type of test enabling us to gain a broader spectrum of information on each tested person.

The TMF was designed to serve physiotherapists and occupational therapists as well as other specialists evaluating the manipulation abilities of any tested person. It evaluates the abilities of an individual in using his hands in uni and bimanual activities by means of the constructional set *Ministav* made for this purpose. TMF complements the scale of the tests of manipulation functions. Its advantage, as opposed to other tests, is that, thanks to positive motivation and a creative approach, the patient experiences a minimum of stress caused by failure (Vyskotová, 2003). The testing resembles child's play, in which it is possible to test various types of grasp, the ability to manipulate objects, the coordination of both upper extremities as well as some psychological processes (initiation, selection of strategy, task memory, etc.). During testing, it is possible to set a degree of difficulty and to make use of suitable subtests according to a particular condition and the course of a certain illness. The constructional set *Ministav* may be used, besides in diagnostics, also for treatment, as it gives a great number of working variants and is easily portable.

TMF may be regarded to be one of the specialised motoric tests. The contents of the motoric tests are movement activities listed according to their movement task and respective rules (Měkota & Novosad, 2005). Their standardization requires the use of standardised aids (tools, etc.), the same well thought out, exact instruction, and that they be easy to reproduce (Měkota & Blahuš, 1983). Manipulation function tests are very sensitive to a great number of outer and inner disturbing influences. This is why the tested subject must fully concentrate during testing and must not be disturbed.

The quality of the tests is evaluated by its objectivity, reliability and validity (Komenda, 1995). This study is focussed on one of the aspects of this test - reliability. Measurement reliability shows how the result of measurement changes when repeated (Komenda, 1995). The results of testing should be, to the maximum degree possible, independent of casual errors. The resulting reliability then shows to which degree this requirement is being met (Měkota et al., 1988). To evaluate reliability, several steps are taken: test-retest reliability, reliability of parallel measurements, and/or reliability found out due to the test being done in halves (Hendl, 2006). To verify TMF, the test-retest reliability of two measurements of a number of objects was used, applying a given method in two time periods by means of the Pearson correlation coefficient.

The aim of this study is to verify the reliability of the new TMF test.

METHOD

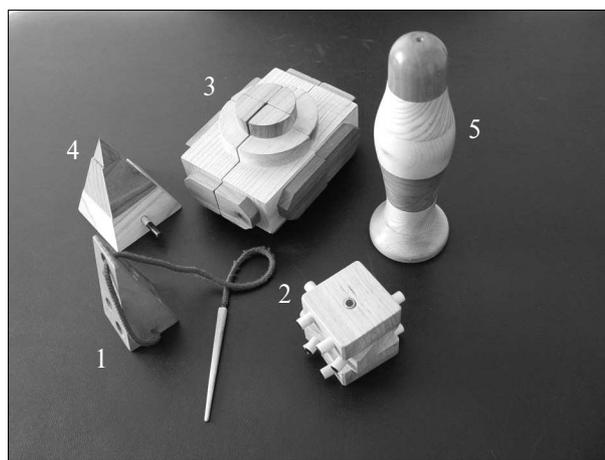
Description of test

TMF is performed using the special patented constructional set *Ministav* (Vyskotová, 2003). TMF comprises 17 subtests, as a whole, performed by means of 5 constructional objects, the so called the "Needle", "Cube", "House", "Pyramid" and "Mummy" (Fig. 1).

1. A "Needle" has the shape of a cone with five holes through which a wooden needle is put, attached to the cone using a cord.
2. A "Cube" is a three segmental prism, which forms three parts having the same dimensions with differently placed side pegs.
3. A "House" is a quadrilateral object, having four independent parts. Provided all four parts are composed in the right way, their walls form simple geometrical shapes according to their axial symmetry.
4. A "Pyramid" is composed of three parts that hold together due to the central axis and the lateral peg.
5. A "Mummy" is a body formed by seven independent segments with a circular diametre, having together a skittle shape.

Fig. 1

Group of five objects of constructional set *Ministav*



Legend

1 - Needle, 2 - Cube, 3 - House, 4 - Pyramid, 5 - Mummy

Each of these objects may be manipulated in a specific way (Vyskotová & Vaverka, 2003). The overview of subtests made using particular objects is shown in TABLE 1. The tested criterion is the time achieved.

TABLE 1

Test of manipulation functions using the constructional set Ministav

Object	Name of subtest	Contents of subtest	Tested quality
Needle	BHS DHS	- both hands sewing (where both hands spell in holding the needle) - dominant hand sewing	tridigital grip, bimanual coordination
Cube	BHA BHD DHA DHD ACP	- both hands assembling (assembling the Cube by both hands) - both hands dismantling (dismantling the Cube by both hands) - dominant hand assembling (assembling the Cube by dominant hand) - dominant hand dismantling (dismantling the Cube by dominant hand) - assembling the Cube according to pattern	bidigital grip, taxis, coordination, stereognosis
House	LDHp LDHf AHP	- lifting the House by dominant hand using a palm grip - lifting the House by dominant hand using a finger grip - assembling the House by both hands according to pattern	palm grip, pinch grip, power of grip, coordination, recognition of geometrical shapes
Pyramid	BHA BHD DHA DHD	- both hands assembling (assembling the Pyramid by both hands) - both hands dismantling (dismantling the Pyramid by both hands) - dominant hand assembling (assembling the Pyramid by dominant hand) - dominant hand dismantling (dismantling the Pyramid by dominant hand)	combination of grips, bimanual coordination, taxis, memory, action planning
Mummy	DHA DHD AMP	- dominant hand assembling (assembling the Mummy by dominant hand) - dominant hand dismantling (dismantling the Mummy by dominant hand) - assembling the Mummy according to pattern	bidigital grip, taxis, memory, cognitive functions

The course and organization of measurement

The testing was carried out in a quiet room. The examiner and tested person were sitting facing each other at the table. The tested subject was placed sitting upright having his/her forearms freely put on the table with hands in a working position. The examiner demonstrated the task to be performed. The subject made a try at each subtest. After the instruction three trials were made. The tasks demanding manipulation conducted by one hand were performed by the preferred extremity. The examiner measured the achieved time by means of a stop-watch. The measured data (in seconds) were registered in given forms. The resulting score of each subtest was represented by the average value of these three trials. The total duration of the whole test TMF took, on the average, 20 minutes.

Tested Groups

The test was applied to a group of subjects divided into four age categories: children 9–10 years, adults aged 20–25, adults in the age category 40–50 years and seniors over 65 years old (TABLE 2). The selection of the group was conducted in the region of Northern Moravia. As a whole, 417 healthy subjects were tested (245 women and 172 men).

Statistical data

The mutual relationship among the trials in the particular group were assessed by means of correlation coefficients, by differences via the Wilcoxon pair test and, alternatively, also by a one selection pair t-test. The reliability of measurement was verified by means of the correlation relationship among the single trials and the resulting score. In order to assess the reliability of a new test, statistical analysis was conducted using the Pearson coefficient. The data were processed with the help of the software system to analyse data by StatSoft, Inc. (2001), Statistica Cz, version 6 (www. StatSoft.cz).

TABLE 2
Measured groups

Group	Figure			Age		min	max
	total	female	male	\bar{x}	s		
Children 9-10 year	105	49	56	9.7	0.44	9	10
Adults 20-25 year	109	61	48	21.8	1.88	20	25
Adults 40-50 year	101	69	32	44.3	3.75	40	50
Seniors over 65 year	102	66	36	73.0	6.48	65	90
Whole group	417	245	172	36.7	24.35	9	90

RESULTS

In all four age groups, as well as in the whole set, the mutual relations among these particular three trials in all 17 subtests were tested. Average values of each reliability coefficient were obtained for each subtest and these are considered to be final values.

The baseline of data processing was presented by the calculation of basic statistical characteristics in all

measurements for each of 17 subtests. Subsequently, the calculation of correlation coefficients among the particular trials was carried out. TABLE 3a and 3b show the survey of correlation coefficients giving final values when the first trial was compared with an average value of the second and third one, as well as the second trial with an average value of the first and third one, and the third trial with an average value of the first and second one. Using the three numerical values in each subtest,

TABLE 3a

Reliability coefficients expressed in correlation coefficients among single trials in groups of children, adults 1 and adults 2

Test	Subtest	Groups								
		Ch			A1			A2		
		Correlation among trials			Correlation among trials			Correlation among trials		
		1:23	2:13	3:12	1:23	2:13	3:12	1:23	2:13	3:12
Needle	BHS	0.65	0.69	0.73	0.75	0.76	0.77	0.61	0.67	0.72
	DHS	0.58	0.64	0.59	0.72	0.71	0.62	0.49	0.58	0.69
	Cube	BHA	0.29	0.39	0.32	0.47	0.61	0.48	0.52	0.55
Cube	BHD	0.71	0.78	0.75	0.72	0.77	0.75	0.71	0.77	0.74
	DHA	0.44	0.45	0.48	0.67	0.70	0.69	0.65	0.75	0.60
	DHD	0.63	0.73	0.77	0.75	0.82	0.82	0.64	0.69	0.68
	ACP	0.12	0.25	0.38	0.60	0.68	0.70	0.37	0.53	0.45
	House	LDHp	0.65	0.71	0.64	0.67	0.80	0.78	0.62	0.68
House	LDHf	0.13	0.19	0.11	0.53	0.52	0.51	0.30	0.30	0.32
	AHP	0.51	0.55	0.56	0.73	0.74	0.67	0.54	0.69	0.62
	Pyramid	BHA	0.62	0.58	0.66	0.58	0.59	0.59	0.68	0.81
Pyramid	BHD	0.49	0.64	0.60	0.68	0.66	0.60	0.45	0.54	0.41
	DHA	0.50	0.62	0.60	0.54	0.61	0.60	0.46	0.55	0.65
	DHD	0.45	0.45	0.46	0.67	0.63	0.61	0.65	0.52	0.54
	Mummy	DHA	0.59	0.68	0.56	0.70	0.70	0.73	0.61	0.68
Mummy	DHD	0.56	0.74	0.67	0.79	0.85	0.77	0.72	0.50	0.83
	AMP	0.45	0.57	0.50	0.55	0.63	0.56	0.35	0.50	0.51

Legend

1:23 means the correlation between the 1st trial and an average value of the 2nd and 3rd trial; 2:13 correlation between 2nd trial and an average value of the 1st and 3rd trial; 3:12 correlation between the 3rd trial and an average value of the 1st and 2nd trial.

Ch - group of children 9-10 year; A1 - group of adults 20-25 year; A2 - group of adults 40-50 year; Sr - group of seniors over 65 year; Gro - whole group; BHS - both hands sewing; DHS - dominant hand sewing; BHA - both hands assembling; BHD - both hands dismantling; DHA - dominant hand assembling; DHD - dominant hand dismantling; ACP/AHP/AMP - assembling the Cube/House/Mummy according to pattern; LDHp - lifting the House by dominant hand using a palm grip; LDHf - lifting the House by dominant hand using a finger grip.

TABLE 3b

Reliability coefficients expressed in correlation coefficients among single trials in groups of seniors and whole group

Test	Subtest	Groups					
		Sr			Gro		
		Correlation among trials			Correlation among trials		
		1:23	2:13	3:12	1:23	2:13	3:12
Needle	BHS	0.92	0.95	0.94	0.92	0.94	0.94
	DHS	0.94	0.93	0.96	0.90	0.91	0.92
Cube	BHA	0.83	0.88	0.80	0.79	0.83	0.79
	BHD	0.83	0.88	0.90	0.84	0.88	0.88
	DHA	0.84	0.88	0.83	0.82	0.86	0.82
	DHD	0.81	0.89	0.87	0.84	0.90	0.90
	ACP	0.67	0.78	0.77	0.67	0.78	0.78
House	LDHp	0.79	0.87	0.86	0.74	0.82	0.79
	LDHf	0.62	0.58	0.66	0.49	0.47	0.45
	AHP	0.77	0.83	0.68	0.78	0.83	0.71
Pyramid	BHA	0.89	0.86	0.86	0.86	0.85	0.86
	BHD	0.78	0.87	0.81	0.78	0.86	0.82
	DHA	0.84	0.87	0.83	0.79	0.85	0.82
	DHD	0.85	0.84	0.80	0.84	0.83	0.81
Mummy	DHA	0.80	0.78	0.78	0.82	0.82	0.82
	DHD	0.89	0.94	0.87	0.90	0.95	0.91
	AMP	0.83	0.85	0.79	0.79	0.84	0.80

Legend

BHS - both hands sewing; DHS - dominant hand sewing; BHA - both hands assembling; BHD - both hands dismantling; DHA - dominant hand assembling; DHD - dominant hand dismantling; ACP/AHP/AMP - assembling the Cube/House/Mummy according to pattern; LDHp - lifting the House by dominant hand using a palm grip; LDHf - lifting the House by dominant hand using a finger grip.

and in each group, an average value of reliability coefficients have been calculated. The survey of these values is shown in TABLE 4. All the reliability coefficient values are statistically significant ($p < 0.01$) except for the subtest ACP (Assembling Cube according to Pattern) in the group of children and LHfg (Lifting House using a Finger Grip) in the same group.

The results of the statistical analysis in TABLE 4 show that the values of reliability coefficients within the particular subtests vary with regard to age groups and to particular subtests. The values of reliability coefficients are within particular subtests in particular groups in the range of 0.14 to 0.94.

The lowest average value of reliability coefficient were reached in the group of children ($r = 0.54$). Contrary, the highest values were reached in seniors as well as in the whole group (average value $r = 0.82$). The values of the reliability coefficients given in TABLE 4 show that only the group of seniors can be considered highly reliable in all the subtests except for the subtest LHfg (Lifting House using a Finger Grip).

The groups of adults aged 20–25 and 40–50 years are in the middle range of reliability. The groups of adults in the age category of 20–25 years reached an average value of reliability coefficient of $r = 0.67$ and the group of adults in the age category of 40–50 years had an

average value of $r = 0.60$. The lowest value of reliability coefficient as observed in the subtest LHpg ($r = 0.14$) in the group of children and the highest one in the subtest BHS (Both Hands Sewing) and DHS (Dominant Hand Sewing) was $r = 0.94$ in the group of seniors.

DISCUSSION

According to the rules of the American Society of Hand Therapists, the reliable motoric tests of the manipulation ability of the hand must include a statement of the purpose of the test and evidence of the reliability and validity of the test meant for the target population. Equipment standards must be available for the instrumental and standardized instructions for administering, scoring, and interpreting the test. The norms should include a large normal population sample, which is divided into specific categories according to age, handedness, or occupation (Aaron & Stegink-Jansen, 2003).

Reliability can be evaluated by means of various methods. One of the possibilities is so called test-retest reliability. Its purpose is to determine whether the repeated applications of measuring the same subject or group of subjects tend to change the results. Reliability coefficients above 0.85 are generally regarded as high

TABLE 4

Reliability coefficients expressed in average values of the correlation coefficients among single trials

Test	Subtest	Groups				
		Ch	A1	A2	Sr	Gro
Needle	BHS	0.69	0.76	0.67	0.94	0.93
	DHS	0.60	0.68	0.59	0.94	0.91
Cube	BHA	0.33	0.52	0.57	0.84	0.80
	BHD	0.75	0.75	0.74	0.87	0.87
	DHA	0.46	0.69	0.67	0.85	0.83
	DHD	0.71	0.80	0.67	0.86	0.88
	ACP	0.25	0.66	0.45	0.74	0.74
House	LDHp	0.67	0.75	0.68	0.84	0.78
	LDHf	0.14	0.52	0.31	0.62	0.47
	AHP	0.54	0.71	0.62	0.76	0.77
Pyramid	BHA	0.62	0.59	0.74	0.87	0.86
	BHD	0.58	0.65	0.47	0.82	0.82
	DHA	0.57	0.58	0.55	0.85	0.82
	DHD	0.45	0.64	0.57	0.83	0.83
Mummy	DHA	0.61	0.71	0.62	0.79	0.82
	DHD	0.66	0.80	0.80	0.90	0.92
	AMP	0.51	0.58	0.45	0.82	0.81
	\bar{x}	0.54	0.67	0.60	0.83	0.82
	SD	0.16	0.09	0.12	0.07	0.10

and between 0.60 and 0.85 as moderate (Thonnard, Plaghki, & Bragard, 1994).

The metric parameters of coordination tests are less favourable than those of condition tests (Měkoto & Novosad, 2005). Dexterity tests, where the criterion of performance is the measure of the accuracy of a move, are much less reliable. The successive trials often correlate only on a level with $r = 0.3-0.4$. Reliability will increase to reach an acceptable value when there are a greater number of test repetitions (Měkoto & Blahuš, 1983).

The reliability of single subtests TMF expressed by the Pearson coefficient of reliability moves in a large range from 0.14 to 0.94. Most subtests reach a value of over 0.60. This result is in conformity with those found in dexterity tests where reliability also moves within a range of 0.68-0.94 (Thonnard, Plaghki, & Bragard, 1994). In the best known dexterity test - the Jebsen test of hand function, the estimate of test-retest reliability in seven subtests was made within a range of 0.60-0.99 with the mean value of 0.84 (Thonnard, Plaghki, & Bragard, 1994).

Dexterity tests are more sensitive than other kinds of tests towards external and/or internal disturbing influences. There are various situational and accidental factors that may play a significant role (Měkoto & Blahuš, 1983). An important factor which can influence results is the individual's motoric learning ability, previous experience, motivation, etc. The significant influence of motoric learning as a factor was proven by Aaron and

Stegink-Jansen (2003) when verifying the functional dexterity test. They observed this influence as having stopped at the third trial. They proposed that one experimental trial should be conducted before proper testing to reduce the influence of motoric learning. In case that more than three trials were carried out, the results could also be influenced by fatigue.

In TMF, the group of seniors reached the highest values of correlation coefficient in almost all subtests, which could be explained by a smaller influence of motoric learning and greater experience in this group. In consequence, the group of seniors was able to show steadier performance. Three other groups improved their score throughout the course of repeated trials probably due to the influence of motoric learning. Mostly this impact and practical experience with fine motorics as well were shown in the group of children.

The group of children showed mildly lower values of the coefficient of reliability in almost all subtests, which could be explained not only by the influence of motoric learning, but also by a lesser ability to concentrate, a higher inclination to divert attention, lower motivation, a less developed sense of spatial orientation, etc. The lowest values of the reliability coefficient appeared in subtests demanding a greater participation of the cognitive functions of the brain. It concerned the subtests of assembling objects (Cube, House, Mummy) according to a model and lifting the House using a finger grip.

The above seen results indicate a good reliability of the TMF for the groups of adults and seniors. In these age groups, after evaluation of the test validity of the TMF, it can be used in rehabilitative practice.

In the group of children, the average value of the correlation coefficient varies. There are subtests which can not be assessed as reliable (assembling the Cube using both hands, assembling the Cube according to a pattern, assembling the Mummy according to a pattern and lifting the House using a finger grip). Other subtests can be considered as reliable (both hands sewing, dismantling the Cube using both hands, dismantling the Cube using the dominant hand, lifting the House using the dominant hand and using a palm grip, assembling the Pyramid using both hands, assembling and dismantling the Mummy using the dominant hand). Subtests in which proper reliability was not shown will be taken out of the battery of TMF subtests. They will be further used though, in this age category, as a therapeutic tool.

A further step to take in the given project will be to verify the validity of the TMF and to process normative data.

The TMF has its limits. It is sensitive to all the possible external and internal disturbing influences. This is why the tested subject must fully concentrate during testing and must not be disturbed. To date, the test has been verified on a group of healthy subjects and, at present, testing of the groups of patients with functional deficiency in the hand region is underway.

CONCLUSION

The TMF using the constructional set Ministav was designed to give therapists a diagnostic tool to evaluate decreased manipulation functions of the hand. The TMF presents quite a new original test that broadens and gives more precision to information on the level of the manipulation functions of a tested person. The TMF informs us about the patient's ability to use his hands in mono and bimanual activities, and completes the so far used tests of dexterity. The test consists of 17 subtests conducted by means of five objects of the constructional set Ministav. The performance of each subtest comprises one training trial and three measured trials. For each trial the endurance time is measured. The outcome score of single test items is given by an average of three trials.

Evaluation of its reliability has proven that the given test meets all the requirements made for this type of motoric test, and can be employed for the age category of seniors and adults, respectively. For the age category of children it is recommended to employ only the chosen subtests from the given test battery. A further recommended step before implementing of TMF into clinical

practice is to verify the validity of this test and to work out binding norms.

REFERENCES

- Aaron, D. H., & Stegink-Jansen, C. W. (2003). Development of the functional dexterity test (FDT): Construction, validity, reliability, and normative data. *Journal of Hand Therapy, 16*(1), 12–21.
- Croarkin, E., Danoff, J., & Barnes, C. (2004). Evidence based rating of upper extremity motor function tests used for people following a stroke. *Physical Therapy, 84*(1), 62–74.
- Disman, M. (2006). *Jak se vyrábí sociologická znalost*. Praha: Karolinum.
- Exner, Ch. E. (1993). Content validity of the in hand manipulation test. *The American Journal of Occupational Therapy, 47*(6), 505–513.
- Hardin, M. (2002). Assessment of hand function and fine motor coordination in the geriatric population. *Topics in Geriatric Rehabilitation, 18*(2), 18–27.
- Hendl, J. (2006). *Přehled statistických metod zpracování dat: Analýza a metaanalýza dat* (2nd ed.). Praha: Portál.
- Hluchníková, O. (1999). Hodnocení, testování v ergoterapii. *Informační bulletin České asociace ergoterapeutů, 8*, 18–26.
- Grieve, J. (2000). *Neuropsychology for occupational therapists: Assessment of perception and cognition* (2nd ed.). Oxford: Blackwell.
- Komenda, S. (1995). *Úvod do metodologie zdravotnického výzkumu*. Olomouc: Univerzita Palackého.
- Měkota, K., & Blahuš, P. (1983). *Motorické testy v tělesné výchově*. Praha: Státní pedagogické nakladatelství.
- Měkota, K., Kovář, R., & Štěpnička, J. (1988). *Antropomotorika*. Praha: Státní pedagogické nakladatelství.
- Měkota, K., & Novosad, J. (2005). *Motorické schopnosti*. Olomouc: Univerzita Palackého.
- Thonnard, J. L., Plaghki, L., & Bragard, D. (1994). EVA-MAIN: Computerised system for the evaluation of the hand. In F. Schuind et al. (Eds.), *Advances in the biomechanics of the hand and wrist* (pp. 499–509). New York: Plenum Press.
- Tomášková, H. (2006). *Základy biostatistiky*. Ostrava: Ostravská univerzita.
- Véle, F. (1997). *Kineziologie pro klinickou praxi*. Praha: Grada Publishing.
- Vyskotová, J., & Vaverka, F. (2003). Test of manipulation abilities as a means of therapy to tackle insufficient hand functions. In F. Vaverka (Ed.), *Proceedings of the 3rd International conference Movement and Health* (pp. 357–360). Olomouc: Univerzita Palackého.
- Vyskotová, J. (2003). The use of a special constructional set to diagnose and treat brain function disorders

and those of the hand. *Slovenská antropológia: Bulletin Slovenskej antropologickej spoločnosti pri SAV*, 6 (n. s. 1), 190–192.

**TEST MANIPULAČNÍCH FUNKCÍ
VE FYZIOTERAPII POMOCÍ STAVEBNICE
MINISTAV A OVĚŘENÍ JEHO RELIABILITY**
(Souhrn anglického textu)

Hlavním cílem studie bylo ověření reliability nově vytvořeného „testu manipulačních funkcí“ pomocí stavebnice Ministav (TMF), určeného k testování poruch funkcí ruky. TMF zahrnuje celkem 17 subtestů, prováděných pomocí pěti stavebnicových objektů. Test absolvovalo 417 zdravých osob (245 žen, 172 mužů), rozdělených podle věku do čtyř kategorií: děti 9–10leté, dospělí ve věku 20–25 let, dospělí ve věkové kategorii 40–50 let a senioři ve věku nad 65 let. Testované osoby vykonaly celkem 17 subtestů. Provedení každého subtestu spočívalo v 1 zácvičném pokusu a třech měřených pokusech. Měřila se doba trvání každého pokusu. Výsledné skóre tvořil průměr ze tří pokusů. Testovaným kritériem byl dosažený čas.

U všech 4 věkových podskupin i celého souboru byly zjišťovány korelace mezi jednotlivými třemi pokusy u všech 17 subtestů. K posouzení reliability nového testu byl použit Pearsonův korelační koeficient. Byly vypočteny průměrné hodnoty koeficientů reliability pro každý subtest.

Hodnoty koeficientů reliability se pohybují v jednotlivých subtestech u jednotlivých souborů v rozmezí od 0,14 do 0,94. Nejnižší průměrné hodnoty koeficientu reliability dosahuje soubor dětí ($r = 0,54$). Naopak nejvyšších hodnot dosahuje soubor seniorů ($r = 0,82$).

Většina subtestů dosahuje hodnot nad 0,60. Tento nález se shoduje s nálezy jiných testů manuální dovedností.

Výsledky naznačují dobrou reliabilitu testu TMF pro soubory dospělých a seniorů. U těchto věkových skupin po prokázání validity testu bude moci být test TMF využíván v rehabilitační praxi. Subtesty, u kterých nebyla prokázána vyhovující reliabilita, budou z baterie subtestů TMF vyřazeny. Dále budou využívány jako terapeutický nástroj.

Klíčová slova: ruka, zručnost, manipulace, test manipulačních funkcí, reliabilita.

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First-line publications

Vyskotová, J., & Pech, J. (2002). Využití speciální stavebnice k diagnostice a léčbě poruch mozkových funkcí. In J. Riegerová (Ed.), *Diagnostika pohybového systému* (187). Olomouc: Univerzita Palackého.

Vyskotová, J., & Vaverka, F. (2003). Test of manipulation abilities as a means of therapy to tackle insufficient hand functions. In F. Vaverka (Ed.), *Proceedings of the 3rd International conference Movement and Health* (pp. 357–360). Olomouc: Univerzita Palackého.

Vyskotová, J. (2003). The use of the special constructional set to diagnose and treat brain functions disorders and those of the hand. *Slovenská antropológia. Bulletin Slovenskej antropologickej spoločnosti pri SAV*, 6 (n. s. 1), 190–192.

Vyskotová, J., & Kristiníková, J. (2004). Výcvik manipulačních schopností u gerontů v domovech důchodců. *Česká antropologie*, 54, 209–210.