PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Universal test of possibility of action based on motor potential (UTPA-MP) – health and survival applications

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim: The cognitive aim of the paper is the methodological argumentation, showing the UTPA-MP as a basic tool for providing evidence that the physical education paradigm is in many ways counterproductive in the sense of the social responsibility of science to permanently strengthen all dimensions of personal health and safety. Application objective – a perspective on the application of UTPA-MP from the micro-scale to the global dimension of public.

Material and Methods: UTPA-MP, as a compilation of empirically verified non- and quasi-experimental tests in numerous experimental applications, provides knowledge about human motor potential according to uniform evaluation criteria, irrespective of gender. The age limits are conventional – the boundaries of the continuum are only indicatively linked to the start of primary school.

Results: The results of the UTPA-MP provide knowledge of deep sensibility, flexibility, ability to tolerate imbalances, muscle strength of the upper and lower limbs and abdominal muscles, as well as the body's physical capacity (anaerobic and aerobic). Since it lasts about 15-20 minutes it is a sufficient stimulus preparing the body for the continuation of physical effort. The test is a system of specific training sessions and has references to the strengthening of health and survival skills.

Conclusions: Since in the praxeological sense 'dispositional feasibility' – is the strength, intellectual or manipulative ability and knowledge (skill) and willingness sufficient to perform a given action, the interpretation of the results of measuring motor (energy) potential based on UTPA-MP indices goes beyond the paradigm narrowed to the field of physical education and sport.

Keywords: pain, physical education, physical fitness paradigm, preventive medicine

Introduction

The 'physical fitness' paradigm is most strongly associated with physical education [1], sport and recreation [2, 3], but also with military training and security services [4], health related fitness [5, 6], personal training, physiotherapy. Somewhere further down the line are utilitarian motoricity (of everyday activity), industrial motoricity (relating to different jobs), acting motoricity, musical instrumentalists' motoricity [7, 8] etc. The variety of goals and needs pursued in these and many other areas of human activity is only one reason for the multiplicity of synonyms for the phenomenon 'physical fitness'. Even though the common perception of the phenomenon of 'physical fitness' is linked, only partly rightly, to the biological layer of the human personality, this consistency is not apparent either on a semantic or evaluative level (there are few synonyms for the word, so the chance to avoid misunderstandings).

A synthetic exemplification of the meaning of the last sentence is the paradox that 'strength', as a basic component of 'physical fitness', is measured in metres and centimetres, in the number of repetitions of a diagnostic exercise, in the indicators used in physics, etc. Meanwhile, the term 'strength', in some natural languages combined with various adjectives, effectively clarifies the terminology of even distant scientific disciplines and organises colloquial communication (moral strength, strength of character, strength of personality, strength of influence, strength of argument, etc.). It matters little that 'strength' is replaced by numerous synonyms.

Since the vast majority of human activity involves physical engagement, but not necessarily every time using all somatic (upper and lower limbs, etc.) and energetic resources to the point of subjective exhaustion, and since all activity is impossible outside of time, it is these general premises that are the primary impetus to, first and foremost, challenge the 'physical fitness' paradigm as we know it.

The second group of rationales relates to responsibility for one's own health, the health of those with whom the individual has a legal caring relationship, for survival, and for the quality of the environment (not only the environmental aspect, but also the impact on social health).

doi:10.15561/20755279.2024.0604

This simplified line of reasoning is, in our opinion, sufficient to formulate the elementary assumption that, in place of the 'physical fitness' paradigm, we are proposing an evidence-based model (as a basic tool of preventive medicine) [9, 10, 11] that can be implemented in any activity that can be quantified and modified for desired purposes. This evidence, on the one hand, is synthesised scientific knowledge. On the other, our own innovations, repeatedly verified in many of the areas of practice we highlighted in the first paragraph.

Material and Methods

Methodological background

Praxeology – a forgotten science – is recognized as a methodology proper by the prominent leaders and continuators of The Lwów–Warsaw School (an interdisciplinary school mainly philosophy, logic and psychology) [12]. Praxeology is the science of the effective attainment of the goals of all physical and mental work, and therefore provides concepts at the highest possible level of generality [13, 14]. Thus, a concept with a higher level of generality than 'physical fitness' and its synonym is 'possibility of action' in the sense just understood in praxeology. 'Possibility of action' is still understood in the logical and evaluative sense (refer to the encyclopaedia of praxeology) [14].

Physical fitness is a concept that falls into two praxeological categories that complement the meaning of the term 'possibility of action': a) dispositional feasibility – the strength, intellectual or manipulative prowess, knowledge (skill) and willingness sufficient to perform a given action; b) situational actionability means that the performance of a given action under certain circumstances is not thwarted by those very circumstances [13, 14].

The term 'strength' here is neither synonymous with physical fitness nor identical with the basic component of this phenomenon 'muscle power' (at the same time, this is an example of the use of the synonym 'strength').

Terminological differences (although often the same phenomenon) arise within the practices and sciences exploring selected human activities. The specific disciplines of sport science provide knowledge of 'general physical fitness' and 'special physical fitness' (abstracting from the more in-depth classifications) [15]. These two manifestations of physical fitness remain in relations of identification with 'dispositional feasibility' and 'situational actionability', from the preparation stage (exercises, training) and sports combat to macro-level competition (Olympic Game and world game). It is sport, with its strengths in motor diversity and attractiveness, as well as the possibility of repeatedly verifying the relationship of congruence between 'dispositional feasibility' and 'situational actionability', that is the area most rich in possible evidence-based analyses and syntheses.

A certain analogy applies to the field of instrumental music. However, it is not only the frequency, especially of piano and violin competitions of global prestige, that gives way to the activity associated with sport, descending all the way to the micro level. There is disproportionately less scientific knowledge concerning the motoricity of musicians [7, 8]. The perception of this knowledge by motor learning and performance experts is hindered by the language of methodological publications [16, 17, 18, 19].

Transferring the argument to the field of professional activity, in which motor potential is a leading factor or equivalent to intellectual commitment, epidemiological indicators can – paradoxically – be considered the simplest performance criterion. The lower the scale of failures with fatal and health consequences, the higher the quality of selection for the profession and preparation methods (influencing 'dispositional feasibility' and 'situational actionability'). Regardless of the scale of successes and failures, the barriers to communication between professionals (both educators and researchers) of these more or less distant areas of activity are the different languages with which they describe the motor sphere. However, it is not only language that is a significant factor in many absurdities.

The logical contradiction of the recommended physical fitness test with the practice of motor responses in a certain class of everyday circumstances

Every known test is preceded by a warm up [20, 21, 22, 23]. This is precisely one of the most controversial adaptive effects of transferring to physical education and recreational activities the patterns that work in sport. There, extreme training effort and competition effort take place. Meanwhile, there are three extreme circumstances, pervading daily human activity *en block*, that require an immediate motor response. To survive, minimise, or avoid injury, there is no time to warm up. These include: an unintentional fall [24, 25]; physical aggression directed at the individual [26, 27, 28]. In such circumstances, however, the individual does not have full (complete) 'dispositional feasibility' and 'situational actionability'. Admittedly, although the individual can professionally cushion a fall, is familiar with techniques for avoiding collision with an object in motion and has many years of hand-to-hand-combat practice, he or she may for some reason consciously fail to make an adequate motor response – the example of a determined suicide who lacks the courage for this ultimate act is imposed. In any other internal circumstances (state of the psyche), a person threatened by the aforementioned events cannot postpone the motor response if he wants to avoid the aforementioned consequences as well [29].

However, in order to base warm up on safe fall exercises (techniques), avoiding collision and hand-to-hand combat (self-defence) it is necessary to bring about such motor competences (motor skills) as early as possible in ontogeny. Preferably before the child starts school [10, 30, 31]. Schools do not teach this, because – sarcastically – physical education is generally a giant sports club that injects students with a more or less diverse range of sports techniques [9, 11].

The obvious rationale that in a certain class of circumstances, when an individual's vertical posture is stable, an intentional controlled fall can prevent a collision with an object in motion – if only with the limb of an aggressor who prefers to strike. So there is no need to repeat warm up patterns from sport, some of which favour vertical stability, others enhance activity in a safe horizontal stance.

Since almost every child by the time he or she reaches the age of three is able to collide safely with the ground due to a loss of balance – starting with the first attempts to adopt a vertical stance – this ability must be wisely maintained for the rest of his or her life. This is facilitated by fun forms fall and fun forms of combat [32], the effectiveness of which has been repeatedly verified by the experts of the 'Polish School of Safe Falling' [33]. It is also a way of stimulating the child's cognitive sphere early and attractively.

A pictorial exemplification of the veracity of these assumptions is a sequence attributed to one of the leaders of medieval ju-jitsu, the Nagasaki physician Shirobei Akiyama Yoshitoki: 'the storm breaks the oaks, but the reeds only sway'; to him the first ju-jitsu principle 'give way to win'.

So far, neither the collapse, which is an empirical obviousness available to everyone, nor the medieval discoveries of the Nagasaki doctor, nor praxeology (a methodology appropriate for the efficient achievement of cognitive goals and meaningful implementations of knowledge of value in numerous areas of practice) have disturbed the paradigms of physical fitness and physical education.

UTPA-MP structure, general justifications, evaluation, preliminary interpretations

Intimate sphere

If more than one person is being investigated, the measurement of motivation and perceived pain, but also the determination of the causes of the pulse rate, should be done in a way that ensures that the principles of the GDPR are respected.

The test is preceded by a determination of the motivation for effort (willingness sufficient to perform a given action). The easiest way to do this is to have the test subject point with a gesture to a number between 1 and 10, which should be written down in arbitrary places on a piece of paper beforehand (changing the spacing of the numbers in successive tests counteracts routine). Any change in motivation before any of the trials is signalled by raising the fingers (fingertip) in a number appropriate to the subjective feeling – up (increased motivation) or down (vice versa); zero indicates a refusal of effort. The person must be informed of these possibilities before starting the exercise and also that motivation can be asked by the researcher at any time. The results should be recorded on the UTPA-MP card in the 'motivation' section, in the box confirming the moment of measurement (e.g. trial 3, i.e. before performing the 'Rotational Test – RT').

It is best to measure of the heart rate (HR) using easily accessible technological offers or by palpation. If by palpation, measure HR before exercise for one minute. During exercise, we recommend a six-second measurement [34] immediately after performing the diagnostic exercise. Enter the result multiplied by 10 in the HR section in the cart 'EVALUATION OF THE POSIBILLITY OF ACTION – based on motor potential'.

The HR measurements taken are sufficient to make the interpretations recommended by physiology, medicine and ergonomics [35, 36, 37]. In this simple indicator of the 'HR of work' – during UTPA-MP (HR difference = test HR – HR before test).

We recommend monitoring pain using the Visual Analogue Scale (VAS) from 0 to 10: 0 means no pain; mild pain is rated with points 1, 2, 3; moderate pain with points 4, 5, 6, 7; severe pain 8, 9, 10 (10 - the strongest the person can imagine). Especially when testing children, you can use the VAS in the drawing version [38].

Measuring components of motor potential (MP) with use non-apparatus and quasi-apparatus tests

Deep sensibility

The result is a conjunction of four specific 'diagnostic exercises' (Trials 1, 4, 5, 11).

Trials 1 and 11 – 'lying forward on the ball' (rehabilitation ball up to 80 cm in diameter, darkened goggles, stopwatch; the person tries to lie forward on the ball for as long as possible without contact with the ground by any limb; The longest time from three repetitions of the exercise with open eyes (tOE; Photo 1 and identically with covered eyes (tCE; Photo 2) is taken into account; the result is calculated from the formula (tOE + tCE) : 2 : 15 × 100.

Trial 3 – 'feeling of the dominant hand' (this is one possible version of measuring the phenomenon of the ability to optimally use muscle strength – AUOMS.

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'Diagnostic Exercise Arrangement': '2 × 160 UMS' (UMS – used muscle force). Assumption of this model

is to use 160% of muscle force twice each: three times with OE, three times CE (6 exercises in total) in an order known only to the examiner, alternating OE, CE. We recommend the order of throws from UMS: 50%; **25%**; 75%; **50%**; 35%; **85%**; three times 100% (**bold** CE). Estimation of maximum force is based on performing the last three throws with OE with a sense of the greatest energy exposure, with the longest is the 100% criterion.

Motor criteria: baseball throws from a relatively isolated standing posture (heels, buttocks and back pressed against the wall), the V finger of the hand that holds the ball must adhere to the chin, and the forearm parallel to the ground). The quality of isolated posture is controlled in such a way that the tested person must to press 4 sheets of paper against the wall with the muscles of the back and buttocks (Photo 3). The attempt is considered valid if the card or cards did not fall during the throw of the baseball. The throw distance is determined using a measuring tape with an accuracy of 1 cm (measuring from the wall to the central point of contact between the baseball and the ground).

The consequence of missing even one piece of paper three times conventionally means a throw with a 15% error (six times such a result means a 90% errors). The inability to also maximally expose the UMS in an error-free manner means a score of 99. If this is the only time, the longest score of the six preceding test throws is considered 100%. The results of the throws are documented on the card 'The ability to optimally use the muscle strength AOUMS'. In case of a deficiency in the strength used, insert the mathematical symbol 'minus' (without space) after the number indicating this result. Document each instance of a piece(s) of paper falling short three times with the symbol ∓. Final calculations are made without these symbols and '+' and/or '–'. The index is calculated from the formula 100 – (OE + CE).

Trial 5 – 'feeling of the legs '.

Procedures and model analogous to Trial 4, and the results of the jumps are documented at the bottom of the card 'The ability to optimally use the muscle strength AOUMS'. A method of the long jump from standing position'.

After making a jump in front of a fixed line, the test subject turns on the heel of the foot closer to the starting line (Photo 4ab), and the measure of distance is the number of feet (Photo 4c). If the last foot either crosses the starting line or does not make contact with it (Photo 4d), the distance should be subjectively estimated to the nearest 0.1 of the length of that foot (Photo 4e); the raw result should be recorded, e.g. 6.4.

Flexibility

Photo 1. Lying forward on the ball OE.

Photo 2. Lying forward on the ball CE

Photo 3. Posture standing before baseball throws (without and with goggles) and version sitting on a chair (next to the kilogram weight, used in both forms can replace the baseball).

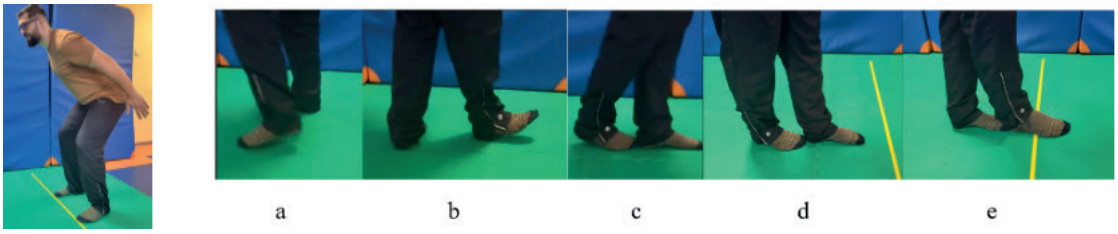

Photo 4. Starting posture during trial 'long jump from standing position' and stages of measuring stroke length

Trial 2 – bend (measurement of the flexibility of lower spinal region and hamstrings: *non-apparatus flexibility test)* [39].

Motor criteria: sit in a straddle position (with legs apart for a foot length) so that the heels are adjacent to the previously determined line i.e. linking tuber calcanei of both feet. Put one hand in the middle of the knees with fingers directed towards the feet and the second one place from the top. Hands joined in his way press lightly down to the ground. Straighten the legs in knee joints and slowly do a forward bend moving the hand on the ground to the area in which you will be able to hold them for 2 seconds tolerating negative feelings generated by the extension of the body (Photo 5a). Without changing the position of the hand bend your knees, sit back and estimate the result.

Assessment method: if the end of distal phalanx of the middle finger (dactylion III) coincides with the determined line, then so-called raw result equals '0' (60 evaluation points – see Table 1). The width of one finger represents 2 evaluation points. Example Photo 5b and 5c means raw score '5–', and decomposition into 50 evaluation points ('sufficient level' of this component of motor potential – it is identified with somatic health and the chance of survival). A decomposition of raw scores into diagnostic points is provided in Table 1.

Trial 3 – 'body balance disturbation tolerance skills (BBDTS)' – measured with a 'Rotational Test' ('RT') in non-apparatus and quasi-apparatus version.

Motor and evaluation criteria (Photo 6): in evaluation criterion is the result in points indicating the number of errors made. 'RT' consists of six tasks (consecutive jumps with body rotation of 360° alternately to the right and to the left). The overall result (motoric aspect) is the sum of the six tasks and includes 0 to 18 stipulated points. Criteria of an individual level of BBDTS are as follows: very high (0-1), high (2-3), average (4-9), low (10-12), very low (13-15), insufficient (16-18). The 'quasi-apparatus' version takes into account execution time 'RT' (this is an additional qualitative criterion).

Trial 6 – 'leg strength' (the longest jump during Trial 5).

Trial 7 – 'arm strength' (the measurement is a compilation of overhangs and pull-ups within 100 seconds).

The stopwatch is activated when the person performs an overhang on the bar (Photo 7a). If they are unable to pull-up, the measure of the arm strength is the overhang time, however, only a time of 100 seconds indicates a score of 49. The equivalent of any overhang up to 48 seconds is equivalent points (1 second = 1 point). If, at any point during the overhang, one pulls up just once so that the chin reaches the height of the bar (Photo 7b), but without assisting the movement with balancing the legs and/or torso, this means a score of 50 points (regardless of how long the overhang lasted). Continuing the overhang for up to 70 seconds increases the score to 59 points. With two pull-ups, regardless of the duration of the overhang, the score means 60 points. Similarly, continuing the overhang to 60 seconds increases the score to 69 points. The required maximum number of pull-ups is 5 and means a score of 90 points. Continuing the overhang up to 30 seconds means a score of 100 points. Table 1 details the decomposition of the observations into points.

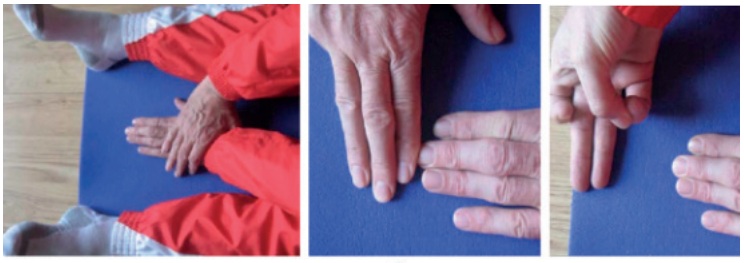

Photo 5. Example of measured flexibility: a) results below the determined line – first stage; b) initiation of detailed measurement – from dactylion III to determined line; c) continuation of the detailed measurement – in this example the raw score fingers '5–'.

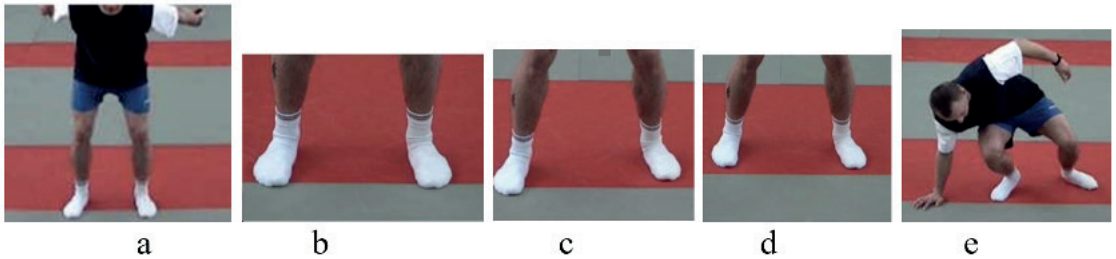

Photo 6. 'RT' starting position (a) and evaluation criteria: b) no error 0 points; c) 1 penalty point; d) 2 -points; e) 3 -points.

Table 1. The ability to optimally use the muscle strength AOUMS

Model of 3 diagnostic throws (sum of 160% UMS) alternately open (OE) and covered eyes (CE)										Only 50% OE & CE are mandatory and only 100% OE
Results	OE	***CE***	*OE*	**CE**	OE	**CE**	open eyes			
	50	*25*	*75*	**50**	*35*	*85*	**100**	**100**	**100**	
	raw results (cm) and verified against the model (%)									
Cm										
%							**sum of throws results ►**			

Profile deep sensibility dominant hand [accuracy in %] **Index DS hand(d)**											
Criteria for three ranges of use of muscle strength (UMS)	open eyes (OE)					covered eyes (CE)					**Mathematical calculations**
	the range of UMS [%]					the range of UMS [%]					differences % 'model ↔ execution' in the score lines 0.00 to <5 are insignificant
	comparison		difference model ↔ execution			Comparison		difference model ↔ execution			
	model	execution	+	–	0 or **	model	execution	+	–	0 or **	**OE** **CE**
5 to 45%	35					25					
50%	**50**					**50**					
55 to 95%	75					85					
Sum	**160**					**160**					
Mathematical calculation	difference*		∑ % without symbols			difference*		∑ % without symbols			**Index DS hand(d)** 100 – (OE + CE)

*put '+' *or* '–' after the result; ** equivalent 15 points (the symbol means that the sheets of paper fell three times)

Trial 5 – 'feeling of the legs' (long jump from standing position)

Model of 3 diagnostic jumps (sum of 160% UMS) alternately open (OE) and covered eyes (CE										Only 50% OE & CE are mandatory and only 100% OE
Results	OE	***CE***	*OE*	**CE**	OE	**CE**	open eyes			
	50	*25*	*75*	**50**	*35*	*85*	**100**	**100**	**100**	
	raw results (number of foots) and verified against the model (%)									
number of foots										
%							**sum of throws results ►**			

Profile deep sensibility legs [accuracy in %] **– Index DS legs**											
Criteria for three ranges of use of muscle strength (UMS)	open eyes (OE)					covered eyes (CE)					**Mathematical calculations**
	the range of UMS [%]					the range of UMS [%]					differences % 'model ↔ execution' in the score lines 0.00 to <5 are insignificant
	comparison		difference model ↔ execution			Comparison		difference model ↔ execution			
	model	execution	+	–	0	model	execution	+	–	0	**OE** **CE**
5 to 45%	35					25					

Table 1. (Continued)

50%	**50**		**50**		
55 to 95%	75		85		
Sum	**160**		**160**		
Mathematical calculation	difference*	∑ % without symbols	difference*	∑ % without symbols	**Index DS legs** 100 – (OE + CE)

*put „+" *or* „–" after the result;

a b

Photo 7. Overhang on the bar: a) it is necessary to bend the legs at the knees to avoid contact of the feet with the ground; b) pull-up counted when the chin reaches the height of the bar.

Photo 8. How to perform trial 8.

Photo 9. How to perform trial 9.

Trial 8 – 'the abdominal muscle strength' (the measure is the time to continue transverse flutter kicks: 1 second = 1 point).

Lying on the back, arms crossed on the chest, legs with minimal bending at the knees raised to 20 cm above the ground. In this position, continue to alternate crossing the legs after opening them as wide as possible (Photo 8).

Trial 9 – 'anaerobic capacity' (Burpee Test 100 seconds version).

Within 100 seconds, repeat the exercise 'from standing to lying forward, rise and clap' (Photo 9). The decomposition of the number of exercises is based on a calculation of 1 cycle in 3 seconds.

Trial 10 – 'aerobic capacity' (measure of aerobic capacity is the 'collective test' score calculated from the formula: $(D_2 + D_3 + E) : 3$. Where: D_2 arm strength; D_3 abdominal muscle strength; E anaerobic capacity. Details in the cart 'EVALUATION OF THE POSIBILLITY OF ACTION – based on motor potential'.

This card also documents the observational data for calculating the motor potential (MP). Index MP = (A + B+ C+ D + E + F) : 6. Where: A *deep sensibility;*

B *flexibility;* C *body balance disturbation tolerance skills*; D *muscle strength*; E *anaerobic capacity*. *F aerobic capacity*. Details in the cart 'EVALUATION OF THE POSIBILLITY OF ACTION – based on motor potential'.

The ability to optimally use the muscle strength AOUMS

Trial 4 – 'feeling of the dominant hand' (baseball throws).

Results

Possibilities and limits of interpretation of evaluation

The measurements made in the course of the UTPA-MP provide knowledge of those dispositional feasibility (DF) definition variables associated with the symbolic term 'strength' and willingness sufficient to perform a given action (Index M).

General knowledge of the variable 'strength', although narrowed down to an individual's motor potential (MP), is only partly provided by Index MP. This knowledge is supplemented by Index P (subjective sense of pain), but only after simple mathematical transformations, as Index CS (chance to survival). Index P = 0, when transformed, is the inverse of Index CS and is '1' (equivalent 100 points/percent). Thus, when P = 0.3, CS = 0.7, while the two indices are equal only at a value of 0.5. The task is not feasible if Index CS = 0.

Thus, 'strength' narrowed down to circumstances when the action requires primarily physical effort is a conjunction of indicators of motor potential and chance to survival (MP ^ CS). If a person has to do simple garden work or clean a large flat, it is obvious that all motor potential is involved, with selective exposure of muscular strength, flexibility, ability to tolerate body imbalances etc. during specific tasks. Both jobs are efforts of extended duration (exceeding at least one hour). The factors that can change significantly during these efforts are, on the one hand, mental (concerning willingness sufficient to perform a given action – its continuation), and, on the other hand – health-related. The health factor has a stronger relationship with either the biological layer of the system, or the mental (psychological) layer, or with both in a relatively balanced way. Since the above-mentioned activities do not require specialised knowledge and skills. The DF index should be calculated from the formula:

$$\text{Index DF} = [((MP+CS)\times M)]^{-1/2}$$

After substituting the values of the indicators monitored in the 'EVALUATION ...' cart (and converting P to CS)

$$\text{Index DF} = [((70+70)\times 50)]^{-1/2} = 83.67$$

That is, the probability of the effect of an individual's effort would have to be estimated at around 84%, with 70% confidence that health and life are not at risk.

If motivation is increased by 10% during exercise, then, with an unchanged sense of pain, the Index DF will increase to 91.65. An approximate 8% increase in exercise efficiency can be expected. If further monitoring of effort by this method shows that motivation is maintained at 60%, but subjective sense of pain has increased by a factor of two, then when these values are substituted (after P-transformation) into the formula the result will not only indicate a reduction in predicted performance to 74.16%. It would be unacceptable from the perspective of respecting ethical criteria to continue the effort with only 40% certainty that no negative health effects would occur.

In other circumstances, preferably when Index CS = 100 and is based on even more demanding criteria for estimating health status and exercise-related risk, repeating the UTPA-MP would be advisable. This is not only for cognitive purposes for the sake of expanding scientific knowledge. Tracking the indicators necessary to determine the dispositional feasibility of a specific individual is important in a preventive and therapeutic sense. Moreover, it is an important element for predicting training effects in the emergency services, the military, the police, etc., but also for selecting suitable individuals for task forces of ad hoc rescue or other interventions.

Discussion

The mathematical simulations that conclude the 'results' section highlight the cognitive and application advantages of using UTPA-MP. The most similarities of measuring motor potential either within the possibility of action model or the physical fitness paradigm relate to diagnostic exercises. We emphasise their similarity, as none are used identically to the recommended *physical fitness tests*. Even more so, the evaluative criteria for observational results are different.

The main difference is that the UTPA-MP combines indicators of motor potential with indicators of the mental sphere (motivation) as well as health status – simple indicators of HR and subjective sense of pain and location are of great preventive value. The method of monitoring HR and pain before and during test exercise meets the criteria for early warning of possible injury.

The universal praxeological definition of the phenomenon of possibility of action takes into account an elementary component, without which any conscious act would be impossible – motivation (called by Kotarbiński in ornate Polish: willingness sufficient to perform a given action). Thus, an elementary question arises as to whether

the rates of diagnosed motor potential at possibly distant motivations (e.g. range ⩾50%) will also vary significantly. There is no certainty that a multiplication of motivation (assuming that the declaration is consistent with the internal state of the examined person) will mean an enlargement of the Index MP or even one component. It may even be the other way around – a reduction in the Index MP, and there may be many reasons for this (e.g. chronic overtraining, illness, injury concealed from the researcher).

The implications related to this question are important not only for intellectual appeal. If motivation does indeed significantly influence the disclosure of motor potential, another question remains unanswered: what level of motivation corresponds to the *physical fitness* results published to date, especially the cross-sectional ones.

This is not to depreciate the cognitive value of such knowledge. Since cross-sectional studies, repeated in cycles of many years, use an identical *physical fitness test,* but do not include a procedure for estimating motivation, this factor must have similarly influenced the average result of repeated studies. Therefore, the cognitive value of studies of positive health of Polish children and youth within the last 2 decades of the 20th century, documented results of International Physical Fitness Test and Cooper Test [40].

Knowledge of the relationship of revealed motor potential to motivation and vice versa (after all, the inability to perform one diagnostic exercise may even result in a refusal to continue) is useful during the aforementioned procedure of selecting individuals for intervention groups and other special tasks.

We recommend one of the most valuable empirical systems for studying this phenomenon. Testing fights in a vertical posture' (TFVP) based on a safe form of sumo, where the winner is the one who first pushes a competitor outside the circle four times or makes them touch the ground within the circle with a body part other than their feet [41, 42]. The four-person group of people combats (GPC) ensures that it is impossible for all participants to tie, in the sense that everyone fights three TFVPs each, so only one can win all and one can lose all [27]. The dynamic rotation of fighting pairs and experiencing after each TFVP the feeling of either 'being a winner' or 'being defeated' – alternating or monotonous – are factors with as yet unknown effects on motivation for the next TFVP. Preceding the TFVP cycle with the use of UTPA-MP and repeating it afterwards will complete the knowledge of the possible interpenetration of the mentioned phenomena and facilitate the discovery of possible regularities.

All diagnostic tools applied in a set sequence with continuous monitoring of HR and P (pain) indices have the unique advantage of reducing the likelihood of injury and overload if continued exertion is stopped in time. Repeated UTPA-MP according to an established algorithm can, over time, develop into a habit of self-monitoring effort during daily physical activity. Correctly performed UTPA-MP lasts about 15-20 minutes, so it can be used even several times a day, as a kind of training session system aimed at strengthening health and survival abilities in critical circumstances. It is important that the procedure for monitoring HR and P ratios is followed, even if for some reason one of the diagnostic exercises is omitted or swapped for another.

Another advantage of half diagnostic exercises is their survival utility. The ability to 'feel the legs' and to be aware of the performance capabilities of the lower limbs in extreme circumstances of their use, precisely in a test-like manner, may prove to be the only way to leave a place of mortal danger. The need to land on a small surface makes the test situation similar during the 'Rotational Test' and highlights the diagnostic value of measuring 'RT' execution time – although this is 'only' an auxiliary evaluative indicator [43]. The extremity of such a sequence of activities, which are not just a figment of the imagination, is compounded by both time pressure and stress. Repeating the UTPA-MP multiple times is therefore a simple method of motor and mental preparation for such and similar circumstances.

The task of educators and authors of publications promoting UTPA-MP is to raise awareness that the outcome of the seemingly trivial 'bent arm hang' diagnostic exercise is of paramount importance for estimating survival competence in the sense of rescue motor skills. It is about increasing the ability to extend the time of the bent arm hang to sufficiently long to leave a threatened area using mountaineering techniques. Evaluation criteria at 49 points document a bent arm hang for 100 seconds.

The Burpee Test score, in addition to being a reliable measure of anaerobic capacity, is linked to predicting the chances of survival after a fall. A number of studies show that 40% of older people who have fallen, although uninjured, are unable to get up on their own. Waiting a long time for help while lying on the ground or floor, causes a number of complications (hypothermia, pneumonia, etc.). One of the main factors increasing mortality after a fall is remaining in a horizontal position for at least 1 hour [44]. Of these people, 1% fail to cope with such stress and die.

The above simulations and comments stimulate the imagination. The authors of the 'physiotherapist in every school' project [9] are right when they emphasise that the physical education paradigm is counter-productive when it draws on more than just the motor patterns of sport. Not only

are injuries and even death calculated into sport, which is a voluntary activity, but this culturally important area of human activity is permeated by a mentality of admiration for the winners and contempt for the losers. The declarative association of the purpose of sport with health, is a blatant denial of reality, but an important indicator from the perspective of estimating social health. Since PE is legally compulsory, so the current PE paradigm is unacceptable in any rational society. The recommended UTPA-MP is therefore first and foremost a tool for elementary health prevention focused on functional motor skills and personal safety. It thus transcends both the physical education paradigm and the physical fitness paradigm. It is a simple, safe tool. With a little imagination possible in a home environment, but optimal motivation is needed. UTPA-MP is therefore a low-cost offer to invest in people from the ground up. That is, in the one good that – as Fritjof Capra [45] noted – we have in abundance. The sample forms for conducting the AOUMS test and the conversion table for the obtained results are placed at the end of the publication (attachment 1, 2, 3).

Conclusions

Since in the praxeological sense (i.e. methodology proper) 'dispositional feasibility' – is the strength, intellectual or manipulative ability and knowledge (skill) and willingness sufficient to perform a given action, the interpretation of the results of measuring motor (energy) potential based on UTPA-MP indices goes beyond the paradigm narrowed to the field of physical education and sport.

Acknowledgements

The authors are grateful to Bartłomiej Gąsienica Walczak PhD for lending his image during the demonstration of the diagnostic exercises.

Funding

The authors declare that a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors has not been used for this project.

Conflicts of interest

The authors declare no conflicts of interest.

Attachment 1 The ability to optimally use the muscle strength AOUMS

A) Trial 4 – 'feeling of the dominant hand'

baseball throws from standing (*siting – option*) posture: **dominant hand** (*non dominant – option*)

Person code ..... place ..... date ..... time: from ..... to .....

Model of 3 diagnostic throws (sum of 160% UMS) alternately open (OE) and covered eyes (CE)										Only 50% OE & CE are mandatory and only 100% OE
Results	OE	***CE***	*OE*	**CE**	OE	**CE**	open eyes			
	50	*25*	*75*	**50**	*35*	*85*	**100**	**100**	**100**	
	raw results (cm) and verified against the model (%)									
cm										
%							**sum of throws results**		>	

Profile deep sensibility dominant hand [accuracy in %] **Index DS hand(d)**											**Mathematical calculations**	
Criteria for three ranges of use of muscle strength (UMS)	open eyes (OE)					covered eyes (CE)						
	the range of UMS [%]					the range of UMS [%]					differences % 'model - execution' in the score lines 0.00 to <5 are insignificant	
	comparison		difference model - execution			comparison		difference model - execution				
	model	execution	+	-	0 or ±**	model	execution	+	-	0 or ± **	**OE**	**CE**
5 to 45%	35					25						
50%	**50**					**50**						
55 to 95%	75					85						
Sum	**160**					**160**					**Index DS hand(d)** 100 – (OE + CE)	
Mathematical calculations	difference*		Σ % without symbols			difference*		Σ % without symbols				

*put '+' *or* '- ' after the result; ** equivalent 15 points (the symbol means that the sheets of paper fell three times)

Attachment 1. (Continued)

B) Trial 5 – 'feeling of the legs'

Model of 3 diagnostic jumps (sum of 160% UMS) alternately open (OE) and covered eyes (CE										Only 50% OE & CE are mandatory and only 100% OE
Results	OE	*CE*	*OE*	**CE**	OE	**CE**	open eyes			
	50	*25*	*75*	**50**	*35*	*85*	**100**	**100**	**100**	
	raw results (number of foots) and verified against the model (%)									
number of foots										
%							**sum of throws results**		>	

Profile deep sensibility legs [accuracy in %] – **Index DS legs**												
Criteria for three ranges of use of muscle strength (UMS)	open eyes (OE)					covered eyes (CE)					**Mathematical calculations**	
	the range of UMS [%]					the range of UMS [%]					differences % 'model - execution' in the score lines 0.00 to <5 are insignificant	
	comparison		difference model - execution			comparison		difference model - execution				
	model	execution	+	-	0	model	execution	+	-	0	**OE**	**CE**
5 to 45%	35					25						
50%	**50**					**50**						
55 to 95%	75					85						
Sum	**160**					**160**					**Index DS legs** 100 – (OE + CE)	
Mathematical calculations	difference*		Σ % without symbols			difference*		Σ % without symbols				
*put „+" *or* „- " after the result;												

Attachment 2 EVALUATION OF THE POSIBILLITY OF ACTION – based on motor potential

Person (code) ..... F/M (circle) height (cm)..... weight (kg) ..... BMI..... age.....

Date ..... time: start ..... end..... /safe HR/ **HRmax = 208 – (0.7 × age)** .....

Sequence and name of the test (diagnostic exercise)		**Motor potential (MP) component**	**Raw score**		**Pts**	**Combined MP indicators**	
			time (s)	**n**		**A**	deep sensibility $(A_1+ A_2+A_3+A_4) : 4$
1	lying forward on the ball	deep sensibility before effort (tOE + tCE) : 2 : 15 × 100				< A_1	
2	bend	flexibility	-			**< B**	flexibility
3	Rotational Test	Body balance disturbation tolerance skills (BBDTS)				**< C**	BBDTS
4	AOUMS upper limbs	feeling of the dominant hand	-			< A_2	component A
5	AOUMS lower limbs	feeling of the legs	-			< A_3	component A
6	long jump from standing position	legs strength	-			< D_1	**D** muscle strength $(D_1+D_2+D_3) : 3$
7	overhangs/pull-ups 100s	arm strength				< D_2	
8	transverse flutter kicks 100s	abdominal muscle strength		-		< D_3	
9	Burpee Test 100s	anaerobic capacity				**< E**	anaerobic capacity
10	'collective test'	aerobic capacity	$(D_2+D_3+E) : 3$			**< F**	aerobic capacity
11	lying forward on the ball post exercise	deep sensibility after a series of physical exertions (tOE + tCE) : 2 : 15 × 100				< A_4	component A

Attachment 2. (Continued)

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Graphic profiles: MP ;M ; test HR ;P											Health indicators and survival capacity		
Points	Sequence of diagnostic tests and exercises												
	1	2	3	4	5	6	7	8	9	10	points	grade	Index MP
100											⩾96	EXCELLENT	
95											86-95	astonishing	
90													
85											76-85	master	
80													
75											66-75	very good	
70													
65											56-65	good	
60													
55											46-55	sufficient	
50													
45													
40											30-45	acceptable	
35													
30													
25											20-29	alarming	
20													
15											10-19	high risk	
10													
5													
0											0-9	risk	
test >	1	2	3	4	5	6	7	8	9	10	general indicators		
motivation (M) for effort on a scale from 1 to 10 (in profile × 10)										average	Index M (willingness to act)		
before>													
before˅	and after each HR test (in profile: % safe HR)									tests	HR difference = test HR – HR before test		
after ˅	pain (P) on a scale from 1 to 10 (in profile × 10) of body parts									average	< Index P (subjective sense of pain)		
										body part<	Index MP = $\frac{A+B+C+D+E+F}{6}$		

Attachment 3 Decomposition of UTPA-MP diagnostic test and exercise scores into evaluation points (trial scores 1, 4, 5. 11 are 'deep sensibility' A components, while time of trial 8 in seconds is the same as the scores; trial 10 is 'collective test': average score trial 7, 8, 9).

Points & seconds equivalent	Trial						Points & seconds equivalent	Trial				
	2	3	6	7a	7b	9		2	3	6	7	9
	bend	'RT'	long jump	over hangs	pull-ups	Burpee 100s		bend	'RT'	long jump	over hangs	Burpee 100s
	finger	error	foot	second	number	number		finger	error	foot	second	number
100	18	0	10	30	time limit overhangs to increase the score to 100 points	34		points limit for overhangs				
99			9.9	29			49			4.9	100	
98			9.8	28		33	48	6-		4.8	48	17
97			9.7	27			47			4.7	47	
96			9.6	26			46	7-		4.6	46	
95	17		9.5	25			45			4.5	45	16
94		1	9.4	24		32	44	8-	10	4.4	44	
93			9.3	23			43			4.3	43	
92	16		9.2	22			42	9-		4.2	42	14
91			9.1	21			41			4.1	41	
90	15		9		5	31	**40**	10-		4	40	

Attachment 3. (Continued)

89		2	8.9	40	time limit overhangs to increase the score to 89 points		39		11	3.9	39	13
88	14		8.8	39			38	11-		3.8	38	
87			8.7	38		30	37			3.7	37	
86	13		8.6	37			36	12-		3.6	36	12
85			8.5	36			35			3.5	35	
84	12		8.4	35		29	34	13-		3.4	34	
83		3	8.3	34			33		12	3.3	33	11
82	11		8.2	33			32	14-		3.2	32	
81			8.1	32		28	31			3.1	31	
80	10		8		4		**30**	15-		3	30	10
79			7.9	59	time limit overhangs to increase the score to 79 points		29			2.9	29	
78	9	4	7.8	49		27	28	16-	13	2.8	28	
77			7.7	48			27			2.7	27	9
76	8		7.6	47			26	17-		2.6	26	
75			7.5	46		26	25			2,5	25	
74	7		7.4	45			24	18-		2.4	24	8
73			7.3	44			23			2.3	23	
72	6	5	7.2	43		25	22	19-	14	2.2	22	
71			7.1	42			21			2.1	21	7
70	5		7		3		**20**	20-		2	20	
69			6.9	60	time limit overhangs to increase the score to 69 points	24	19			1.9	19	
68	4		6.8	59			18	21-		1.8	18	6
67		6	6.7	58			17		15	1.7	17	
66	3		6.6	57		23	16	22-		1.6	16	
65			6.5	56			15			1.5	15	5
64	2		6.4	55			14	23-		1.4	14	
63			6.3	54		22	13			1.3	13	
62	1		6.2	53			12	24-		1.2	12	4
61		7	6.1	52			11		16	1.1	11	
60	0		6		2	21	**10**	25-		1	10	
59			5.9	70	time limit overhangs to increase the score to 59 points		9			0.9	9	3
58	1-		5.8	69			8	26-		0.8	8	
57			5.7	68		20	7			0.7	7	
56	2-	8	5.6	67			6	27-	17	0.6	6	2
55			5.5	66			5			0.5	5	
54	3-		5.4	65		19	4	28-		0.4	4	
53			5.3	64			3			0.3	3	1
52	4-		5.2	63			2	29-		0.2	2	
51			5.1	62		18	1			0.1	1	
50	5-	9	5		1		**0**	0	18	0	0	0

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Cite this article as:
Kalina A, Kalina RM, Kruszewski A, Kruszewski M. Universal Test of Possibility of Action Based on Motor Potential (UTPA-MP) – Health and Survival Applications. *Physical Education of Students,* 2024;28(6):346–361. https://doi.org/10.15561/20755279.2024.0604

Received: 20.10.2024

Accepted: 26.11.2024; Published: 30.12.2024