

Original article

Psychological inflexibility and clinical impact: Adaptation of the Acceptance and Action Questionnaire-II in a sample of patients on haemodialysis treatment[☆]

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ABSTRACT

Background and objectives: Few studies have investigated the role psychological inflexibility (PI) could have in the context of chronic renal failure. The primary objective of this study was to analyse the psychometric features, the reliability and the validity of the Spanish version of the Acceptance and Action Questionnaire-II (AAQ-II) adapted to the context of patients undergoing haemodialysis (HD). The secondary objective was to assess the relationship between PI and parameters related to the adherence to treatment and quality of life in these types of patients.

Materials and methods: Prospective cross-sectional study with patients on haemodialysis (N=186).

Results: The fat tissue index (15.56 ± 5.72 vs. 18.99 ± 8.91 , $P=0.033$), phosphorus levels (3.92 ± 1.24 vs. 4.66 ± 1.38 ; $P=0.001$) and interdialytic weight gain (1.56 ± 0.69 vs. 1.89 ± 0.93 , $P=0.016$) were higher in patients with a higher PI score. Phosphorus levels ($P=0.013$) significantly explained the variability of PI levels. PI was also shown as a significant predictor ($P=0.026$) of the variability of phosphorus levels.

Conclusions: The adaptation of the AAQ-II questionnaire to the HD context led to a valid and reliable measurement of PI in these types of patients and our results also seem to support the

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relationship between PI and health and quality of life parameters in patients with chronic conditions.

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Inflexibilidad psicológica e impacto clínico: adaptación del Cuestionario de aceptación y acción-II en una muestra de pacientes en tratamiento de hemodiálisis

R E S U M E N

Palabras clave:

Inflexibilidad psicológica
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Antecedentes y objetivos: Apenas existen estudios que hayan investigado el papel que la inflexibilidad psicológica (IP) pudiera tener en el contexto de la IRC. El objetivo primario de este estudio fue analizar las propiedades psicométricas, la fiabilidad y la validez de la versión española del Acceptance and Action Questionnaire – II (AAQ-II) adaptada al contexto de pacientes en tratamiento de hemodiálisis (HD). El objetivo secundario fue analizar la relación entre IP y parámetros relacionados con la adhesión al tratamiento y calidad de vida en este tipo de pacientes.

Materiales y métodos: Estudio transversal prospectivo con pacientes en hemodiálisis (N = 186). **Resultados:** El índice de tejido graso ($15,56 \pm 5,72$ vs. $18,99 \pm 8,91$; $p = 0,033$), los niveles de fósforo ($3,92 \pm 1,24$ vs. $4,66 \pm 1,38$; $p = 0,001$) y la ganancia de peso interdiálisis ($1,56 \pm 0,69$ vs. $1,89 \pm 0,93$; $p = 0,016$) fueron mayores en los pacientes con más puntuación en IP. Los niveles de fósforo ($p = 0,013$) explicaron de forma significativa la variabilidad de los niveles de IP, la cual también se mostró como un predictor significativo ($p = 0,026$) de la variabilidad de los niveles de fósforo.

Conclusiones: La adaptación del cuestionario AAQ-II al contexto de HD da lugar a una medida válida y fiable de la IP para este tipo de pacientes y los resultados de este estudio parecen apoyar el papel de la IP con relación a parámetros de salud y calidad de vida en el ámbito de las patologías crónicas.

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Introduction

Psychological inflexibility (PI) is the central concept of acceptance and commitment therapy (ACT), and is defined as a rigid pattern of behaviour in which the person lets their actions be guided by fleeting internal experiences instead of freely chosen values.¹ In other words, it is a process of behaviour regulation, consisting of avoiding and/or escaping unwanted internal events (thoughts, memories, feelings, sensations, etc.), even when doing so means behaving in a way which is incompatible with one's own values and goals. In contrast, psychological flexibility refers to one's ability to focus on the present moment and, based on what the situation affords, to change or persist with behaviour in the search for goals and values.^{2,3}

There is a great deal of empirical evidence to support the maladaptive role of PI.³ First of all, a strong correlation has been demonstrated between PI and a wide range of psychological symptoms, particularly anxiety, depression, stress and somatic complaints in the field of healthcare.^{4–7} Secondly, there is a strong negative correlation with measurements of general health and quality of life.^{8,9} PI is also a factor mediating the effects of a wide variety of psychological constructs and psychological symptoms.¹⁰ Lastly, it adds a greater

predictive validity for psychological symptoms than other existing constructs.¹¹ PI is, moreover, the key process within ACT, which we propose is of greater utility in the approach to chronic diseases than other psychotherapeutic models.^{12,13}

The instrument most used to assess PI is the Acceptance and Action Questionnaire (AAQ). Both the first version¹⁴ and the second, which resulted in an instrument with greater validity and reliability,¹⁵ are validated in Spanish. The psychological intervention model to which this instrument belongs suggests that the concept of PI may vary across different contexts.¹⁶ As a result, a multitude of versions of the AAQ have been adapted to different scenarios, both work-related¹⁷ and in health. For example, there are versions of the AAQ specifically adapted to chronic diseases such as: chronic pain,¹⁸ diabetes,¹⁹ cancer,²⁰ obesity,²¹ epilepsy,²² etc. These studies have described significant relationships between PI and the worsening of symptoms, quality of life and adherence to treatment.

Various studies have investigated the role of acceptance (a process related to the concept of PI) as a strategy to cope with the disease in patients with chronic renal failure.^{23–25} However, to our knowledge, we are the first to study the concept of acceptance proposed by the ACT model, which is understood as an experiential domain sub-dimension (not as a coping

strategy), the function of which is to promote the psychological flexibility of the individual to enable him to focus on his personal values. Therefore, the primary objective of this study was to analyse the psychometric properties, reliability and validity of the Spanish version of the AAQ-II adapted to patients on haemodialysis (HD). The secondary objective was to analyse the relationship between the PI variable and the parameters related to adherence to treatment and quality of life in this type of patient.

Material and methods

Participants

We conducted a prospective, cross-sectional study with outpatients in the HD programme at the Fresenius Medical Care clinics in the province of Cordoba (San Rafael, Pintor García Guijo, Cabra and Palma del Río), Spain. From the potential sample from the four clinics ($n=316$), we selected patients ($n=186$) who met the inclusion criteria: 1) ability to understand and speak Spanish; 2) aged 18–90; 3) have provided a signed informed consent form for the study; 4) more than six months on HD; and 5) not suffer from cognitive impairment or a serious mental disorder. A total of 130 patients were therefore excluded, which resulted in a 58% response rate to the study. After that, we requested authorisation from the Hospital Universitario Reina Sofía Independent Ethics Committee (IEC), which we received in June 2017.

Measuring instruments

The following instruments were applied:

- COOP-WONCA quality of life charts using the Arenas et al version.²⁶ This is a general questionnaire for assessing health-related quality of life consisting of nine items that rate the following dimensions: 1) physical fitness; 2) feelings; 3) daily activities; 4) social activities; 5) changes in health; 6) overall health; 7) pain; 8) social support; and 9) general quality of life. Each of the dimensions refers to what happened in the last two weeks and is answered with a Likert scale that scores from 1 to 5, with the highest scores reflecting the worst perceived health. In the end, an overall score is obtained corresponding to the sum of all dimensions, except for item 5 which, having a bipolar structure, has a different reading from the rest of the dimensions.²⁷ For the present study it showed a good Cronbach's Alpha (0.77).
- Acceptance and Action Questionnaire-II for patients on haemodialysis (AAQHD-II) This instrument (Appendix Table) assesses the level of PI in the context of certain thoughts (items 2 and 3), fears (item 6), treatment regimens (items 4 and 5), situations related to the HD therapy (item 1) and how the treatment regimens affect the patient's life (item 7). It is a seven-item questionnaire with a five-point Likert scale (1= *never true*, 2= *very seldom true*, 3= *sometimes true*, 4= *frequently true*, 5= *always true*). The instrument showed a good Cronbach's Alpha (0.72), grouping the items into one single factor, just like the original questionnaire.

- Hospital Anxiety and Depression Scale (HADS), Spanish version by Terol et al.²⁸ This instrument assesses the emotional responses of anxiety and depression in patients with physical and mental disorders and in general population without taking into account somatic symptoms, so limiting the chance of the symptoms of the disease contributing to the scores.^{29,30} It contains 14 items with a four-point Likert response format ranging from 0 to 3: the higher the score the worse the anxiety or depression. It is made up of two sub-scales: one for anxiety and the other for depression. In this study, a good Cronbach's Alpha (0.83) was obtained, both for the anxiety and the depression sub-scales.

Sociodemographic and medical variables

Sociodemographic variables included the dialysis centre, gender, age, marital status, educational level and employment status. Clinical variables included active prescription of psychiatric drugs, time on HD, transplant waiting list, Charlson comorbidity index score, presence of diabetes and type of vascular access. In addition, the average dialysis dose for the month was estimated, measured as Kt/V calculated using the On-line Clearance Monitor (Fresenius Medical Care), Kt On-line Clearance Monitor or eKt/V, the mean pre-HD systolic blood pressure for the month and interdialysis weight gain. We also collected the lab analysis results for that month for potassium, sodium, haemoglobin, transferrin saturation, C-reactive protein, albumin, phosphorus (P) and calcium. Finally, we measured the patients' relative hydration status by bioimpedance spectroscopy and their body composition using the BCM[®] device (Body Composition Monitor; Fresenius Medical Care), recording the relative overhydration, lean tissue mass, adipose tissue mass, fat tissue mass, lean tissue index, fat tissue index, relative lean tissue mass and relative fat tissue mass. The information for the clinical variables was obtained from the Euclid database³¹ belonging to Fresenius Medical Care. The data were collected in June and July 2017.

Procedure

The AAQHD-II was created after a review of items in the Spanish version of the AAQ-II¹⁵ and other versions of said instrument used for the study of diabetes,¹⁹ cancer²⁰ and obesity.²¹ The whole AAQHD-II development process was reviewed and agreed on by an interdisciplinary team (nephrologist, psychologist, social worker and nurse) with extensive experience in the treatment of patients on HD. A battery of ten items was then put together and reviewed by another psychologist, author of the Spanish version of the AAQ-II. That battery was administered to a group of six patients on HD to assess their degree of understanding of the items. After evaluating the patients' opinions on completing the questionnaire, three items which seemed ambiguous were removed, while the term HD was replaced by the word dialysis; as the patients are more familiar with that. By consensus from the start, the specialists involved in adapting the questionnaire considered the use of a five-point Likert scale, rather than the seven points in the original scale, to make it easier to understand the response format in view of the advanced age of the target patients.

The evaluation protocol was carried out in the treatment rooms during the patients' haemodialysis sessions by three assessors previously trained in completing the questionnaires. The aims of the study were explained to the patients prior to the questionnaire evaluation, and the questionnaires along with the study instructions were administered to those who agreed to take part by signing the informed consent form. Completion time ranged from 20 to 30 min.

Statistical analysis

Cronbach's alpha and its 95% confidence interval (CI) were calculated to analyse the internal consistency of the AAQHD-II. The item-total correlations were calculated to identify items that should be removed due to a low discrimination index (values below 0.20). The suitability of the data for a factor analysis was measured with the Kaiser-Meyer-Olkin test. After that, an exploratory factor analysis was carried out using the robust unweighted least squares extraction method using polychoric correlations with the program Factor 10.8.03.³² The number of dimensions was determined by means of a parallel analysis based on the Minimum Rank Factor Analysis.³³

In order to verify the convergent validity of the instrument, Pearson's correlations were made between PI and the psychological symptoms (anxiety and depression), and health-related quality of life dimensions.

The data are presented as mean \pm standard deviation for continuous variables with normal distribution, median and interquartile range (25th percentile-75th percentile) for non-normal continuous variables or percentages for categorical variables.

Those who scored more than 20 points on the AAQHD-II test were defined as inflexible patients. This value was chosen because it is a standard deviation above the mean of the AAQHD-II variable, and also for being the cut-off value of the upper quartile of the distribution.

To verify the possible existence of significant differences between the flexible and inflexible patients for the different variables recorded in the study, the Chi-square statistical tests were applied for the categorical variables, Student's *t* for the normal continuous variables and the Mann-Whitney *U* test for continuous non-normal variables.

To identify variables associated with PI, a multiple linear regression analysis was performed in which clinical or psychological variables that were significant in the bivariate analysis were included as independent variables.

All statistical analyses were performed using the statistical package SPSS version 23.0. The level of statistical significance was set at $P < 0.05$.

Results

Characteristics of the study participants

The characteristics of the sample used are detailed in Table 1. A total of 186 patients were assessed, 113 (60.8%) male and 73 (39.25%) female. The mean age was 70.17 ± 1.01 years, 97.85% were pensioners or retired, 33.87% had diabetes and the Charlson comorbidity index was 4.

Characteristics of the participants based on the degree of psychological inflexibility

Table 2 shows a comparison of patient scores based on a high or low PI score. Among the sociodemographic variables we found a significant association between PI and gender ($P = 0.005$). In terms of health-related quality of life, the most inflexible patients obtained the worst scores (24.67 ± 5.91 ; $P < 0.000$). In the emotional symptoms, the most inflexible patients had the highest scores for both anxiety ($P < 0.000$) and depression ($P < 0.000$). Among the medical variables, the most inflexible patients were more likely to be taking psychoactive drugs ($P = 0.034$). The fat tissue index (18.99 ± 8.91 ; $P = 0.033$), phosphorus levels (4.66 ± 1.38 ; $P = 0.001$) and interdialytic weight gain (1.89 ± 0.93 ; $P = 0.016$) were also increased in patients with a higher PI score.

Psychometric analysis of the Acceptance and Action Questionnaire-II for patients on haemodialysis

As already mentioned in the section on instruments, the AAQHD-II showed acceptable internal consistency in this study. Table 3 shows the content of the items and corrected item-total correlations. The corrected item-total correlations varied from 0.28 (item 4) to 0.61 (item 3). As all scores were greater than 0.20, no items were eliminated because of a low level of discrimination.

The results showed that the data were appropriate for performing an exploratory factor analysis in view of the fact that Bartlett's test was statistically significant (290.8 [21], $P < 0.001$) and the results of the Kaiser-Meyer-Olkin test were acceptable (0.71). The parallel analysis recommended extracting a single factor that explained 44.31% of the variance (self-value of 3.10). The factor loadings of the items varied from 0.35 (item 4) to 0.81 (item 3) (Table 3)

Evidence of convergent validity

Table 4 shows the correlations between the AAQHD-II and the other instruments. The total AAQHD-II score was significantly correlated with both the anxiety ($r = 0.54$, $P = 0.000$) and the depression ($r = 0.51$, $P = 0.000$) sub-dimensions, assessed with the Hospital Anxiety and Depression Scale, and with the total score for health-related quality of life ($r = 0.45$, $P = 0.000$), assessed with the COOP-WONCA charts, and the following sub-dimensions: social activity ($r = 0.42$, $P = 0.000$), daily activities ($r = 0.40$, $P = 0.000$), feelings ($r = 0.36$, $P = 0.000$), overall health (0.32 , $P = 0.000$), quality of life in general ($r = 0.31$, $P = 0.000$), physical fitness ($r = 0.23$, $P = 0.001$) and change in health ($r = 0.14$, $P = 0.004$).

Multivariate regression analysis for the prediction of psychological inflexibility

The results of the multivariate regression analysis are presented (Table 5) with the variables that showed statistical significance in the prediction of PI in the univariate analysis. This analysis shows how the variables being female, health-related quality of life, anxiety, depression, time on HD, albumin, fat tissue index, calcium levels, phosphorus levels

Table 1 – Sociodemographic, quality of life, psychological and medical characteristics of the patients (n = 186).

[17,0]Sociodemographic	[3,0]Clinical	1	44.09%
		2	21.51%
		3	26.88%
		4	7.53%
	Gender	% Female	39.25%
	Age	Years	70.17 ± 1.01
	4,0Marital status	Single	12.37%
		Married	61.83%
		Cohabiting partner	2.69%
		Separated/divorced	4.30%
		Widowed	18.82%
	[3,0]Educational level	No schooling	51.08%
		Primary	31.18%
		Secondary	11.29%
		University	6.45%
	[2,0]Employment status	No data	0.54%
		Unemployment	1.61%
		Pensioner/retired	97.85%
Quality of life	Health-related quality of life		21.41 ± 0.39
[2,0]Psychological	Psychological inflexibility		15 (11–19)
	Anxiety		5 (2.75–8)
	Depression		5 (3–8)
[270]Medical	On psychiatric drugs	Yes	34.41%
	Time on haemodialysis (months)		53 (26.75–104)
	Renal transplant waiting list	Yes	10.75%
	Charlson Comorbidity Index (CCI) score		4 (2–5)
	Diabetic	Yes	33.87%
	Vascular access	(Catheter)	20.43%
	OCM Kt/V		1.91 ± 0.03
	OCM Kt		57.91 ± 0.72
	eKt/V		1.7 ± 0.04
	K (mmol/l)		5.2 ± 0.06
	Na (mmol/l)		139.12 ± 0.2
	Haemoglobin (g/dl)		11.33 ± 0.1
	Transferrin saturation (%)		21 (16–28)
	C-reactive protein (mg/l)		7.2 (2.8–15.83)
	Pre-HD relative overhydration (%)		11.4 (5.7–16.7)
	pre-SBP (mmHg)		133.2 ± 1.73
	Albumin (g/dl)		3.67 ± 0.02
	Lean tissue mass (kg)		30.47 ± 0.72
	Adipose tissue mass (kg)		42.74 ± 1.31
	Fat tissue mass (kg)		31.41 ± 0.95
	Lean tissue index (kg/m ²)		11.41 ± 0.22
	Fat tissue index (kg/m ²)		16.25 ± 0.49
	Relative lean tissue mass (%)		41.35 ± 0.92
	Relative fat tissue mass (%)		40.45 ± 0.72
	Total Ca present month (mg/dl)		8.84 ± 0.05
	P (mg/dl)		4.07 ± 0.1
	HbA1c (last 3 months) (%)		6.57 ± 0.14
	Inter-HD weight gain (kg)		1.62 ± 0.75

HD: haemodialysis; pre-SBP: pre-dialysis systolic blood pressure.

and inter-HD weight gain explain a large portion of the PI ($R^2 = 46\%$, $P = 0.000$). However, the only ones to show statistical significance were: anxiety ($P = 0.000$), depression ($P = 0.009$) and phosphorus levels ($P = 0.013$).

Multivariate regression analysis for the prediction of phosphorus levels

The results of the multivariate regression analysis are presented (Table 6) with the variables that showed statistical

significance in the prediction of phosphorus levels in the univariate analysis. This analysis shows how the variables being a woman, age, being single, married, separated/divorced, widowed, PI, anxiety, systolic blood pressure, potassium levels and inter-HD weight gain partly explain the variability of phosphorus levels ($R^2 = 23\%$, $P = 0.000$). However, the only ones to show statistical significance were being female ($P = 0.014$), age ($P = 0.000$), PI ($P = 0.026$), systolic blood pressure ($P = 0.016$) and potassium levels ($P = 0.004$).

Table 2 – Sociodemographic, quality of life, psychological and medical characteristics according to the degree of psychological inflexibility.

		AAQHD-II	Flexible <20	Inflexible ≥20	P	
		N	147	39		
[13,0]Sociodemographic	Gender	% Female	34.01%	58.97%	0.005	
	Age	Years	70.87 ± 14.16	67.51 ± 12.33	0.179	
	Marital status	Single		13.61%	7.69%	0.279
		Married		62.59%	58.97%	
		Cohabiting partner		2.72%	2.56%	
		Separated/divorced		2.72%	10.26%	
	Educational level	Widowed		18.37%	20.51%	0.263
		No schooling		51.02%	51.28%	
		Primary		30.61%	33.33%	
		Secondary		10.20%	15.38%	
Employment status	University		8.16%	0.00%	0.581	
	No data		0.68%	0.00%		
	Unemployed		2.04%	0.00%		
Quality of life	Pensioner/retired		97.28%	100.00%		
	Health-related quality of life		20.54 ± 4.89	24.67 ± 5.91	0.000	
[1,0]Psychological	Anxiety		4 (2–7)	8 (5–13)	0.000	
	Depression		4 (3–7)	8 (6–10)	0.000	
	On psychiatric drugs	Yes		30.61%	48.72%	0.034
	Time on haemodialysis (months)		53 (23–104)	53 (32–94)	0.991	
	Renal transplant waiting list	Yes		10.88%	10.26%	0.910
	CCI		4 (2–5)	4 (3–5)	0.243	
	Diabetic	Yes		30.61%	46.15%	0.068
	Vascular access	(catheter)		19.05%	25.64%	0.364
	OCM Kt/V			1.92 ± 0.42	1.85 ± 0.37	0.297
	OCM Kt			57.38 ± 9.09	59.86 ± 11.97	0.161
[27,0]Medical	eKt/V		1.68 ± 0.31	1.77 ± 0.42	0.288	
	K (mmol/l)		5.21 ± 0.84	5.18 ± 0.74	0.863	
	Na (mmol/l)		139.32 ± 2.73	138.38 ± 2.58	0.056	
	Haemoglobin (g/dl)		11.33 ± 1.38	11.35 ± 1.2	0.954	
	Transferrin saturation (%)		22 (16–28)	21 (16–29)	0.738	
	C-reactive protein (mg/l)		6.9 (2.1–17.1)	8.2 (4.4–14.9)	0.376	
	Pre-dialysis relative overhydrat. (%)		11.7 (6.4–16.7)	9.2 (3.05–15.38)	0.112	
	pre-SBP (mmHg)		131.82 ± 22.56	138.41 ± 26.91	0.122	
	Albumin (g/dl)		3.68 ± 0.32	3.63 ± 0.29	0.313	
	Lean tissue mass (kg)		30.11 ± 8.42	31.94 ± 13.5	0.309	
	Adipose tissue mass (kg)		41.17 ± 15.52	48.97 ± 22.92	0.060	
	Fat tissue mass (kg)		30.26 ± 11.4	35.99 ± 16.85	0.060	
	Lean tissue index (kg/m ²)		11.22 ± 2.45	12.17 ± 4.43	0.223	
	Fat tissue index (kg/m ²)		15.56 ± 5.72	18.99 ± 8.91	0.033	
	Relative lean tissue mass (%)		41.61 ± 11.62	40.3 ± 14.99	0.570	
	Relative fat tissue mass (%)		40.07 ± 9.05	41.97 ± 11.6	0.364	
	Total Ca present month (mg/dl)		8.86 ± 0.66	8.77 ± 0.63	0.491	
P (mg/dl)		3.92 ± 1.24	4.66 ± 1.38	0.001		
HbA1c (last 3 months) (%)		6.52 ± 0.95	6.71 ± 1.29	0.524		
Inter-HD weight gain (kg)		1.56 ± 0.69	1.89 ± 0.93	0.016		

HD: haemodialysis; pre-SBP: pre-dialysis systolic blood pressure.

Table 3 – Analysis of AAQHD-II item-rest correlation.

Item	Corrected item-total correlation	Factor loadings
Item 1. I try to avoid any thing or situation that reminds me of my dialysis	0.47	0.70
Item 2. My concerns about dialysis take up much of my time day to day.	0.57	0.76
Item 3. I very often think I depend on a dialysis machine	0.61	0.81
Item 4. My desire to drink is stronger than my willpower when it comes to controlling what I drink	0.28	0.35
Item 5. I can't stand the pressure of following my diet	0.37	0.47
Item 6. I avoid doing any physical activity (walking, etc) for fear of not being able to do it	0.42	0.58
Item 7. I avoid social situations to control what I eat and drink	0.34	0.40

Table 4 – Relationship between AAQHD-II scores, psychological symptoms and quality of life dimensions.

Variable	r	P
Anxiety	0.54	0.000
Depression	0.51	0.000
Health-related quality of life (total COOP/WONCA charts)	0.45	0.000
Social activity	0.42	0.000
Daily activities	0.40	0.000
Feelings	0.36	0.000
Overall health	0.32	0.000
General quality of life	0.31	0.000
Physical fitness	0.23	0.001
Change in health	0.14	0.004

Table 5 – Multivariate linear regression to identify predictors of psychological inflexibility.

		B	Std. Error	P coefficients	P model	R ²
Sociodemographic	Intercept	15.369	5.121	0.003		
	Gender					
Quality of life	[0,2-3]Health-related quality of life	0.146	0.083	0.081		
	[0,2-3]Anxiety	0.481	0.098	0.000		
[1,0]Psychological	[0,2-3]Depression	0.317	0.120	0.009		
	Time on haemodialysis (months)	-0.008	0.005	0.086	[10,0]0.000	[10,0]0.469
	Albumin (g/dl)	-0.578	1.094	0.598		
[5,0]Medical	Fat tissue index (kg/m ²)	0.033	0.052	0.524		
	Total Ca present month (mg/dl)	-0.905	0.533	0.091		
	P (mg/dl)	0.608	0.243	0.013		
	Inter-HD weight gain (kg)	0.503	0.483	0.299		

HD: haemodialysis.

Discussion

In this study, we analysed the psychometric properties, reliability and validity of the Spanish version of the AAQ-II adapted to patients on HD. The data obtained provide good evidence that the adaptation of AAQHD-II is a valid and reliable measurement for assessing PI in the context of patients receiving this therapy. In general, the data are similar to the Spanish version of the questionnaire obtained by Ruiz et al.¹⁵ Specifically, the results showed that the AAQHD-II obtained: a) acceptable internal consistency; b) construct validity (parallel analysis recommended extracting only one single factor); and c) convergent validity, as it was correlated with both psychological symptoms (anxiety and depression) and the levels of health-related quality of life and its different sub-dimensions.

This is the first study in which PI levels have been assessed in patients on HD, this being a psychological construct of great interest for the study of psychopathology and quality of life in the area of chronic diseases.^{13,34} We specifically looked

at how this construct might be associated with parameters related to treatment adherence and quality of life in this type of patient. A significant relationship was found between PI and the variables gender, quality of life, anxiety, depression, taking of psychiatric drugs, fat tissue index, phosphorus and interdialytic weight gain. Only anxiety, depression and phosphorus levels were independent predictors of PI levels in the multivariate model.

Also interesting was the relationship found between PI and P levels. In the multivariate linear analysis, PI presented as an independent predictor of P levels, which shows that this psychological characteristic could be an added factor to take into account in patients with poor control of P.

The lack of studies on the assessment of PI in the context of chronic renal failure makes comparison with other results impossible. However, it is relevant to mention other studies carried out in other chronic diseases on the relationships between that construct and different health and quality of life outcomes.

Table 6 – Multivariate linear regression to identify predictors of p.

			B	Std. Error	p coefficients	p model	R ²
	Intercept		1.7999	0.945	0.059		
	Gender	Female	0.464	0.187	0.014		
	Age	Years	-0.026	0.006	0.000		
[6,0]Sociodemographic	Single		0.201	0.284	0.480		
	Married		0.341	0.347	0.509		
	Cohabiting partner		0.712	0.554	0.200		
	Separated/divorced		0.804	0.496	0.107	[12,0]0.000	[12,0]0.237
	Widowed		0.020	0.261	0.940		
[1,0]Psychological	Psychological inflexibility		0.037	0.016	0.026		
	Anxiety		0.009	0.027	0.730		
[2,0]Medical	SBP (mmHg)		0.009	0.004	0.016		
	K (mmol/l)		0.316	0.109	0.004		
	Inter-HD weight gain (kg)		0.113	0.131	0.389		

HD: haemodialysis; SBP: systolic blood pressure.

In two randomised controlled trials with diabetes patients it was found that patients who were trained in coping strategies for the promotion of psychological flexibility (mindfulness, acceptance strategies and clarification of values), reported better management of their diabetes (diet, exercise and glucose measurement) and achieving normal-range levels of glycosylated haemoglobin (HbA1c) after this intervention.³⁵

In obese and overweight patients, the application of strategies to promote psychological flexibility (cognitive distancing and acceptance of psychological reactions deriving from their disorder) resulted, at three and six months post-treatment, in significantly greater weight loss than that established in standard behavioural intervention programmes. Lillis et al. randomly assigned 84 overweight people who had lost weight in the previous two years to a waiting list control group or a mindfulness and acceptance workshop aimed at stigma related to obesity and psychological distress. After three months, patients who had participated in the intervention condition (mindfulness and acceptance) showed improvements in the stigma related to obesity, quality of life, psychological distress and body mass level, as well as improvements in tolerance to the anguish and greater psychological flexibility in the face of the difficulties associated with weight loss. The mediation analysis revealed that changes in coping strategies based on acceptance and psychological flexibility mediated changes in the outcomes.^{36,37}

There have also been several studies in cancer in which interventions have been carried out to promote psychological flexibility and its relationship with better health outcomes in this type of patient. After performing an intervention based on ACT (identification of problematic thoughts/feelings, mindfulness and clarification of values/planning of activities in relation to these) in cancer patients, Feros et al. found improvements in the measurements assessed (psychological distress, depression, psychological flexibility and quality of life) after treatment and at the 3-month follow-up, compared to the pre-treatment assessment. The regression analysis showed that changes in the levels of psychological flexibility predicted changes in the variables quality of life, psychological distress and depression.³⁸ In another study, in patients with high levels of anxiety-depression after reactivation of cancer, an intervention in promotion of psychological flexibility resulted in the improvement of a wide variety of not only negative aspects (anxiety, depression and specific cancer problems: fear of recurrence, cancer-related trauma symptoms and physical pain), but also positive aspects (vitality, sense of life meaning, comprehensibility, manageability). At the same time, changes in the levels of psychological flexibility related to cancer predicted most of the outcomes measured: depression ($P = 0.04$), physical pain ($P = 0.03$), traumatic impact of the cancer ($P = 0.01$), vitality ($P = 0.03$), life meaning ($P = 0.03$) and manageability ($P = 0.04$). It also nearly predicted changes in anxiety ($P = 0.06$) and comprehensibility of life ($P = 0.08$), which is consistent with the hypothesis of the mediating role of PI.²⁰

The main limitation of this study is its cross-sectional design, as conclusions can only be obtained based on the relationship or association between variables. In fact, it does not allow us to assess whether a higher PI is a consequence of the impact of problems related to the HD (treatment dependence, diet adherence, weight control, taking of medication, physical

symptoms, etc.). Other limitations are the fact we included a wide range of patients (aged from 18 to 90), and that the sample includes very different profiles in terms of whether or not they are on the transplant waiting list. A stratification by age ranges and dividing the sample (patients on waiting list versus those who are not) would have given more specific information by groups.

The present findings also highlight the benefits of assessing PI in relation to a specific context. Future research could use the AAQHD-II to assess whether it shows better prediction or mediation in cross-sectional and longitudinal studies, or even after an intervention promoting psychological flexibility in patients on HD.

The association found between PI and phosphorus opens up the possibility of new pathways for psychological intervention to improve the quality of life of these patients. Moreover, this highlights the importance of the interdisciplinary approach and the nephrologist-psychologist interaction in the care of patients with chronic renal failure.

Conclusion

The adaptation of the AAQ-II questionnaire to the HD context has produced a valid and reliable measure of PI for this type of patient. The results of this study contribute to the creation of a body of evidence supporting the role of PI in relation to health parameters and quality of life in chronic diseases. Further research is needed into the role of PI in patients with chronic renal failure on treatment with HD and its impact on health-related quality of life.

Conflicts of interest

The authors have no conflicts of interest to declare.

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Appendix A

Acceptance and Action Questionnaire-II for patients on haemodialysis (AAQHD-II).

Below you will find a list of statements. Please rate how *true each statement is for you* by selecting a number next to it. Use the scale below to make your choice.

	Never true	Very seldom true	Sometimes true	Frequently true	Always true
1. I try to avoid any thing or situation that reminds me of my dialysis	1	2	3	4	5
2. Worrying about dialysis takes up much of my time day to day	1	2	3	4	5
3. I very frequently think about the fact that I depend on a dialysis machine	1	2	3	4	5
4. My desire to drink is stronger than my willpower when it comes to controlling what I drink	1	2	3	4	5
5. I can't stand the pressure of keeping to my diet	1	2	3	4	5
6. I avoid doing any physical activity (walking, etc) for fear of not being able to do it	1	2	3	4	5
7. I avoid social situations to control what I eat and drink	1	2	3	4	5

REFERENCES

- Bond FW, Hayes SC, Baer RA, Carpenter KM, Guenole N, Orcutt HK, et al. Preliminary psychometric properties of the acceptance and action questionnaire-II: a revised measure of psychological inflexibility and experiential avoidance. *Behav Ther.* 2011;42:676–88.
- Hayes SC, Strosahl KD, Wilson KG. *Acceptance and commitment therapy: an experiential approach to behavior change.* New York: Guilford Press; 1999.
- Hayes SC, Smith S, Wilson KG. *Terapia de aceptación y compromiso: proceso y práctica del cambio consciente (mindfulness).* Bilbao: Desclée de Brouwer; 2014.
- Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: model, processes and outcomes. *Behav Res Ther.* 2006;44:1–25.
- Bohlmeijer ET, Fledderus M, Rokx TA, Pieterse ME. Efficacy of an early intervention based on acceptance and commitment therapy for adults with depressive symptomatology: Evaluation in a randomized controlled trial. *Behav Res Ther.* 2011;49:62–7.
- Fledderus M, Bohlmeijer ET, Pieterse ME, Schreurs KM. Acceptance and commitment therapy as guided self-help for psychological distress and positive mental health: a randomized controlled trial. *Psychol Med.* 2012;42:485–95.
- Brinkborg H, Michanek J, Hesser H, Berglund G. Acceptance and commitment therapy for the treatment of stress among social workers: a randomized controlled trial. *Behav Res Ther.* 2011;49:389–98.
- A-Tjak JG, Davis ML, Morina N, Powers MB, Smits JA, Emmelkamp PM. A meta-analysis of the efficacy of acceptance and commitment therapy for clinically relevant mental and physical health problems. *Psychother Psychosom.* 2015;84:30–6.
- Berghoff CR, Tull MT, DiLillo D, Messman-Moore T, Gratz KL. The role of experiential avoidance in the relation between anxiety disorder diagnoses and future physical health symptoms in a community sample of young adult women. *J Contextual Behav Sci.* 2017;6:29–34.
- Eustis EH, Hayes-Skelton SA, Roemer L, Orsillo SM. Reductions in experiential avoidance as a mediator of change in symptom outcome and quality of life in acceptance-based behavior therapy and applied relaxation for generalized anxiety disorder. *Behav Res Ther.* 2016;87:188–95.
- Farach FJ, Mennin DS, Smith RL, Mandelbaum M. The impact of pretrauma analogue GAD and posttraumatic emotional reactivity following exposure to the September 11 Terrorist Attacks: a longitudinal study. *Behav Ther.* 2008;39:262–76.
- Gloster AT, Klotsche J, Chaker S, Hummel KV, Hoyer J. Assessing psychological flexibility: what does it add above and beyond existing constructs? *Psychol Assess.* 2011;23:970–82.
- Graham CD, Gouick J, Krahé C, Gillanders D. A systematic review of the use of Acceptance and Commitment Therapy (ACT) in chronic disease and long-term conditions. *Clin Psychol Rev.* 2016;46:46–58.
- Barraca-Mairal J. Spanish adaptation of the acceptance and action questionnaire (AAQ). *Int J Psychol Psychol Ther.* 2004;4:505–15.
- Ruiz FJ, Langer-Herrera AI, Luciano C, Cangas AJ, Beltrán I. Measuring experiential avoidance and psychological inflexibility: the Spanish version of the acceptance and action questionnaire-II. *Psicothema.* 2013;25:123–9.
- Bond FW, Lloyd J, Guenole N. The work-related acceptance and action questionnaire: Initial psychometric findings and their implications for measuring psychological flexibility in specific contexts. *J Occup Organ Psychol.* 2013;86:331–47.
- Ruiz FJ, Odriozola-González P. The Spanish version of the work-related acceptance and action questionnaire (WAAQ). *Psicothema.* 2014;26:63–8.
- Fish RA, McGuire B, Hogan M, Morrison TG, Stewart I. Validation of the Chronic Pain Acceptance Questionnaire (CPAQ) in an internet sample and development and preliminary validation of the CPAQ-8. *Pain.* 2010;149:435–43.
- Gregg JA, Callaghan GM, Hayes SC, Glenn-Lawson JL. Improving diabetes self-management through acceptance, mindfulness, and values: a randomized controlled trial. *J Consult Clin Psychol.* 2007;75:336–43.
- Arch JJ, Mitchell JL. An Acceptance and Commitment Therapy (ACT) group intervention for cancer survivors experiencing anxiety at re-entry. *Psychooncology.* 2016;25:610–5.
- Lillis J, Hayes SC. Measuring avoidance and inflexibility in weight related problems. *Int J Behav Consult Ther.* 2008;4:30–40.

22. Lundgren T, Dahl J, Hayes SC. Evaluation of mediators of change in the treatment of epilepsy with acceptance and commitment therapy. *J Behav Med.* 2008;31:225-35.
23. Keogh AM, Feehally J. A quantitative study comparing adjustment and acceptance of illness in adults on renal replacement therapy. *ANNA J.* 1999;26:471-7.
24. Gillanders S, Wild M, Deighan C, Gillanders D. Emotion regulation, affect, psychosocial functioning, and well-being in hemodialysis patients. *Am J Kidney Dis.* 2008;51:651-62.
25. Poppe C, Crombez G, Hanouille I, Vogelaers D, Petrovic M. Improving quality of life in patients with chronic kidney disease: influence of acceptance and personality. *Nephrol Dial Transplant.* 2013;28:116-21.
26. Arenas MD, Moreno E, Reig A, Millán I, Egea JJ, Amoedo ML, et al. Evaluation of health-related quality of life (HRQL) based on information from Coop/Wonca sheets in hemodialysis patients. *Nefrología.* 2004;24:470-9.
27. Van Weel C. Functional status in primary care: COOP/WONCA charts. *Disabil Rehabil.* 1993;15:96-101.
28. Terol MC, López-Roig S, Rodríguez-Marín J, Martín-Aragón M, Pastor MA, Reig MT. Propiedades psicométricas de la Escala Hospitalaria de Ansiedad y Depresión (HAD) en población Española./Hospital Anxiety and Depression Scale (HAD): psychometric properties in Spanish population. *Ansiedad y Estrés.* 2007;13:163-76.
29. Pérez Domínguez TS, Rodríguez Pérez A, Buset Ríos N, Rodríguez Esparragón F, García Bello MA, Pérez Borges P, et al. Psiconefrológia: aspectos psicológicos en la poliquistosis renal autosómica dominante. *Nefrología.* 2011;31:716-22.
30. Perales-Montilla CM, Duschek S, Reyes-del Paso GA. Influencia de los factores emocionales sobre el informe de síntomas somáticos en pacientes en hemodiálisis crónica: relevancia de la ansiedad. *Nefrología.* 2013;33:816-25.
31. Pérez-García R, Palomares-Sancho I, Merello-Godino JJ, Aljama-García P, Bustamante-Bustamante J, Luño J, et al. Epidemiological study of 7316 patients on haemodialysis treated in FME clinics in Spain, using data from the EuCliD® database: results from years 2009-2010. *Nefrología.* 2012;32:743-53.
32. Lorenzo-Seva U, Ferrando PJ. FACTOR: a computer program to fit the exploratory factor analysis model. *Behav Res Methods.* 2006;38:88-91.
33. Timmerman ME, Lorenzo-Seva U. Dimensionality assessment of ordered polytomous items with parallel analysis. *Psychol Methods.* 2011;16:209-20.
34. Dindo L, Van Liew JR, Arch JJ. Acceptance and commitment therapy: a transdiagnostic behavioral intervention for mental health and medical conditions. *Neurotherapeutics.* 2017;14:546-53.
35. Shayeghian Z, Hassanabadi H, Aguilar-Vafaie ME, Amiri P, Besharat MA. A randomized controlled trial of acceptance and commitment therapy for type 2 diabetes management: The moderating role of coping styles. *PLoS One.* 2016;11:1-14.
36. Niemeier H, Leahey T, Reed KP, Brown RA, Wing RR. An acceptance-based behavioral intervention for weight loss: a pilot study. *Behav Ther.* 2012;43:427-35.
37. Lillis J, Hayes SC, Bunting K, Masuda A. Teaching acceptance and mindfulness to improve the lives of the obese: a preliminary test of a theoretical model. *Ann Behav Med.* 2009;37:58-69.
38. Feros DL, Lane L, Ciarrochi J, Blackledge JT. Acceptance and Commitment Therapy (ACT) for improving the lives of cancer patients: a preliminary study. *Psychooncology.* 2013;22:459-64.