



# Determinants of Professional Activity After Kidney and Liver Transplantation: Questionnaire Development and Validation

K. Wesolowska-Gorniak<sup>a</sup>, J. Gierus<sup>b</sup>, M. Wojtowicz<sup>c</sup>, J. Bugajska<sup>d</sup>, and B. Czarkowska-Paczek<sup>a,\*</sup>

<sup>a</sup>Department of Clinical Nursing, Medical University of Warsaw, Warsaw, Poland; <sup>b</sup>Psychiatric Clinic, Medical University of Warsaw, Pruszkow, Poland; <sup>c</sup>Department of Immunology, Transplantology, and Internal Diseases, Medical University of Warsaw, Warsaw, Poland; and <sup>d</sup>Central Institute for Labor Protection, National Research Institute, Warsaw, Poland

---

## ABSTRACT

**Background.** Organ transplantation is currently the treatment of choice in end-stage organ failure. Organ replacement therapy compensates for most of organ function loss and offers recipients the potential for an independent life; nevertheless, the employment rate after kidney or liver transplant is low vs the general population. The purpose of this study was to create a questionnaire for kidney and liver transplant patients that comprehensively assesses factors affecting employment among these people including demographic, physical, and psychosocial variables.

**Material and Methods.** The study was based on a self-prepared questionnaire developed by a team of specialists in the field of medicine, rehabilitation, psychology, and employment. The questionnaire contained 5 parts: demographic data, professional factors, medical factors, physical factors, and psychological factors. The normalization sample consisted of 64 individuals (women and men) aged between 18 to 45 years 1 to 5 years after kidney or liver transplant. The Determinants of Professional Activity after Kidney and Liver Transplantation Questionnaire (DPATQ) was developed based on descriptive statistics, Spearman  $\rho$  coefficient, principal component analysis, Cronbach  $\alpha$ , and item response theory analysis.

**Results.** The Cronbach  $\alpha$  reliability coefficient for the psychological part reached 0.88.

**Conclusion.** The DPATQ is a new method for measuring post-transplant adaptation and other factors influencing employment status. It offers good psychometric reliability. The DPATQ may be useful in the preparation process of vocational rehabilitation programs or in research studying problems with employment after solid organ transplant.

---

**O**RGAN transplantation is the current treatment of choice for end-stage organ failure, and the life expectancy of organ transplant recipients has increased worldwide. It currently exceeds 20 years after liver transplant [1]. The 10-year kidney transplant survival varies among countries, but it is 58% in Canada, 43% in the United States, and 56% in Great Britain [2]. In Poland, data from Poltransplant suggest that the 5-year survival rate for kidney transplant is 74% and 87% for kidney transplant recipients; 10-year survival rate is 57% and 74%, respectively. For liver transplant, the 5-year survival rates for transplant and transplant recipients are 89% and 73%, respectively, and 10-year survival rates are 60% and 65%, respectively [3,4]. The number of organ transplants has also

increased, and thus the community of recipients is growing. Organ replacement therapy compensates for most organ function loss and offers the recipients the potential to lead a restored and independent life. However, organ transplant does not imply complete health normalization: in many cases, the disease that leads to organ failure persists, and

---

\*Address correspondence to Bozena Czarkowska-Paczek, MD, PhD, Department of Clinical Nursing, Medical University of Warsaw, Ciolka str. 27, 01-445 Warsaw, Poland. Tel: (+48 22) 83 60 972, Fax: (+48 22) 83 60 972. E-mail: [bozena.czarkowska-paczek@wum.edu.pl](mailto:bozena.czarkowska-paczek@wum.edu.pl)



### Professional factors

---

#### 1. What was the total number of years of your professional experience prior to the transplantation?

I had never worked	1-5 years	Over 10 years
Below 1 year	5-10 years	

#### 2. Were you employed 1 year before the transplantation and on what basis?

I did not work	I worked full-time
I worked part-time	I did casual work

#### 3. What kind of work did you perform during 1 year before the transplantation (as regards income-producing work)?

I did not work	Blue collar worker
I held a managerial position	Outwork
White collar worker	Other, please specify _____

**Fig 1.** Continued.

lifelong immunosuppressive treatment has many adverse effects [5,6].

The goal of the complex rehabilitation implemented after transplant is to maximize the lifetime, improve the quality of life, restore social relationships, and regain the ability to perform certain social roles including employment. There are many advantages of post-transplant employment. Besides financial stability and independence, it offers the opportunity to achieve personal goals, gain satisfaction, improve self-esteem and psychosocial adaptation, and increase the position in the family [1]. In addition, not working by choice for 12 months post-transplant was shown to be associated with a greater risk to the graft [7]. The economic burden of transplantation is a great challenge in every country. From a societal perspective, the increased employment rate after transplant lowers the costs resulting from productivity loss and early retirement.

The employment rate after kidney or liver transplant is lower than the general population. The average employment rate after liver transplant is 37%, ranging from 22% to 55% [1]. The employment rate among kidney transplant recipients varies from 18% to 82% [8]. Many factors influence the quality of these data including the lack of a precise

definition of employment, country-specific sociocultural backgrounds, the number of patients enrolled, the time post-transplant for data collection, and the period of investigation for differences in surgical techniques and pharmacotherapy development [9].

Effective vocational rehabilitation should be performed because of the reasons described above, but it should always be preceded by an in-depth analysis of employment status among transplant recipients and the factors that affect it. Several instruments can measure quality of life and work ability, but they are not unique to transplant patients. The purpose of this study was to create a questionnaire specifically for patients after kidney and liver transplant that would comprehensively assess the factors affecting employment in this group. We emphasized demographic, physical, and psychosocial variables.

#### MATERIAL AND METHODS

##### Participants and Procedure

The Ethics Committee of the Medical University of Warsaw, Poland, approved the experimental protocol (No. KB/7/A/2018). The normalization sample consisted of 64 women and men aged

**4. Were you obtaining permanent benefits because of the disease during 1 year prior to the transplantation?**

Yes, a disability benefit

Yes, others, please specify \_\_\_\_\_

No

**5. What was your main source of income during 1 year prior to the transplantation?**

Disability benefit

Income of a family member

Professional activity

Others, please specify \_\_\_\_\_

**6. How do you assess your financial situation during 1 year prior to the transplantation?**

Poor

Average

Good

Moderately unfavourable

Moderately favourable

**7. Are you currently employed? On what basis?**

No

I work full-time

I work part-time

I do casual work

**8. What kind of work are you currently performing (as regards income-producing work)?**

Managerial position

Outwork

White collar worker

Other, please specify \_\_\_\_\_

Blue collar worker

**9. What is currently your main source of income?**

Disability benefit

Income of a family member

Professional activity

Others, please specify \_\_\_\_\_

**10. What was the period between the transplantation and resuming professional activity?**

I have not worked since the transplantation

6-12 months

Below 3 months

1-2 years

3-6 months

Over 2 years

**Fig 1.** Continued.

**11. Did you have to change professions after the transplantation in order to be able to work?**

I have not undertaken employment      No      Yes

**12. Has your working position had to be modified since you returned to work?**

I have not undertaken employment      No      Yes

**13. Indicate one, the most important reason for not undertaking employment after transplantation:**

Health-related contraindications      Intention to continue education  
 Fear of losing the disability benefit      Not applicable (I undertook employment)

**14. Indicate one, the most important reason for undertaking employment as regards income-producing work:**

No health-related contraindications      Not applicable (I did not undertake employment)  
 Necessity to earn income      Others, please specify \_\_\_\_\_  
 Aims unrelated to income (willingness to socialize, willingness to develop)

**15. How do you assess your current financial situation?**

Poor      Average      Good  
 Moderately unfavourable      Moderately favourable

**16. How long had you had a disability certificate prior to the transplantation?**

Below 1 year      2-5 years      I had not obtained a disability certificate  
 1-2 years      Over 5 years

**Fig 1.** Continued.

---

**Medical factors**


---

**Patients who underwent renal transplantation 1.****Estimate the period of dialysis therapy:**

I had not been dialysed

Less than 6 months

6-12 months

12-24 months

More than 24 months

**2. Indicate the type of dialysis therapy:**

Haemodialysis

Peritoneal dialysis

**3. Primary reason for organ insufficiency:**

Diabetes (type I or II)

Hypertension

Autoimmune diseases, PBC, PSC

Glomerulonephritis

Others

**4. Indicate whether the transplanted organ was harvested from a living donor:**

Yes

No

**Patients who underwent liver transplantation 5.****Primary reason for organ insufficiency:****I Chronic liver failure:**

Viral infections, HCV/HBV

Alcoholic liver cirrhosis

Others

**II Acute liver failure:**

Paracetamol poisoning

Others (e.g. mushroom poisoning, hepatitis fulminans)

**6. Indicate whether the transplanted organ was harvested from a living donor:**

Yes

No

**Fig 1.** Continued.

**Physical factors**

Indicate whether your current health status limits the performance of the following activities. If so, to what extent? **Indicate only one response for every activity on the scale from 1 to 5** (1 – no problems, 2 – slightly problematic, 3 – moderately problematic, 4 – markedly problematic, 5 – extremely problematic).

	No problems				Extremely problematic
a. Running	1	2	3	4	5
b. Lifting/Carrying heavy objects	1	2	3	4	5
c. Housework (e.g. vacuuming, cleaning windows)	1	2	3	4	5
d. Going upstairs (more than 1 floor)	1	2	3	4	5
e. Bending forwards or kneeling	1	2	3	4	5
f. Cycling	1	2	3	4	5
g. Walking over 500 m	1	2	3	4	5
	No problems				Extremely problematic

**Fig 1.** Continued.

between 18 to 45 years after kidney or liver transplant. The age range of the respondents was controlled to assess factors predisposing employment. The inclusion criterion was also the time after transplant between 1 to 5 years.

**Process of Developing Determinants of Professional Activity after Kidney and Liver Transplantation Questionnaire Draft**

The idea to develop this tool is based on the observation that employment is lower in liver or kidney transplant recipients than the general population. We enrolled the help of physiotherapists, a psychologist, and an employment specialist, who were led by a medical doctor. The draft version of the Determinants of Professional Activity after Kidney and Liver Transplantation Questionnaire (DPATQ) consisted of 5 parts: demographic data, professional factors, medical factors, physical factors, and psychological factors. The questionnaire contained open and closed questions, and some questions used a Likert-type scale. Each part was created based on literature to identify all possible employment determinants among transplant recipients.

Initially, demographic data contained questions about age, sex, transplanted organ, education, academic degree, place of residence, marital status, having a disability certificate, total number of

individuals in household, and total number of individuals who have an income. These factors were selected based on a literature review that confirmed their impact on employment status among patients after liver or kidney transplant [1,9,10]. Several studies evaluated employment after organ transplant of those older than 18 years—older patients were usually less likely to return to work [10–12]. This was the main reason for narrowing down the target group to the age range of 18 to 45 years because it identified other determinants of employment beyond age.

Professional factors that might affect post-transplant employment status were the total number of years of professional experience prior to transplant, employment status during 1 year before the transplant, the type of work performed before transplant [1,9,13], working with animals or work exposed to frequent contact with people in the context of infection risk (identified by the American Society of Transplantation Infectious Diseases Community of Practice as a risk occupations) [14], obtaining permanent benefits because of the disease, main source of income, and assessment of financial situation before the transplant. The same questions were used in the post-transplant period. In this part of the questionnaire, the questions about the need to retrain or workplace modification were also included as well as questions about the reason for undertaking or not undertaking employment after transplant.

---

**Psychological factors**

---

Indicate to what extent the following statements may be referred to you. Select only one response for every activity on the scale from 1 to 5 (1 – strongly disagree, 2 – disagree, 3 – don't know, 4 – agree, 5 – strongly agree).

	Strongly disagree				Strongly agree
1. My plans regarding employment/work are the same as before the disease	1	2	3	4	5
2. After the period of the disease and treatment I became more financially dependent on the family	1	2	3	4	5
3. I consider myself to be healthy at the moment.	1	2	3	4	5
4. I find it hard to meet my own expectations	1	2	3	4	5
5. My responsibilities at home changed as a result of the disease and treatment	1	2	3	4	5
6. I suppose that my health status will deteriorate	1	2	3	4	5
7. I feel the most comfortable when each day looks the same	1	2	3	4	5
8. I feel fear or unspecified anxiety	1	2	3	4	5
9. Undertaking new tasks is too challenging for me as a result of my health problems	1	2	3	4	5
10. I avoid tackling the topic of health problems	1	2	3	4	5
11. My ambitions remained unchanged after transplantation	1	2	3	4	5
12. It is impossible for me to work because of health problems	1	2	3	4	5
13. Thinking about my health is tiring	1	2	3	4	5
14. I feel helpless because of my health status	1	2	3	4	5
15. I feel as if I was incapacitated	1	2	3	4	5
16. Fear and anxiety disrupt my sleep	1	2	3	4	5
17. I have no influence on my health status	1	2	3	4	5
18. There is space for somebody like me in the job market	1	2	3	4	5
19. I feel that my problems are not understood by persons who had not had a similar experience	1	2	3	4	5
20. Sadness, anxiety or irritability made me limit professional activity	1	2	3	4	5

**Fig 1.** Continued.

21. I would be financially and organizationally stable without the help of my family	1	2	3	4	5
22. I feel uncomfortable among other people and I avoid attracting attention	1	2	3	4	5
23. Pain or malaise made me limit professional activity	1	2	3	4	5
24. I am afraid of being criticized and assessed by other people	1	2	3	4	5
25. I am able to perform complex tasks as precisely as in the past	1	2	3	4	5
26. When I am in company I blush and start perspiring because of stress	1	2	3	4	5
27. Some aspects of my health status are currently unbearable	1	2	3	4	5
28. It is possible for me to concentrate on a task for several hours	1	2	3	4	5
29. I am able to perform most of the activities which I did before the disease	1	2	3	4	5
30. A lot has changed in my family after transplantation	1	2	3	4	5
31. Health-related worries dominate my thoughts	1	2	3	4	5
	Strongly disagree				Strongly agree

Fig 1. Continued.

Medical factors were divided into questions for liver or kidney recipients and included duration and dialysis type, primary cause for organ insufficiency, donor type, comorbidities, adverse effects of immunosuppressive therapy, and psychological or psychiatric treatment. Physical factors used questions about self-determined limitations caused by current health status such as running, lifting or carrying heavy objects, carrying shopping bags, housework (eg, vacuuming, cleaning windows), going up stairs less or more than 1 floor, bending forward or kneeling, cycling, and walking less than 100 m, less than 500 m, or over 500 m. This used a 5-point Likert scale: 1: no problems, 2: slightly problematic, 3: moderately problematic, 4: markedly problematic, and 5: extremely problematic. In the physical factors section, questions about participation in everyday activities were also used: walking longer than 10 minutes, walking stairs, cycling, and carrying light things. This used a Likert scale: 1: none, 2: occasionally, 3: half days a month, 4: most days a month, and 5: every day. The final question in this section was estimated sitting time during working and nonworking days.

When constructing the psychological part of the survey, procedures for factor analysis, classical test theory, and Rasch model (item response theory [IRT]) were applied. Factor analysis has been used to study the structure of the scale; correlation analysis and Cronbach  $\alpha$  can select test positions, and IRT offers a more restricted selection of test items. IRT is a valid procedure of psychometrics based on logistic

regression that includes elements of factor analysis and other analyses based on the probability of answers. Here, analyses determined the difficulty level of test positions understood as the probability of giving the same answer to the subjects. In this sense, excessively easy items poorly differentiate the measured characteristics within the test. Elements that are too difficult are excessively vulnerable to the impact of confounding variables or the randomness of answers.

During the initial stage, an analysis of 5 psychological scales for measuring the quality of life during a disease was performed. Here, 69 test positions were created and rated with a 5-point Likert scale (from 1: Absolutely No to 5: Absolutely Yes); the scale was inverted in 39 positions. It was also assumed that these items would measure health beneficial attitude (18 positions), adaptation for employment (16 positions), family context of employment (9 positions), and general mood and anxiety level.

### Statistical Analysis

Results were analyzed using descriptive statistics (number and percentage, mean, standard deviation, median, quartiles, and minimum and maximum for continuous variables). Spearman  $\rho$  coefficient was used to investigate monotonic correlations between ordinal variables. Principal component analysis analyzed multidimensional connections between variables. Cronbach  $\alpha$  was used to measure reliability of

**Table 1. Demographic Data**

Demographic Data	Parameter	Total (N = 64)
Education	No data	1.6% (n = 1)
	Primary	6.2% (n = 4)
	Secondary	32.8% (n = 21)
	Bachelor's degree	14.1% (n = 9)
	Master's degree	29.7% (n = 19)
	Vocational	15.6% (n = 10)
Academic degree	No	100% (n = 64)
Place of residence	No data	3.1% (n = 2)
	City	28.1% (n = 18)
	Small town	4.7% (n = 3)
	Medium-sized town	28.1% (n = 18)
	Village	35.9% (n = 23)
	Formalized relationship	46.9% (n = 30)
Marital status	Nonformalized relationship	25% (n = 16)
	Single	28.1% (n = 18)
Total no. of individuals in household	1	9.4% (n = 6)
	2	29.7% (n = 19)
	3	25% (n = 16)
	4	18.8% (n = 12)
	5 or more	14.1% (n = 9)
	No data	3.1% (n = 2)
Total no. of individuals in household who have income	1	15.6% (n = 10)
	2	53.1% (n = 34)
	3	15.6% (n = 10)
	4	6.2% (n = 4)
	5 or more	1.6% (n = 1)
	No data	7.8% (n = 5)
Disability certificate	No	32.8% (n = 21)
	Yes	67.2% (n = 43)

several parts of the questionnaire; *P* values less than .05 were considered significant. Computations and graphs were prepared in R (ver. 3.3.2, R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>). The IRT analysis used jMetrik software (Charlottesville, Va, United States) and indicated items where difficulty or easiness may be excessive. The DPATQ is shown in Fig 1.

## RESULTS

### Demographic Data

The normalization sample consisted of 64 individuals (24 women) after kidney or liver transplant. The average age was 34.6 years old (standard deviation [SD], 7.09). Most participants (79.7%) received a kidney. Detailed demographic data are presented in Table 1.

### Professional Factors

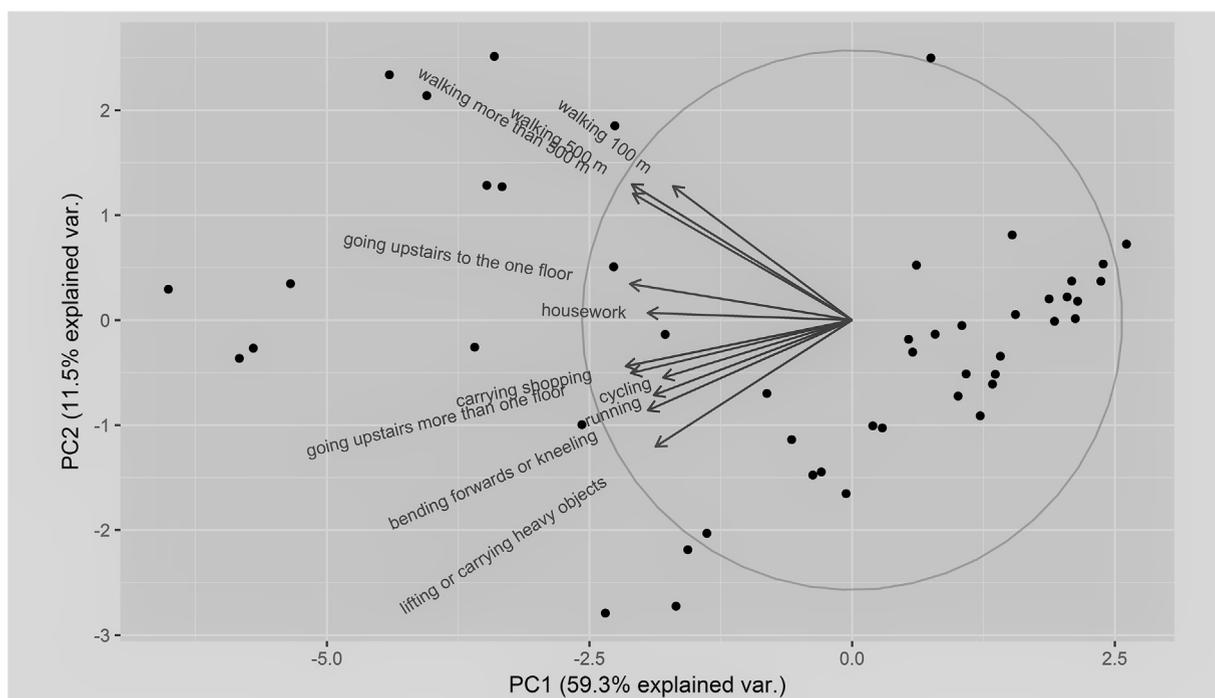
The average number of years of respondents' professional experience was 7.3 (SD, 5.58) years. There were no data

about age for 7.8% of respondents. We found that 42.2% of respondents had employment during the year before transplant. Of these, there were no data for 1.6% of them. The question about the kind of work performed during that period was an open question, and 37 different parameters were identified. No data were collected for 18.8% of the study group about this topic. Most respondents (73.4%) declared working exposed to frequent contact with people during the pretransplant period but not animals; 14.1% of respondents did not answer both questions. Full-time employment during the pretransplant period was noted in 59.4% of the subjects; 26.6% of respondents did not work at that time and the remainder declared part-time work. There were no missing data in this question.

The question about obtaining benefits because of the disease before the transplant was partially open, and 9 different answers or their combination were selected: attendance allowance, disability benefit, rehabilitation benefit, both attendance allowance and rehabilitation benefit, etc. A total of 39.1% respondents did not obtain any financial benefits because of the disease. The question about main source of income before the transplant was also partially open: 9 different variants of answers and their combination were selected, for example, income of a family member (10.9%), disability benefit (3.1%), professional activity (53.1%), social benefit (12.5%), income from family farm (6.2%), disability benefit and income of a family member (1.6%), or professional activity and social benefit (1.6%). The data were missing in 1.6% of respondents. The financial situation assessment of the respondents during the pretransplant period was based on a 5-degree scale: 23.4% assessed their financial situation as good, 39.1% as average, 26.6% as moderately favorable, 7.8% as moderately unfavorable, and 3.1 as a poor. There were no missing data in this question.

At the time of the survey, most respondents were not employed (51.6%); all subjects answered this question. The question about the type of work performed on the day of the questionnaire was an open question, and 25 different parameters were selected. There were no data for 6.2% of the study group. Most respondents declared working exposed to frequent contact with people during the post-transplant period (51.6%), and most respondents did not work with animals during that time (53.1%). A total of 42.2% of respondents did not answer the question about contact with people during their working time, and 46.9% did not answer the question about contact with animals. The average time between the transplant and resuming professional activity was 6.3 months. Only 7.8% of respondents had to change professions after the transplant in order to work, and only 3.2% of respondents had to modify their working position—most did not clarify how.

The respondents were asked to indicate the most important reason for not undertaking employment after transplant, and this question was partially open. Six different variants of answers were selected. The most frequently indicated answer was health contraindications (23.4%). The most frequently indicated reasons for undertaking full-time or part-time



**Fig 2.** Principal component analysis: self-determined limitations. PC, principal component.

employment were necessity to earn income (25%) and health contraindications (3.1%). Missing data were noted in 7.8% of respondents in both questions. The financial situation assessment of the respondents at the moment of filling in the questionnaire was based on a 5-degree scale similar to the one for pretransplant. Missing data were observed in 4.7% of respondents. Most of them assessed their financial situation as average (42.2%).

#### Medical Factors

The average duration of dialysis therapy period was 22.94 (SD, 17.57) months, and it was mostly hemodialysis (51.6%). Questions about the primary reason for organ insufficiency were partially open, and 26 different answers were selected. There were 3.1% missing data. In 78.1% of respondents, the transplanted organ came from a deceased donor. The average duration of waiting for transplant was 17.46 (SD, 14.73) months, and this period and the duration of dialysis were usually the same.

The question about comorbidities was partially open, and 17 different variants were selected. Similarly, there were 10 different variants of answers in the question about the adverse effects of immunosuppressive therapy. At the end of this part of the questionnaire, the respondents were asked about psychological or psychiatric treatment (previous or current).

#### Physical Factors

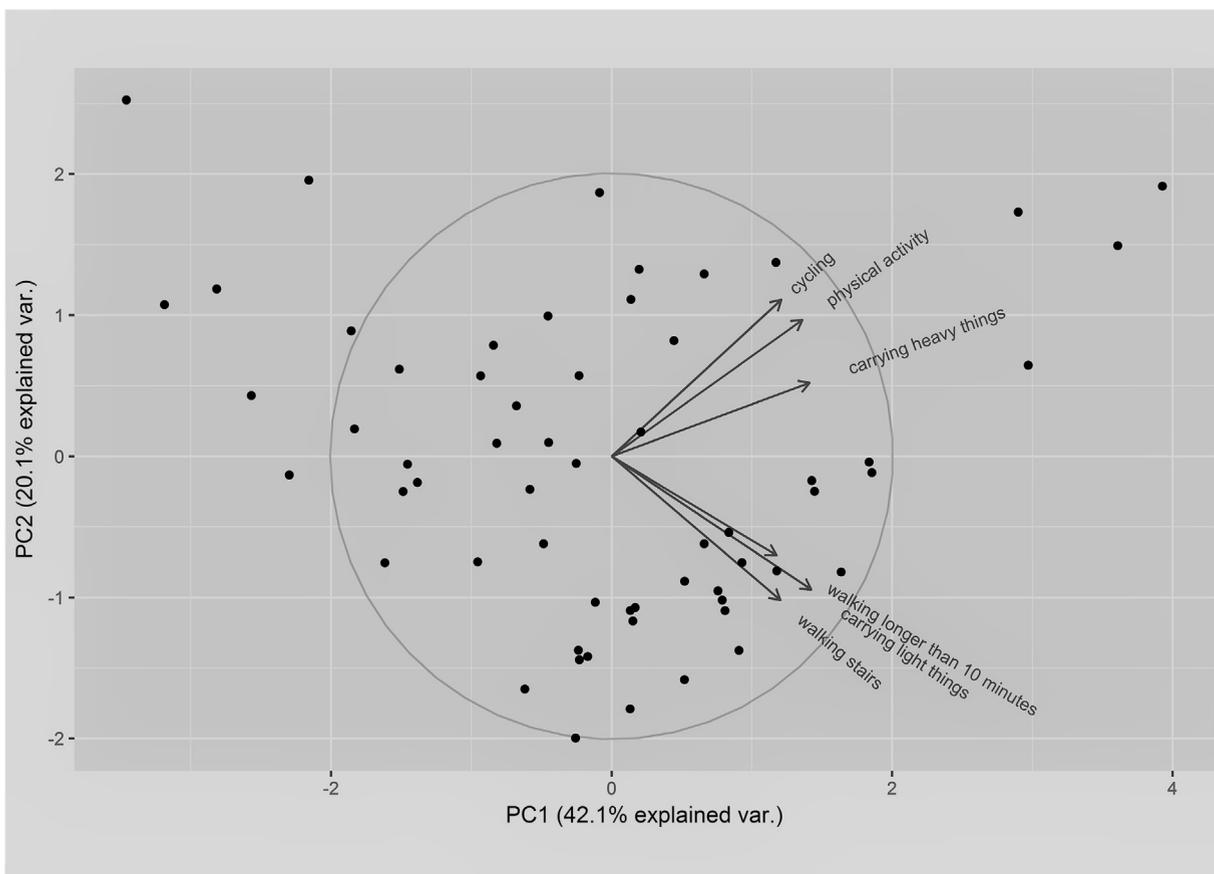
There were statistically significant correlations between all points, and some of them were strongly related ( $r > 0.8$ ) in

the question about self-determined limitations caused by current health status. Principal component analysis singled out 3 groups of strongly correlated variables: walking less than 100 m, walking less than 500 m, and walking more than 500 m; walking stairs less than 1 floor, housework, and other points. The results are shown in Fig 2. Cronbach  $\alpha$  in this question was estimated at 0.931 (CI, 0.879–0.953).

Not all points were correlated in the question about participation in everyday activities during the last month. The highest value of correlation coefficient was observed between carrying light objects and walking stairs ( $\rho = 0.46$ ;  $P < .001$ ). Principal component analysis singled out 2 groups of correlated variables: cycling, physical activity, and carrying heavy things; and walking longer than 10 minutes, carrying light things, and walking stairs. The results are shown in Fig 3. Cronbach  $\alpha$  in this question was estimated at 0.707 (CI, 0.523–0.801). The questions about estimation of sitting time during working and nonworking days were difficult to analyze because many respondents did not understand the question. Some respondents specified a time of sitting during the week as a sum rather than a daily metric.

#### Psychological Factors

*Analysis of Item Reliability.* The internal consistency analysis ( $\alpha = 0.95$ ) is very high. This result turned out to be excessively high suggesting that too many questions clearly report the same type of behavior. To remove this problem and maintain textual richness, the following measures were undertaken: 1. highly correlating pair of each was removed; 2. positions that do not significantly correlate with the



**Fig 3.** Principal component analysis: participation in everyday activities. PC, principal component.

scale's general raw result were removed. Also, 16 pairs of highly correlated items (Spearman  $\rho > 0.4$ ;  $P < .05$ ) were detected and eliminated. The correlation analysis used Spearman  $\rho$  coefficient and indicated that 9 test positions do not correlate significantly ( $P > .005$ ) with the general result. These have been removed.

**IRT Analysis.** The difficulty of test positions ranged between 2.81 and 4.06, and the discrimination coefficient was between  $-0.70$  and  $0.72$ .

After a detailed analysis of the distribution of the answers, we assumed that test positions in which about half of whole respondents and more gave the same answer as well as those in which the answers were distributed in a manner close to random would be removed.

Finally, 8 test positions were removed. In 39 positions, we turned the measuring scale. We assumed that these items would measure attitude toward health (18 positions), adaptation of employment (16 positions), family context of employment (9 positions), and general mood and anxiety level.

**Factor Structure and Reliability of the Scale.** The factor analysis indicated that the achieved version of the scale (including 31 test positions) measures 1 factor explaining 31.41% of the method's variance (Fig 4).

The most adequate name of the scale's dominating factor is "post-transplant adaptation." Items most strongly correlating with this factor include a sense of helplessness, fear of examination, limiting activity because of emotional reasons, pain, mental suffering, and the sense of being ill.

The internal consistency values were best in a shortened version of the scale. This showed high reliability and internal diversification of the method. The scale's internal consistency is shown in Table 2.

**Construct Validity.** Principal component analysis identified 1 factor explaining 31.41% of the variance of the method. Most test items load the factor more than 0.50 (Pearson correlation). Cronbach  $\alpha$  for this version was 0.88, which means high internal consistency with no signs of excessiveness. Construct validity was assessed by verifying the relation between the scale's general result and self-reported information concerning activity and employment. The scale's general result correlated significantly with types of activities: lifting weights ( $\rho = -0.57$ ), lifting groceries ( $\rho = -0.40$ ), household activities ( $\rho = -0.47$ ), walking up stairs for more than 1 floor ( $\rho = -0.54$ ), riding a bicycle ( $\rho = -0.44$ ), bending over and kneeling down ( $\rho = 0.54$ ), walking  $> 500$  m ( $\rho = -0.41$ ), and physical activity ( $\rho = -0.39$ ). Groups of employed and

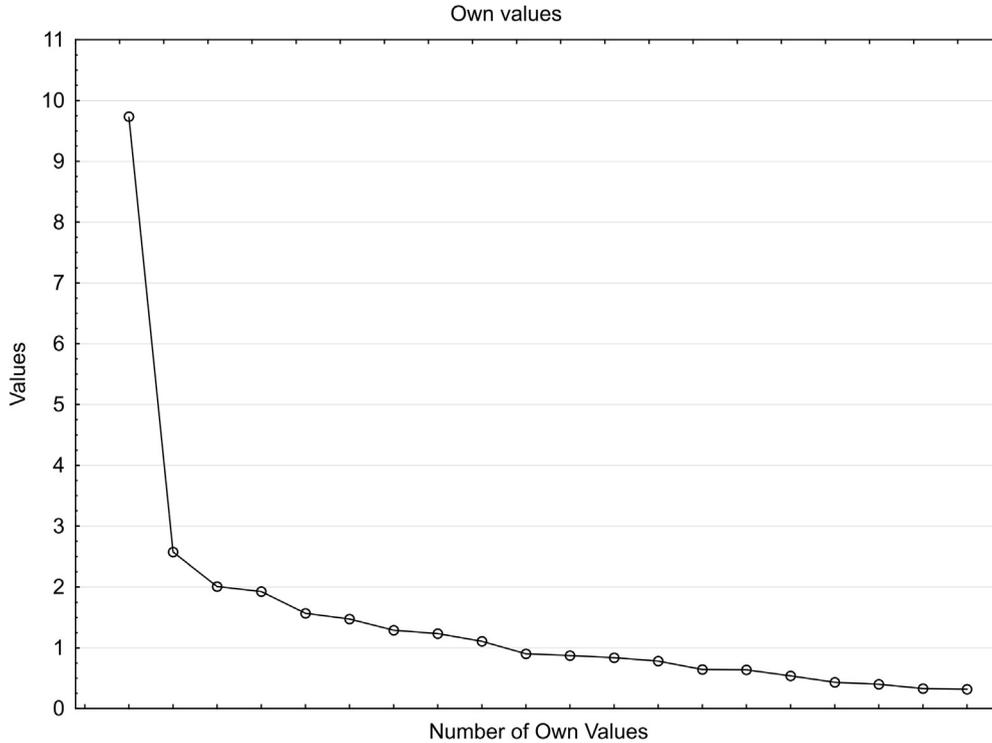


Fig 4. Scree graph of own values with factor analysis.

unemployed participants differed significantly in terms of the total result achieved in the psychological part (Mann-Whitney  $U = 177.5; P < .005$ ). The total result was higher for employed people with an average of 10 points.

DISCUSSION

We developed a new method to assess the demographic, professional, medical, physical, and psychological determinants of professional activity after kidney or liver transplant. Transplant recipients' ability to return to work is not only a quality of life concern but also an economic and societal one. Petersen et al [7] demonstrated that working full time at the time of the transplant and at 12 months post-transplant suggests high impact of graft and longer recipient survival. Working part time by choice and not working by choice at the time of transplant or for a short time after transplant were significantly associated with a worse outcome when compared with those working full time. Not only did grafts have a shorter lifespan, but recipient survival

was also diminished in that study. Numerous authors underscore the importance of sociodemographic and psychologic aspects during rehabilitation after transplant [15]. This fact provides a solid basis for the need to evaluate the determinants of the ability to work after transplant of large organs such as the liver or kidney.

The final version of this questionnaire was developed after statistical and substantive analysis of DPATQ draft; it consisted of 5 groups of factors.

Demographic Data

This answer was removed from the demographic data because of a lack of respondents having an academic degree.

Table 2. Scale's Internal Consistency

Method	Estimate	95% CI	SEM
Guttman $\lambda_2$	0.9109	(0.8764–0.9395)	5.6040
Coefficient $\alpha$	0.8947	(0.8540–0.9286)	6.0911
Feldt-Gilmer	0.9089	(0.8735–0.9382)	5.6677
Feldt-Brennan	0.9061	(0.8697–0.9363)	5.7527
Raju $\beta$	0.8947	(0.8540–0.9286)	6.0911

Abbreviation: SEM, standard error of the mean.

Table 3. Interpretation of Scale Punctuation

Points	Sten	Interpretation
79 pts or less	1	Very low post-transplant adaptation
80–87 pts	2	Low post-transplant adaptation
88–96 pts	3	
97–105 pts	4	Borderline results
106–114 pts	5	Average post-transplant adaptation
115–122 pts	6	
123–131 pts	7	Borderline results
132–140 pts	8	High post-transplant adaptation
141–148 pts	9	
149 and more	10	Very high post-transplant adaptation

Abbreviation: pts, points.

### Professional Factors

There were many different parameters and many data lacking in the open questions. Thus, the questions in this part of the DPATQ draft were specified and grouped into several ranges. Most respondents worked with people but not animals. Many did not answer this question, especially for the post-transplant period. Thus, both questions were considered incomprehensible and were removed.

### Medical Factors

Similar to the professional part of the DPATQ draft, some partially open questions have many different parameters that resulted in the need to specify and group these questions into ranges. These questions were removed because of the variety of answers about related diseases and the adverse effects of immunosuppressive therapy; this made it difficult to perform statistical assessment. The questions about psychological or psychiatric treatment have also been removed because of the high percentage of negative answers.

### Physical Factors

Some points were strongly correlated in this part of the questionnaire. Thus, some of them have been removed after substantive analysis. The questions about sitting time have been also removed because of frequent misunderstanding.

### Psychological Factors

The remaining data suggest that selecting test positions in the psychological part of the questionnaire was efficient; the high internal consistency of the method was maintained as was its textual richness. The scale measured 1 factor (post-transplant adaptation). The scale's general result is characterized by a high content validity: it significantly correlates with the level of activity and it differentiates employed and unemployed patients. The test positions most closely related with the measured factor concern emotional factors related to basic activities. Thus, the psychological part of the method meets the initial assumptions. However, it would be beneficial to increase the research sample and develop norms for a sample larger than  $N = 200$ . The interpretation of scale punctuation is shown in [Table 3](#).

### CONCLUSIONS

The DPATQ is a new method for measuring post-transplant adaptation and other factors influencing employment status. It has good psychometric properties (reliability). The DPATQ may be useful in the preparation of vocational rehabilitation programs or in research. It can analyze problems with employment after solid organ transplant. The DPATQ might have diagnostic, auxiliary, and explanatory usefulness. It can define barriers in returning to work or in

starting work after surgery. It is useful to state proper timing after returning to work.

### ACKNOWLEDGMENTS

The study was funded by the PFRON, grant no. BEA/000034/BF/D. Statistical analysis was performed by Biostat, Kowalczyka Street, 44-205 Rybnik, Poland. English language was edited by AmericanManuscriptEditors.com.

### REFERENCES

- [1] Aberg F. From prolonging life to prolonging working life: tackling unemployment among liver-transplant recipients. *World J Gastroenterol* 2016;22:3701–11.
- [2] Gill JS, Tonelli M. Penny-wise, pound-foolish? Coverage limits on immunosuppression after kidney transplantation. *N Engl J Med* 2012;366:586–9.
- [3] Przygoda J, Borczon S, Łęczycka A, Pszeny A, Hermanowicz M, Danek T, et al. Rejestr przeszczepień narządów. Biuletyn informacyjny. *Poltransplant* 2017;1:49–52.
- [4] Czerwiński J, Antoszkiewicz K, Grygiel K, Karpeta E, Górski Ł, Dudkiewicz M, et al. National Transplants Registry in Poland: early and long-term results of organ transplantations in the years 1998 to 2014. *Transplant Proc* 2016;48:1407–10.
- [5] van der Mei SF, Kuiper D, Groothoff JW, van den Heuvel WJA, van Son WJ, Brouwer S. Long-term health and work outcomes of renal transplantation and patterns of work status during the end-stage renal disease trajectory. *J Occup Rehabil* 2011;21:325–34.
- [6] Sevarolli MDL, Loschi TM, Pereira E, Miyaura VTO, Baccan MDTA, Pavao DN. Epidemiologic profile of transplant patients treated by the physiotherapy. *Transplant Proc* 2018;50:831–4.
- [7] Petersen E, Baird BC, Barenbaum LL, Leviačov A, Koford JK, Shihab F, et al. The impact of employment status on recipient and renal allograft survival. *Clin Transplant* 2008;22:428–38.
- [8] Eng M, Zhang J, Cambon A, Marvin MR, Gleason J. Employment outcomes following successful renal transplantation. *Clin Transplant* 2012;26:242–6.
- [9] Nour N, Heck CS, Ross H. Factors related to participation in paid work after organ transplantation: perception of kidney transplant recipients. *J Occup Rehabil* 2015;25:38–51.
- [10] Huda A, Newcomer R, Harrington C, Blegen MG, Keeffe EB. High rate of unemployment after liver transplantation: analysis of the United Network for Organ Sharing Database. *Liver Transpl* 2012;18:90–100.
- [11] Adams PC, Ghent CN, Grant DR, Wall WJ. Employment after liver transplantation. *Hepatology* 1995;21:140–4.
- [12] Rongey C, Bambha K, Vanness D, Pedersen RA, Malinchoc M, Therneau TM, et al. Employment and health insurance in long-term liver transplant recipients. *Am J Transplant* 2005;5:1901–8.
- [13] Danuser B, Simcox A, Studer R, Koller M, Wild P, Psychosocial Interest Group, Swiss Transplant Cohort. Employment 12 months after kidney transplantation: an in-depth bio-psycho-social analysis of the Swiss Transplant Cohort. *PLoS One* 2017;12:e0175161.
- [14] Avery RK, Michaels MG, AST Infectious Diseases Community of Practice. Strategies for safe living after solid organ transplantation. *Am J Transplant* 2013;13:304–10.
- [15] Kristen AV, Ammon K, Koch A, Dosch AO, Erbel C, Celik S, et al. Return to work after heart transplantation: discrepancy with subjective work ability. *Transplantation* 2009;87:1001–5.