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## **The Computer Test Measuring Vocational Interests (CTMVI) of people with intellectual disabilities: method development**

### **Streszczenie**

Komputerowy Test Zainteresowań Zawodowych (CTMVI) dla osób niepełnosprawnych intelektualnie

Niedobór narzędzi psychometrycznych dla osób niepełnosprawnych intelektualnie utrudnia skuteczne wspieranie tej grupy w poszukiwaniu pracy. Komputerowy Test Zainteresowań Zawodowych (CTMVI – Computer Test Measuring Vocational Interests) został opracowany z uwzględnieniem potrzeb i możliwości niepełnosprawnych intelektualnie, w formie programu komputerowego. Nie wymaga on umiejętności czytania i pisania, zamysłem autorów było sformułowanie pytań w sposób prosty i umożliwiający dokonywanie wyboru osobom zdiagnozowanym jako upośledzone w stopniu lekkim i umiarkowanym. Test jest połączony z bazą danych i może służyć jako narzędzie pracy służb zatrudnienia.

CTMVI ma postać wyświetlających się na monitorze komputera 112 par krótkich filmów ukazujących proste, wyselekcjonowane czynności zawodowe. Jego wyjątkowość opiera się na zastosowaniu techniki dla zwiększenia dostępności (prostota, zrozumiałość, zgodność prezentacji z rzeczywistością). Wyniki pozwalają stwierdzić preferencje w zakresie czynności i środowisk pracy.

Poniższy artykuł prezentuje wyniki badania pilotażowego w zakresie właściwości psychometrycznych i dostępności narzędzia, przeprowadzonego w grupie 48 uczniów Zasadniczej Szkoły Zawodowej zdiagnozowanych jako niepełnosprawni intelektualnie. Zbadano także zależność między płcią, IQ i profilem klasy a uzyskanymi wynikami.

Stwierdzono, że narzędzie ma zadowalające właściwości psychometryczne i nie sprawia trudności badanym, wymaga jednak dalszych badań na większej grupie i pracy nad zwiększeniem dostępności dla osób o sprzężonych niepełnosprawnościach.

**Słowa kluczowe:** niepełnosprawni intelektualnie, upośledzenie umysłowe, rehabilitacja zawodowa, test zainteresowań zawodowych, test komputerowy.

## 1. Introduction

The objective of the study presented was to develop a psychological test assessing vocational interests of intellectually disabled persons with the support of technology, check its accessibility for users and examine psychometric properties. The goal of the method developed was to ameliorate career guidance and vocational rehabilitation of intellectually disabled persons. The Computer Test Measuring Vocational Interests (CTMVI) was based on the following principles.

Firstly, professional activity of the intellectually disabled shall be a core part of the rehabilitation process. According to the available literature, employment on an open labour market (Dimichale & Terwilliger 1953; Otrębski 2007) is recommended. Inclusion by employment proves that the disabled can play important social roles and be accepted by the rest of population (Fabian 1992). It also raises the overall number of employees and diminishes the need for financing disability pensions (Rosenberg, Cheyney & Greenberg 1991; Anthony 1994). Unfortunately, working abilities of the intellectually disabled seem to be deeply underestimated in the literature and in practice (Andrews 2005; Otrębski 2007; Pawlak-Lis 2008). Even though their mental capacity obviously limits the number of vocational tasks they can perform and careers they could pursue, they are often better than workers without disability while performing simple, boring, repetitive tasks. Intellectually disabled workers are more precise and do not get bored easily, but, instead gain satisfaction from good performance corresponding with their abilities (Pawlak-Lis 2008). Finally, they are usually devoted both to their task and company (Mrugalska 1998; Barczynski 2001; Andrews 2005; Kirenko & Parchomiuk 2006).

Secondly, professional activation of the intellectually disabled needs support on political, organizational and scientific level, as well as in the field of psychometric methods for vocational guidance. Commonly used psychometric tests do not provide proper information about the intellectually disabled clients due to several reasons. They are written in too difficult a language, full of abstract terms and complicated descriptions (Kanchier 1990) so they are incomprehensible for people who have to face deficits such as poor understanding of the world and themselves, limited ability to process information and underdeveloped abstract thinking (Bartlett & Bunning 1997; Carson & Butcher 2004). Pen and paper inventories, due to their format, are not easy to understand and maintain, therefore they can only reach a certain level of accessibility. Close-to-life methods however seem to improve comprehension and have an additional effect on intellectually disabled clients: making their expectations and self-evaluation more

adequate. Finally, norms established for psychometric tests refer to the general population and do not give correct information about the intellectually disabled (Kanchier 1990).

Thirdly, the intellectually disabled target only a limited number of professions available for the general population and have different personal competences (Langone & Gill 1986). That is why the job search and psychometric methods used in job counseling should be based on an analysis of features of the intellectually disabled as well as of the situation at the labor market.

On the whole, the existing theoretical framework of vocational psychology seems irrelevant for intellectually disabled persons, whose interests and personality develop differently comparing to the general population. Certain theoretical principles however can serve as a base of job counseling for the intellectually disabled. The CTMVI was based on the principle of the Psychological Theory of Work Adjustment by René V. Dawis and Lloyd H. Lofquist, which is the need of correspondence between an individual and a work environment. Such correspondence should lead to personal satisfaction and work efficiency (Dawis & Lofquist 1981). Moreover, the Psychological Theory of Work Adjustment stresses individual differences as a base of work fit and was already successfully applied by the authors in the research on work personality of the intellectually disabled (Dawis & Lofquist 1970). The work fit seems essential for vocational rehabilitation of persons with intellectual disability, for whom the choice of professions and posts is more ultimate than for the general population, due to two reasons. On the one hand, they face much more difficulty during professional training, so every change brings additional risk of failure. On the other hand, intellectually disabled persons rarely feel the need to search for challenges and would rather stay in the safe workplace they were once trained for (Rumrill & Roessler 1986).

Finally, proper assessment of interests is essential for choosing satisfying career options (Super 1972). Unfortunately, the fact that the intellectually disabled have their own preferences and are able to make their own choices is often being neglected while personal interests are an obvious starting point in career planning for clients who do not suffer from any disability. Lack of self-knowledge and self-consciousness among the intellectually disabled however leads to difficulties in specifying what they want, like, or are able to do with satisfaction (Rumrill & Roessler 1986).

For the reasons described the test for interests assessment was created. The CTMVI was based on Strong's (1951) definition of an interest as a *tendency*

*to occupy oneself with certain subjects and prefer certain activities* (Super 1972: 53) and two principal factors, the present labour market and its possible growth and capabilities of the intellectually disabled in vocational context. It has to be remembered though that development and crystallization of interests might be slower and poorer due to intellectual disability (Law & Lester 1991).

Although some methods were already elaborated for measuring interests, we decided to make an improvement by using technology. Previous inventories were based on pictures, like *the Reading-Free Vocational Interest Inventory RFVI-VIII* (Becker 1988) and the *Vocational Interest and Sophistication Assessment VISA* or on work samples, like *Vocational Information and Evaluation Work Samples (VIEWS)*, *the New Concepts Vocational Evaluation System (VES)*, *the Valpar Component Work Samples*, *the Micro-Tower* and *Wide-Range Employment Sample Test* (Botterbusch 1987). While methods based on pictures cannot completely avoid the demand for abstract thinking and methods based on work samples require staff, space and time, computer-based methods should prevent both problems described.

The CTMVI was created with respect to the knowledge gathered in studies concerning technology use in vocational rehabilitation of the intellectually disabled. These studies revealed the following conclusions. Skills gained by the participants were easily transferred to real situations, but, in opposition to job coaching, computer modes allowed making mistakes, could be repeated unlimited amount of times (Wehmeyer et al. 2006), never lost patience and took advantage of non-verbal techniques for teaching abstractive thinking (Standen & Brown 2005). Computer modes allowed to save time and lower financial costs (Davies et al. 2002) and, what is more, had minimal influence on the social situation of the disabled. They diminished the risk of shame and humiliation connected with the human factor (Standen & Brown 2005) and allowed independence and equality with other employees (Davies et al. 2002). To illustrate the above statement with some examples, audio and video prompting systems gave the possibility to adapt the pace to personal abilities (Davies et al. 2002) and yielded good results in real work settings (Furniss et al. 2001). They also improved task accuracy and performance independence comparing to traditional training and gained positive evaluation of the users (Furniss et al. 2001; Davies et al. 2002). Video-modeling systems yielded satisfying results in teaching new skills, their maintenance and generalization (Cihak et al. 2005). Also virtual reality was applied in vocational rehabilitation for independent living in the areas of grocery shopping, preparing food, orientation, road safety and manufacturing skills.

It was beneficial due to the possibility of unlimited creation of conditions and tasks and repeating them until the goal was reached (Cihak et al. 2005; Rehfeldt et al. 2008). To sum up, the meta-analysis conducted by Wehmeyer et al. (2006) on 411 PsychINFO articles written on the subject of technology in vocational rehabilitation showed that 90% of them recommend the use of technology for employment support of young people as long as coaches' help is not completely replaced by computers and Universal Design Principles are not neglected. The studies mentioned above demonstrated the fact that computer-based systems were more effective for vocational training of the intellectually disabled (from mild to severe) than pictorial booklets or job coaching without technological support.

Successful use of computer techniques for rehabilitation, which allowed more accurate and realistic presentation of work settings, gave a strong recommendation to use them in the CTMVI.

## **2. Materials and methods**

### **2.1. Presentation of the CTMVI**

The method was designed for the individual examination of persons with mild and moderate intellectual disability, especially the ones who face difficulties while using verbal or pictorial tests. The CTMVI comprises 16 vocational tasks, being the most representative ones to present 8 work environments. The tasks, tested in a paired comparison, formed 112 items.

The CTMVI was created as a part of an online database to gather information concerning clients' education and work experience, psychological diagnoses, opinions of teachers, therapists, parents, job counselors and job coaches. This solution should improve the information flow between all concerned parties: clients, parents, counselors, therapists, coaches and employers. The website where the database and the CTMVI are located has a simple design, without any decorative graphics or unnecessary elements. All icons are distinct and based on commonly used symbols (Poncelas & Murphy 2007). Green color means saving or proceeding while red – cancelling and deleting.

## 2.2. The CTMVI development

### 2.2.1. Selection of the professions (work environments)

According to the current statistics people with mental retardation<sup>1</sup> constituted only 6.4% of all disabled workers in 2008 in Poland (Central Statistical Office 2009) and performed only a few kinds of jobs, mainly packing and arranging goods (Centrum DZWONI 2011). Because of the limited employment possibilities currently available at the labour market for the intellectually disabled, we have focused on its prospective expansion. A group of competent judges – 3 teachers, 2 job counselors and a school psychologist from the Vocational School for Special Needs Education nr 2 in Lodz – analyzed the governmental compendium called *Guide through Professions (Przewodnik po zawodach)* (Ministry of Labour and Social Policy 2003) to decide which of them could be performed by the intellectually disabled, basing on their abilities. Features of the intellectually disabled, together with indications and contraindications for the employment of mentally disabled workers elaborated by Polak-Sopinska (2007), were the base of the judgment. According to Polak-Sopinska, vocational tasks should be easy to learn and consist of repeated actions. Work responsibility should be shared with at least one other person and cause no mental distress. The job should not require working at night or using personal protective equipment that could cause difficulties while moving or hinder perception. Especially professions in which intellectual tension or decision-making takes more than 50% of working time should be avoided.

As a result 8 professions were selected: Administrative Assistant, Cook, Gardener, Janitor, Shop Assistant, Cloakroom Attendant, Car Wash Assistant and Cleaner. The same experts judged if the tasks normally performed in the selected professions (basing on professions' descriptions from *Guide through Professions [Przewodnik po zawodach]*) (Ministry of Labour and Social Policy 2011) were adequate for the intellectually disabled participants. Professions were chosen regardless of the existing training programs in special needs' education, which are out-of-date and do not provide education required at the present labor market. The choice of a training program is usually made without examining students' capabilities and preferences, in the age of 15–16 (or later, if a student had to repeat one year or more at school). At this age not many teenagers have crystallized interests (Super 1972), and this problem is much more serious for the intellectually disabled due to the difficulties described in the above paragraphs.

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<sup>1</sup> The term 'mental retardation' is used in this context since it is an existing term in Polish legal acts and social support system.

Basing on the Theory of Work Adjustment, not specified posts, but preferred tasks and places where they are performed were used in the CTMVI. This solution should facilitate the choice of elements to be presented in video modes and provide results that would give more information than a specified profession or post. Choice of an environment and preferred task brings flexibility in individual guidance as it allows searching for similar elements between preferred tasks and environments and the features of available positions.

### 2.2.2. The choice of vocational tasks to represent the professions (work environments)

Firstly, the most typical vocational tasks for each environment were chosen in a pool by a group professional job counselors (19 women and 10 men). From the list of tasks performed in the selected professions and accessible for the intellectually disabled (see: 2.2.1) they chose the most illustrative towards each profession, regardless of the problem of intellectual disability. The amount of tasks to be included in the test was limited to 2 per profession – the ones with highest ranks among the judges – in order to prevent examinees from fatigue, keep their motivation and avoid random answers. The final list of work environments and tasks is presented in Table 1.

Table 1. Work environments and vocational tasks included in the CTMVI

Profession	Work Environment	Vocational Task 1	Vocational Task 2
Administrative Assistant	Office	Photocopying	Typing
Cook	Kitchen	Cutting	Washing Dishes
Gardener	Garden	Watering Plants	Picking Fruits
Janitor	Janitoring	Raking Leaves	Removing Rubbish
Shop Assistant	Shop	Unpacking & Arranging Goods	Sticking Prices
Cloakroom Attendant	Cloakroom	Collecting Coats and Handing Over Tokens	Handing Over Coats and Hanging Tokens Back
Car Wash Assistant	Car Wash	Hoovering Cars	Washing Cars
Cleaner	Cleaning	Washing Floors	Dusting

### 2.2.3. Format of the items

Every item presents two vocational tasks in video modes accompanied by a question *What do you prefer? (Co wolisz?)*. Each task was compared against each of the other tasks, except the one that belonged to the same work environment, which resulted in 112 items. Items were shown in a random order. Paired comparison was used to reach high reliability (Ferguson & Takane 1997) even if examinees' self-knowledge, self-expression and ability to take decisions are very low. Paired comparison should simplify the decision-making process by limiting the choice to two options and obliging participants to express preferences about each combination instead of asking to rank a group of tasks at the same time, which could be more difficult and, consequently, more random (Ferguson & Takane 1997). Paired comparison should also eliminate the problem of acquiescence of the intellectually disabled clients with job counselors, which appears not only during interviews, but also while using questionnaires. Video modes were implemented to create adequate, close-to-life representations of vocational tasks. Promising results of the research on video-based methods in vocational rehabilitation made such an approach reasonable (Davies et al. 2002; Cihak et al. 2005; Rehfeldt et al. 2008). The videos were looped and kept repeating until the choice was made to avoid time pressure and make the CTMVI more adaptable to individual ability to focus attention. The videos were shot in real work environments, with one actor (male, 24) to avoid choices being made on the basis of participant's preference for the actor.

### 2.2.4. Participants and procedures

#### 2.2.4.1. Test administration

Before the examination information about an examinee should be gathered in the connected database to facilitate and ameliorate the guidance process.

After creating a personal account of an examinee the test can begin. It starts with short instructions written in simplified language which can be read by the participant himself/herself or by an examiner. After choosing the green arrow on the screen by using the left mouse button items start to appear on the screen in a random order. To proceed with the test an examinee has to choose his/her preferred task by pressing left mouse button. The examination can be unassisted if an examinee understands instructions, can cope with a computer mouse and does not need support. It can also be conducted with all help that is needed as long as the choices are not influenced. Time for completing the task is not

limited. Results can be saved before completing all the items. After the last item results appear on the screen and are saved by the program in the personal profile.

The instructions are disclosed below:

*This test will show which tasks you like and which you don't like. It will help to find a job you would like to do.*

*You will see two films. They will show people doing different things. Choose the one you like more and click the film with the left mouse button. After that you will see another pair of films. Click again on the preferred one. Do not worry that the movies are repeating. Continue until you see your results on the screen.*

*Do not hurry. You have as much time as you need. If there is anything you do not know, ask.*

#### 2.2.4.2. Scoring procedure

The results are calculated for every vocational task and work environment by the program itself. All items in which a task is presented are counted as 1 when chosen and as 0 when not. Results are expressed as a proportion of positive choices for each task. Sum of the results of two tasks is a result for work environment.

#### 2.2.4.3. Participants

The sample consisted of 48 students of the Vocational School for Special Needs Education nr 2 in Lodz. Examinees were between 16 and 22 years old ( $M = 18.46$ ;  $SD = 1.66$ ), 20 female (42%) and 28 male (58%). They were learning to become Tailors (25%) Cooks (19%) Confectioners (31%) and Mechanics (25%). Most of them were diagnosed as mildly mentally retarded, a few as moderately retarded and the others were on the borderline of intellectual functioning ( $M_{IQ} = 62.44$ ;  $SD_{IQ} = 5.08$ ). All the participants were trained in daily life skills, used to solving problems on their own and familiar with computers.

The research was also conducted on a few persons with a lower level of adaptation and IQ, but the sample was too small to compare the two groups and give significant results.

For the current study the test was performed on stationary personal computers, with standard keyboards and mice.

#### *2.2.4.4. Analyses examining the validity of the CTMVI*

The CTMVI validity was assessed with Spearman's rho intercorrelations of tasks' results to test if the two tasks that form one work environment correlate with each other stronger than with the rest of tasks.

The efficacy of the CTMVI to diagnose vocational preferences was assessed by comparing its results with the judgment of experts on students' preferences. A post-trial form was filled in focus groups consisting of the head teacher of each class, school job counselor and school psychologist, who knew the students for at least one year. They chose and ranked the 3 CTMVI tasks they considered the most interesting for each student, basing on all previous assessments and knowledge about him or her. These rankings were compared with 3 top results (for the tasks) from the CTMVI outcomes. Mean rank difference was compared with the maximal possible rank difference between the examinee's and experts'.

#### *2.2.4.5. Analyses examining the reliability of the CTMVI*

The test-retest reliability was measured without a time break. The method construction made it impossible for the participants to remember choices from the first examination (items appearing in random order, consisted of repeated videos). In order to measure the test-retest reliability Pearson's  $r$  correlations were computed.

## **3. Results**

### **3.1. Psychometric properties**

#### **3.1.1. Validity of the CTMVI**

Table 2 reports analyses examining the validity of the CTMVI (significant values;  $p < .05$ ). These analyses have shown that the tasks which form one work environment are in all cases positively related (mean rho = .670,  $p < .05$ ,  $N = 48$ ). Apart from the correlations between Raking Leaves and both Picking Fruits ( $p < .05$ , rho = .301,  $N = 48$ ) and Watering Flowers ( $p < .05$ , rho = .287,  $N = 48$ ) all other significant correlations were negative.

The measurement of the CTMVI efficacy revealed the following rank differences between experts and examinees. The mean rank difference was 6.61

(SD = 2.82), which is below the median (MD = 7.5, min. = 0, max. = 15, N = 48) and fulfills authors' assumption about an acceptable result.

Table 2. Content validity for the Computer Test Measuring Vocational Interests. Spearman's rho coefficients; significant correlations only

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1		.626				-.402										
2									-.303							
3				.552				-.319						-.295	-.322	
4													-.525	-.522	-.309	-.420
5						.704	.287				-.351	-.389				
6							.301						-.291	-.290		
7								.616						-.351		
8																
9										.746					-.291	
10															-.306	-.295
11												.920				
12																
13														.816		-.299
14																-.400
15																.381
16																

Note. 1 – Photocopying, 2 – Typing, 3 – Cutting, 4 – Washing Dishes, 5 – Watering Plants, 6 – Picking Fruits, 7 – Raking Leaves, 8 – Removing Rubbish, 9 – Unpacking & Arranging Goods, 10 – Sticking Prices; 11 – Collecting Coats and Handing Over Tokens, 12 – Handing Over Coats and Hanging Tokens Back, 13 – Hoovering Cars, 14 – Washing Cars, 15 – Washing Floors, 16 – Dusting. All correlations (Spearman's rho) are significant  $p < .05$ , sample size  $N = 48$ .

### 3.1.2. Reliability of the CTMVI

Tables 3 and 4 present the results of analyses examining the test-retest reliability of the Computer Test Measuring Vocational Interests. As displayed in the tables, the CTMVI yielded acceptable levels of reliability ( $r_{tt} > .7$ ) for all tasks ( $p < .01$ , mean  $r = .764$ ,  $p < .01$ ,  $N = 48$ ) and environments ( $p < .01$ , mean  $r = .793$ ,  $N = 48$ ), for which the result was slightly higher. The strongest correlations among the tasks were yielded for Photocopying and Vacuuming Cars ( $p < .01$ ,  $r = .898$ ,  $N = 48$ ) while the weakest for Picking Fruits ( $p < .01$ ,  $r = .409$ ,  $N = 48$ ). Among the work environments Pearson's  $r$  was the highest

for Office ( $p < .01$ ,  $r = .925$ ,  $N = 48$ ) and lowest for Garden ( $p < .01$ ,  $r = .539$ ,  $N = 48$ ).

Table 3. Test-retest reliability for the Computer Test Measuring Vocational Interests vocational activities

Activity	Pearson's $r$
Photocopying	.898
Typing	.828
Cutting	.810
Washing Dishes	.849
Watering Plants	.854
Picking Fruits	.409
Raking Leaves	.734
Removing Rubbish	.800
Unpacking & Arranging Goods	.758
Sticking Prices	.742
Collecting Coats and Handing Over Tokens	.770
Handing Over Coats and Hanging Tokens Back	.817
Hoovering Cars	.898
Washing Cars	.824
Washing Floors	.562
Dusting	.809
<b>mean <math>r</math></b>	<b>.764</b>

Note. All correlations are significant  $p < .01$ , sample size  $N = 48$ .

Table 4. Test-retest reliability the Computer Test Measuring Vocational Interests work environments

Work Environment	Pearson's $r$
Office	.925
Kitchen	.904
Garden	.539
Janitorial	.840
Shop	.826
Cloakroom	.840
Car Wash	.904
Cleaning	.702
<b>mean <math>r</math></b>	<b>.793</b>

Note. All correlations are significant  $p < .01$ , sample size  $N = 48$ .

### 3.1.3. Differences across the groups of different IQ, sex and professional education

The analyses across the groups of different IQ, sex and specialization revealed the following findings. Watering Plants ( $p = .018$ ,  $F = 6.021$ ,  $df = 1$ ) was significantly more popular among people with lower IQ while Washing Cars ( $p = .014$ ,  $F = 6.524$ ,  $df = 1$ ) – among people with higher IQ. Differences were also found among men and women, however, they follow a very stereotypical pattern: female participants preferred Jobs in the Kitchen ( $p = .001$ ,  $F = 13.639$ ,  $df = 1$ ) while male participant – Jobs in the Carwash ( $p = .003$ ,  $F = 9.969$ ,  $df = 1$ ). Analyses across the groups of different professional education showed Jobs in the Garden ( $p = .017$ ,  $F = 3.784$ ,  $df = 3$ ) to be popular among Confectioners and Tailors, and Jobs in the Carwash ( $p = .032$ ,  $F = 3.204$ ,  $df = 3$ ) to be popular among Mechanics.

### 3.1.4. Accessibility of the CTMVI

Concerning the accessibility of the CTMVI the following observations were made. The test was performed quickly and with fewer difficulties than expected (15 minutes on average). The instrument seemed to be easy enough for people with low level of adaptation and IQ lower than mild class of mental retardation, although the examination required assistance and took more time. Difficulties were observed mainly among persons with seeing disorders and low eye-hand coordination. The test was performed in a rather self-directed manner. Support was asked by some participants only, mainly when the first item appeared or when a participant saw the same video again for the first time.

## 4. Discussion

The current study reveals psychometric properties of the CTMVI as well as findings concerning its usage. Firstly, positive correlations between all the tasks that belong to the same work environments proved the content validity of the CTMVI. Positive correlations were also revealed between Picking Fruits and Raking Leaves, which can be explained by similarity of work environments. However, no other unexpected correlations appeared, which indicates that tasks were selected correctly. The concurrent validity reached acceptable results as well, although the risk of a biased outcome has to be taken into account. The

experts could have confused preferences with suitability for the tasks or they could have been wrong in their judgment of the participants' interests. The bias could have also been caused by the fact that they were only judging observed preferences, while the CTMVI ranked all tasks.

Additionally, the work environments selected for the CTMVI seem to be comparable with the interest classification by Becker (1975), who distinguished the following interests areas: Automotive, Building Trades, Clerical, Animal Care, Food Service, Patient Care, Horticulture, Janitorial, Personal Service, Laundry Service, Materials Handling, Light Industrial and House Keeping. Regarding the differences in the labor market in Poland and in the USA, where Becker's classification was created, similarity of both systems gives hope for developing a universal classification and a culturally universal method measuring vocational interest of the intellectually disabled. Using non-verbal modes seems to contribute to this goal. However, universality of selected work environments and tasks needs further research.

The reliability appeared to be on an acceptable level for all tasks and work environments except for Picking Fruits, Washing Floors and Garden. The results however could be interpreted as high according to the age of examinees and their self-awareness (Campbell 1977), which is lowered by the disability. The reliability is higher for the work environments than for the tasks, therefore the results of the CTMVI seem to be more reliable in vocational guidance towards working environment than vocational tasks.

Analyses across the described groups revealed the following findings. The results of the IQ group comparison could be reasoned by a bigger interest in technique and higher understanding of it among the group with higher IQ. This conclusion corresponds with capacities of the disabled and the practice of job centers. Differences found between men and women follow a very stereotypical pattern concerning gender roles. Similar results across men and women were yielded with the BWAP by Otrębski (2007). The problem requires further research as it seems that a lot needs to be done in the field of gender equality among the intellectually disabled. Secondly, the areas of professional education do not seem to be related to vocational interests measured by the CTMVI besides the class of Mechanics. This fact could be interpreted either as a sign of low validity of the CTMVI, which is not so probable according to the above mentioned analyses, or as a sign of faulty selection in the educational system. This problem is often being described by the employees of vocational schools and requires further research that could result in a call for systemic reforms.

Finally, the CTMVI items seem difficult to remember and the method seems stable in time. Therefore no bias is expected in the results as to making breaks or dividing an examination into parts. Nevertheless this suggestion should be tested.

## 5. Future prospects

The method's accessibility for persons with multiple disabilities, especially seeing and kinesthetic disorders, should be improved by adding a magnifying option and designing a panel that could be used instead of computer mouse and keyboard. Voice instruction could also be added to reduce the need of participation of a support person. Method standardization should be completed on a bigger sample. Further research should be conducted on concurrent validity of the CTMVI. Firstly, a sample of intellectually disabled that are already employed should be tested. Secondly, psychometric properties of the CTMVI should be assessed on the sample for which other methods to measure vocational interests are available, thus in a country where they have been implemented. What should also be examined is predictive validity. Last but not the least, cultural universality of the CTMVI should be checked.

Finally, the CTMVI could be developed by adding more work environments to the testing mode, as longer examination does not seem to be too difficult for the participants. This would also allow adaptation to the expanding labor market for the intellectually disabled. As a result a flexible method, in which a job counselor can choose items basing on examinee's abilities and current vacancies, could be created. Adding the possibility to modify the testing mode should also lead to higher flexibility in different cultures.

## 6. Conclusions

To conclude, the CTMVI has acceptable levels of reliability and validity and can be recommended for experimental use to job centers for intellectually disabled clients. The results of the CTMVI should serve as a base for an individual guidance process in which they would be combined with broader information about the client.

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## References

- Andrews L.W. 2005. Hiring people with intellectual disabilities, *HR Magazine*, No. 50, pp. 72–77.
- Barczyński A. 2001. *Zakłady pracy chronionej w polskim systemie rehabilitacji zawodowej osób niepełnosprawnych*, KIG-R, Warszawa.
- Bartlett C. & Bunning K.T. 1997. The importance of communication partnerships: a study to investigate the communicative exchanges between staff and adults with learning disabilities, *British Journal of Learning Disabilities*, No. 25, pp. 148–153.
- Becker R.L. 1975. *AAMD – Becker Reading-Free Vocational Interest Inventory Manual (and Male and Female Inventories)*, American Association on Mental Deficiency Press, Washington.
- Becker R.L. 1988. *Revised Reading-Free Vocational Interest Inventory. Manual*, Elbern Publications, Columbus.
- Botterbusch K.F. 1987. *Vocational Assessment and Evaluation Systems: A Comparison, Menemonie: Material Development Center*, Stout Vocational Rehabilitation Institute, Wisconsin.
- Campbell D.P. 1977. *Manual for the SVIB-SCII (Strong-Campbell Interest Inventory)*, Stanford University Press, Stanford.
- Carson R.C., Butcher J.N. & Mineka S. 2000. *Psychologia zaburzeń*, transl. M. Gajdzińska, GWP, Gdańsk.
- Central Statistical Office. 2009. *Labour Force Survey in Poland 2009. Statistical Information and Elaboration*, GUS, Warszawa.
- Centrum DZWONI. 2009. *Zawody dostępne dla klientów niepełnosprawnych intelektualnie w regionie łódzkim*, available online at <http://www.centrumdzwoni.pl> (accessed 21 December 2009).
- Cihak D.F., Alberto P.A. & Gama R.I. 2005. Use of static picture prompts versus video modeling during simulation instruction, *Research in Developmental Disabilities*, No. 26, pp. 327–339. doi:10.1016/j.ridd.2004.11.002.
- Davies D.K., Stock S.E. & Wehmeyer M.L. 2002. Enhancing independent task performance for individuals with mental retardation through use of a handheld self-directed visual and audio prompting system, *Education and Training in Mental Retardation and Developmental Disabilities*, No. 37, pp. 209–218.
- Dawis R.V. & Lofquist L.H. 1981. *Job satisfaction and work adjustment: implications for vocational education*, Ohio State University Press, Columbus.
- Dimichale S.G. & Terwilliger W.B. 1953. Counselors' Activities in the Vocational Rehabilitation of the Mentally Retarded, *Journal of Clinical Psychology*, No. 9, pp. 99–106.

- Fabian E.S. 1992. Supported employment and the quality of life: does a job makes a difference, *Rehabilitation Counseling Bulletin*, No. 2, pp. 84–97.
- Ferguson G.A. & Takane Y. 1997. *Statistical analysis in psychology and Education*, PWN, Warszawa.
- Furniss F., Lancioni G., Rocha N., Cunha B. Seedhouse P., Morato P. & O'Reilly M. 2001. Development and evaluation of a palmtop-based job aid for workers with severe developmental disabilities, *British Journal of Educational Technology*, No. 32, pp. 277–287.
- Kanchier C. 1990. Career Education for Mentally Handicapped Adolescents, *Journal of Career Development*, No. 16.
- Kirenko J. & Parchomiuk M. 2006. *Edukacja i rehabilitacja osób z upośledzeniem umysłowym*, Wydawnictwo AWSSP, Lublin.
- Langone J. & Gill G.H. 1986. Developing Effective Vocational Programs for Mentally Retarded Persons: Cooperative Planning Between Rehabilitation & Education *Journal of Rehabilitation*, No. 52, pp. 63–67.
- Law J. & Lester R. 1991. Speech therapy provision in a social education centre: Is it possible to target intervention? *Mental Handicap*, No. 19, pp. 22–28.
- Lisiecki M. 2008. *Aktywizacja zawodowa osób niepełnosprawnych intelektualnie*. Unpublished manuscript, University of Łódź.
- Ministry of Labour and Social Policy. 2003. *Przewodnik po zawodach*, MLSP, Warsaw.
- Mrugalska K. 1998. Osoby z upośledzeniem umysłowym, in: Szczepankowska B. & Ostrowska A. (ed.), *Problem niepełnosprawności w poradnictwie zawodowym. Zeszyty informacyjno-metodyczne doradcy zawodowego*, Krajowy Urząd Pracy, Warszawa, No. 10, pp. 117–145.
- Otrębski W. 2007. *Interakcyjny model rehabilitacji zawodowej osób z upośledzeniem umysłowym*, Wydawnictwo KUL, Lublin.
- Pawlak-Lis T. 2009. *Jak zatrudnić osobę niepełnosprawną? Poradnik dla pracodawcy z otwartego rynku pracy*, ISP, Warszawa.
- Polak-Sopińska A. 2007. *Przystosowanie stanowisk pracy do indywidualnych możliwości osób niepełnosprawnych, podstawą ich aktywizacji zawodowej*, KIG-R, Warszawa.
- Rehfeldt R.A., Dahman D., Young A., Cherry H. & Davies P. 2003. Teaching a simple meal preparation skill to adults with moderate and severe mental retardation using video modeling, *Behavioral Intervention*, No. 18, pp. 209–218. doi: 10.1002/bin.139.
- Rosenberg H., Cheyney W. & Greenberg B. 1991. Dropout prevention in vocational special needs education. Career development for exceptional individuals, *Career Development for Exceptional Individuals*, No. 14, pp. 91–101. doi: 10.1177/088572889101400108.
- Rumrill P. & Roessler R. 1999. New directions in vocational rehabilitation: A 'career development' perspective on 'closure', *Journal of Rehabilitation*, No. 65, pp. 26–30.
- Standen P.J. & Brown D.J. 2005. Virtual Reality in the Rehabilitation of People with Intellectual Disabilities: Review, *Cyberpsychology & Behavior*, No. 3, pp. 272–282. doi:10.1089/cpb.2005.8.272.
- Super D.E. 1964. *La psychologie des intérêts*, PUF, Paris.
- Wehmeyer M.L., Palmer S.B., Smith S.J., Parent W., Davies D.K. & Stock S. 2006. Technology use by people with intellectual and developmental disabilities to support employment activities: A single-subject design meta analysis, *Journal of Vocational Rehabilitation*, No. 24, pp. 81–86.