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Assessing transplant representation: psychometric characteristics of the Transplanted Organ Questionnaire in an Italian sample of transplant recipients

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Abstract

Background: Organ transplantation may elicit several emotional responses, where the lack of psychological integration of the allograft can lead to up to out-to-out manifestations of psychopathological symptoms. As there are only a few studies which examined the impact of a successful psychological integration, it is mandatory to have a specific tool available. The aim of this study is to assess the factorial structure of the Italian translation of the Transplanted Organ Questionnaire (TOQ) and verify the association with its dimensions and psychopathology.

Methods: The TOQ was translated from English into Italian using back-translation procedure, then it has been included in a survey with the Brief Symptoms Inventory in order to assess predictive validity with psychopathological symptoms. 117 Italian solid organ transplant recipients were enrolled via web and completed the survey.

Results: Confirmatory factor analyses showed that the three-factor model had sufficient fit to the data obtained from the Italian sample, with the exclusion of five items for cultural and transplant-specific reasons. Predictive validity was partially confirmed, implying that the TOQ is significantly associated with mental health outcome measures.

Conclusion: The Italian version of the TOQ represents a valid tool to explore the process of psychological integration of the transplanted organ and could improve the understanding about the role of psychological factors in post-transplant physiological recovery and duration of the graft. Clinicians and researchers in healthcare settings may take advantage of the TOQ to assess the changes experienced over time by transplant recipients and the resulting psychological implications on their global well-being.

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1. Introduction

Transplant is a first-rate treatment for several diseases and organ failure that consist in the replacement of a non-functional organ with a healthy one received from a deceased or living donor. With the exponential improvement of surgery procedures and immunosuppressant therapies, transplantation leads to a substantial recovery in health-related quality of life, autonomy and an extended life expectancy (Pinson et al. 2000, Cannavò et al. 2019). One must consider that transplant patients have to cope with peculiar comorbidities, such as the increased exposition to resistant bacterial and viral infections and increased cancer risk (Bhat et al., 2018). Furthermore, immunosuppressants pharmacotherapies can lead to severe side effects, including cardiovascular diseases, diabetes, sleep disturbances and cognitive impairment (Faravelli et al., 2021). Moreover, transplantation concern several psychosocial dimensions, including social belonging, re-employability (Ferrario et al., 2014; De Pasquale et al., 2019), loss of continuity in sentimental relationship and sexual dysfunctions. Notwithstanding the physical recovery, several studies highlighted the elevated global psychiatric symptom and distress levels in these patients (Dew et al. 2015; Sheikhalipour et al. 2018; Kahl et al. 2019; Sadlonova et al., 2021).

Organ transplantation elicits a complex constellation of emotional responses, body image distress, concerns about graft duration and possible rejection, demoralization (Battaglia et al. 2020) up to out-to-out manifestations of psychopathological symptoms, such as affective disorders and anxiety (De Pasquale et al., 2020a). Furthermore, prior and/or emerging psychopathology threatens the adherence to immunosuppressive treatments and consequently enhances the risk of allograft rejection (Gokoel et al. 2020; Russel et al., 2022; Scheel et al., 2018). Indeed, the experience of receiving the organ of another human being could represent a laborious emotional path that could lead to psychological distress. In this sense, previous studies highlighted the remarkable role of psychological integration (Muslin, 1971; Lefebvre et al. 1973; De Pasquale et al. 2010; Sheikhalipour et al. 2018) defined as the representational process that leads to the integration of the new organ in the psycho-physical unity. The outcome of this process could enhance the quality of life of transplant patients (Goetzmann et al. 2008, Goetzmann et al. 2018), while poor organ integration may be a risk factor for health outcomes and non-adherence (Látos et al. 2016; Látos et al. 2022). Nowadays, psychological dimensions in transplant recipients are assessed mostly during the pre-transplant phase, thanks to the wide development of assessment protocols (Maldonado et al., 2012). Nevertheless, monitoring the psychological integration process of the transplanted organ is hardly considered. At the same time, there are only a few comprehensive studies so far that have investigated the impact of a

successful psychological integration on physical recovery and the extent of the transplantation's success (Látos et al. 2016; Hennemann et al. 2021, Sambucini et al. 2022), despite the promising results and implications for psychological interventions.

1.1 The Transplanted Organ Questionnaire

Corruble and colleagues (2012) designed the Transplanted Organ Questionnaire (TOQ), which measures feelings and attitudes that transplanted people can experience in relation to their transplant, by using assumptions which refer on the feelings experienced towards the donor, such as refusal and regret towards the allograft and positive feelings towards the transplant. The validation study included 134 liver transplanted patients admitted in the Centre Hepato-Biliaire of the Paul Brousse Hospital in Paris. The research team gathered the initial pool of items from multidisciplinary expert meetings and patients' focus groups. The response pattern ranged from 1 ("never") to 6 ("all of the time"). The questionnaire was submitted to 20 transplanted patients in a 4-hour focus-group, and then carried out to patients 3 months, 6 months, 12 months, 24 months, and 36 months post-transplant. The original factorial structure showed the interrelation of the three factors mentioned, and the authors hypothesized that these dimensions could predict depression symptoms and patient survival. Results suggested that higher Psychological Rejection subscale 6 months post-transplant was associated with increased risk of death and also positively associated with depression 3 months and 6 months post-transplant. The final structure of the TOQ resulted in 24 items divided in three subscales corresponding to Positive attitude towards the transplant, Donor and Psychological Rejection, explaining 44% of the total variance.

1.2 Theoretical perspective of transplant representation

There are relatively few studies on the intrapsychic processing of a transplant. A major contribution came from psychodynamic theories, in which several authors focused on organ transplantation from the dawning of transplant medicine. Surgery, and specifically transplantation surgery, is a shock for the mind-body integrity, and can cause emotional distress and archaic defense mechanisms (De Pasquale et al., 2020b) in order to face a challenging adaptation process to new corporeal sensations, pharmacological regimens and Self reconfiguration. In this sense, Muslin (1971, 1972) suggested a stadial internalisation of the transplanted organ that starts from an extraneousness experience toward the graft – which may be associated with persecution anxiety and/or idealization mechanisms – to result in a total incorporation where the transplant is perceived as a part of the recipient's Self. Other authors,

instead, affirmed that the psychological integration of the organ pertains to individual variability and fluidity, which implies a dimensional process on a continuum between an immediate incorporation of the graft, resembling a narcissistic identification, and an outdistancing mode that set the transplanted organ as a completely foreign object (Basch, 1973; Castelnuovo-Tedesco, 1973). In this sense, the preferred integration is positioned in the middle range of this spectrum, but it is not exempted from instability and rearrangements, since the transplant implies a revolution in the body-image, forced to include a new organ in the spatial, perceptive and experiential boundaries of the Self (Látos et al. 2015). This process involves the representation of the donor, who is phantasized if deceased. According to Muslin (1972), after the transplantation, the recipient experiences a substantial overlapping between the Self and the representation of the donor, then over time the donor representation undergoes a detachment from the Self in order to be replaced into the external world. In this sense, both the graft and the deceased donor assume the function of transitional objects (Winnicott, 1951) which can foster the physiological recovery and the psycho-social burden following organ transplantation (Goetzmann, 2004). Recent literature underlined the consequences in failing this process, primarily on the recipients' mental health. In particular, Goetzmann (2007) observed the association of poor organ integration and/or a symbiotic donor relationship with psychological distress, which influences non-adherence behaviour and threatens the length of the graft (Látos et al. 2016). Furthermore, a high degree of identification with the donor, such as the fantasy to have taken on the donor's attributes or personality traits (e.g. the laugh, music taste etc.) is associated with low adherence behaviours, and frequently reports feelings of guilt and encounters difficulties in disclosing it (Goetzmann et al., 2009). On the other hand, a good organ integration involves positive feelings towards the donor, sometimes by implementing small rituals to celebrate the gift received and express gratitude, but the desire to be endowed with the donor's qualities does not occur. A positive attitude to the transplant and the donor is also associated with appreciation of life, new perspectives and projects, generally with the inclusion of a new meaning of life (Martín-Rodríguez et al., 2018). In the specific case of living donation – where the Italian law stipulates that only relatives and family members, more rarely Samaritan, may offer themselves as a candidate to give their kidney, liver or lung – the intrapsychic processing of a transplant implies the introjection of relational elements with the donor, with whom there is a close relationship. Although patients who have received a living donor transplant may experience higher levels of mental and physical health – since they received potentially a more compatible organ on a scheduled time (Gill & Lowes, 2008; Ladner

et al., 2015; Gozdowska et al., 2016; Kaul et al., 2022) – transplantation can exacerbate pre-existing family dynamics (Jacobs et al., 1998; Pistorio et al., 2019), feelings of guilt and restorative needs, or expressing symbiotic relational modalities among family members as well.

1.3 The current study

Assessing transplant representation has had little attention so far in post-transplant practices, in spite of being a key indicator for graft course and psychopathological risk, providing salient elements when designing targeted interventions. In the transplantation experience, patients rarely express their ambivalent feelings and organ representations spontaneously. Therefore, disposing of a reference tool can direct the attention of health care professionals towards a complementary and integrated approach in the field of the psychological aspects of transplantation, and this feature could be relevant in the healing process and in the management of the transplant (Hennemann et al., 2021; Sambucini et al., 2022). In addition, the need of a deeper understanding of the role of transplant representation for the recipients over the long-term is emerging in research, especially considering its relationship to mental and physical health. Physicians could benefit from the evaluation of transplant representation in patients, specifically supporting them to develop a more positive attitude towards their condition within pre and post-transplant psychological procedures. Currently, there are no shared tools to assess the representations of the transplanted organ and psychological rejection in scientific literature, least of all in Italy, leaving Italian researchers and clinicians without a useful measure that takes these dimensions into consideration. Transplant-specific measures was designed to evaluate definite concepts such as symptoms experienced, knowledge of the transplant regimen, body image, organ transplant stressors, or the management of home self-care. In this context, the questionnaire developed by Corruble and colleagues (2012) aims to assess the positive and negative attitudes towards the transplanted organ, concerns about the donor (feelings of gratitude, guilt and indebtedness) and transplantation both as a salvific and as a potential negative aspect in the patient's representations. To this end, this study aims to evaluate the psychometric characteristics of TOQ in an Italian sample of transplant recipients. In addition, in order to verify predictive validity, we hypothesize a positive correlation between Psychological Rejection TOQ subscale and mental health dimensions as suggested from the revised literature.

2. Methods and measures

2.1 Translation

Each item was translated into Italian following the back-translation method (Behling & Law, 2000) through the following phases:

1) translation from English to Italian by two independent experts in the fields of psychology and health profession; potential differences between both versions were discussed, merging in a combined version.

2) back-translation from Italian to English by two native English speakers with excellent proficiency in Italian; as before, differences were discussed until the comparison of the new English version with the original one lead to an agreement on the final version. This resulting version was discussed in a pilot sample of the target subjects to check for clarity.

2.2 Measures

1) Transplanted Organ Questionnaire (TOQ): it measures the representations of recipients towards the transplanted organ (Corruble et al., 2012). It consists of three scales: the "Psychological rejection" subscale reveals a negative attitude regarding the new organ. The "Donor" subscale enquires concerns about donor, and the "Positive attitude towards the transplant" subscale asks about the positive representation of the transplanted organ.

2) Brief Symptoms Inventory (BSI): the BSI is a 53-item self-report scale designed to evaluate psychopathological and psychological symptoms, measuring nine dimensions (namely, somatization, obsession–compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) that can be summed up to reflect a global index, named General Severity Index (GSI). In more detail, the BSI uses a 5-point Likert scale, ranging from 0 ("not at all") to 4 ("extremely"). Good levels of reliability were detected in this sample (Cronbach's $\alpha = .953$).

2.3 Participants and procedures

For this study, 117 participants (Table 1) were recruited in Italy via web between March 2021 and June 2022 through a survey hosted on Qualtrics (Qualtrics, Provo, UT). The eligibility criteria were: (1) be a solid organ transplant patient; (2) being > 18 years old; (3) Italian citizenship. Letters and emails were sent to Italian stakeholders in order to ease a snowball sampling recruitment strategy. All collected data were protected by a secure gateway accessible only by the principal investigator (PI). The PI removed the IP addresses of each participant to

guarantee anonymity and to share data with other researchers. All procedures performed in the present study were in accordance with the ethical standards of the 1964 Helsinki declaration; furthermore, the study was approved by the Ethical Committee of Psychological Research of the first author's university (approval n° 5/2021).

Tabel 1. Sociodemographic characteristics

Characteristics	*N (%)*	*Mean*	*SD*	*Min/Max*
Age	117	49,46	12,09	23–78
Gender	117	-	-	-
Male	52 (44,4%)	-	-	-
Female	65 (55,6%)	-	-	-
Education	117	-	-	-
≤ High School	87 (74,4%)	-	-	-
≥ College	30 (25,6%)	-	-	-
Employment status	117	-	-	-
Yes	59 (50,4%)	-	-	-
No	58 (49,6%)	-	-	-
Relationship	117	-	-	-
Yes	88 (76,2%)	-	-	-
No	29 (24,8%)	-	-	-
Residency	117	-	-	-
Northern Italy	60 (51,3%)	-	-	-
Central Italy	18 (15,4%)	-	-	-
Southern Italy and islands	39 (33,3%)	-	-	-

The sample (Table 1) consists of 117 participants, of which 52 males and 55 females, with a mean age of 49.46 years (SD = 12.9; range = 23–78) residing in Northern Italy (51.3%), Southern and islands (33.3%) and Central Italy (15.4%). Regarding transplant information (Table 2), the sample is mostly comprised of renal (57.3%) and hepatic (25.6%) recipients, while cardiac and pulmonary recipients make up the rest of the sample (14.5%), together with three participants who reported having received a multiple transplant, specifically of liver and kidney (2.6%). Regarding the phase of their transplantation, the sample is heterogeneous, since time frame after the surgery is very large, with an average of 8.6 years (SD = 8.4; range = 0–38.5). About the donor, the majority of the sample received a transplant from a deceased donor (81.2%), according to the data available from the latest Italian Transplant Centre's Report, which counts most of the transplants carried out on the national territory coming from cadavers.

Tabel 2. Descriptive characteristics of transplant

	N (%)	*Mean*	*SD*	*Min/Max*
Transplanted organ	117	-	-	-
Kidney	67 (57,3%)	-	-	-
Heart	13 (11,1%)	-	-	-
Liver	30 (25,6%)	-	-	-
Lung	4 (3,4%)	-	-	-
Liver and kidney	3 (2,6%)	-	-	-
Time elapsed after transplantation	117	-	-	-
In years		8,6	8,4	0–38,5
In days		3145,49	3100,640	6–14063
Donor	117	-	-	-
Living	22 (18,8%)	-	-	-
Deceased	95 (81,2%)	-	-	-

To derive psychopathology dimensions, we compared the mean scores of the BSI with the T scores (Derogatis, 1993). From the descriptive analysis (Table 3) emerges that 40.2% of the sample shows levels over the cut-off, therefore of clinical interest, on the GSI. This index is sensitive to the psychological distress of the respondents (Derogatis, 1993), in which the information on the major psychopathological symptoms and their intensity are condensed. In detail, one of the most frequent symptoms is somatization (41% > cut-off), which reflects disorders that arise from the perception of sensations and bodily discomforts. For example, the subscale asks how often headaches, dizziness, thermic sensations such as shivers or flushing have occurred in the last week; another dimension observed in a substantial part of the sample is anxiety (41.9% > cut-off), which implies manifestations of restlessness, heart pounding, sudden fears even in usual and familiar conditions, feeling off the hook and more. In addition, the size of depressive disorders emerges (38.5% > cut-off), in which a wide spectrum of symptoms converge such as weakness, suicidal ideation, crying spells, sense of loneliness and self-recriminations. As concerns the representation of the transplant, from the dimensions of the TOQ it emerges that the sample mainly presents positive feelings towards the transplanted organ, which acquires a salvific character towards the participants' life and in the recovery of their autonomy. Likewise, the sample shows medium levels in the donor dimension, in which feelings of gratitude are prominent. Conversely, persecutory and extraneous affections emerge with a low frequency in the participants, who therefore present very low psychological rejection values.

Tabel 3. Descriptives of psychopathology variables and transplant representation. Note: BSI: Brief Symptoms Inventory; GSI: Global Severity Index; TOQ: Transplanted Organ Questionnaire.

	N (%)	*Mean*	*DS*	*Min/Max*
BSI				
GSI	117	0,6104	0,48636	0–2,57
> cut-off	47 (40,2%)			
Psychoticism	117	0,4051	0,50066	0–3,20
> cut-off	33 (28,2%)			
Somatization	117	0,7422	0,65817	0–3,33
> cut-off	48 (41%)			
Obsession-compulsion	117	0,7721	0,68425	0–3
> cut-off	33 (28,2%)			
Interpersonal sensitivity	117	0,5278	0,66207	0–3,25
> cut-off	24 (20,5%)			
Depression	117	0,7336	0,70203	0–3,33
> cut-off	45 (38,5%)			
Anxiety	117	0,7336	0,66776	0–2,67
> cut-off	49 (41,9%)			
Hostility	117	0,5316	0,52860	0–2,20
> cut-off	32 (27,4%)			
Phobic anxiety	117	0,3778	0,55135	0–2,60
> cut-off	33 (28,2%)			
Paranoid ideation	117	0,5009	0,57393	0–2,60
> cut-off	20 (17,1%)			
TOQ				
Psychological rejection	117	2,4103	2,91889	0–15
Donor	117	15,8120	8,30759	0–35
Positive attitude	117	21,7521	6,87061	2–35

2.4 Statistical analyses

All the analyses were performed with R Statistical Software with lavaan package. To investigate the factor structure of the translated questionnaire, a Confirmatory Factor Analysis (CFA) was performed on the 24 items of the questionnaire to control the factorability of the correlation matrix though Bartlett's test of sphericity (Cole, 1987). The Kaiser-Meyer-Olkin (KMO) measure was used to assess the adequacy of the sample. After checking the factor loadings, items were deleted in case of poor loading (values less than .40). Internal consistency and reliability was computed by calculating the Cronbach alpha coefficient for the scale and each found subscale. The CFA was performed with maximum likelihood estimation with robust standard errors (Hancock & Liu, 2012), model fit was assessed through the following indices: chi square ($\chi 2$), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), comparative fit index (CFI), and Tucker-Lewis index (TLI). For predictive

validity, we used correlations with mental health indices calculated with the Spearman correlation coefficient.

3. Results

The original three-factor model proposed by Corruble and colleagues (2012) fit the data obtained from the Italian sample. Internal consistency reliability was evaluated through Cronbach's α. Total α coefficient was good (α =.849). Positive attitude was acceptable (α =.788). Rejection Cronbach's α coefficient was adequate (α =.696) and Donor was good (α =.867).

Factor	Item	Estimate	SE	Z	*p*	Stand. Estimate
Donor	2	1.306	0.1109	11.78	< .001	0.097
	11	1.429	0.1290	11.08	< .001	0.139
	12	0.965	0.1212	7.96	< .001	0.160
	13	1.232	0.1510	8.16	< .001	0.245
	14	1.355	0.1359	9.97	< .001	0.173
	15	0.538	0.1079	4.99	< .001	0.148
	17	0.879	0.1551	5.67	< .001	0.298
Positive attitude	1	0.614	0.1108	5.54	< .001	0.138
	3	0.796	0.1135	7.01	< .001	0.140
	6	0.682	0.1758	3.88	< .001	0.367
	18	0.781	0.1426	5.48	< .001	0.235
	19	0.720	0.1400	5.14	< .001	0.224
	21	1.092	0.1454	7.51	< .001	0.228
	22	1.277	0.1446	8.83	< .001	0.226
Psychological rejection	4	0.646	0.1161	5.56	< .001	0.153
	5	0.449	0.0482	9.30	< .001	0.026
	7	0.405	0.0824	4.92	< .001	0.065
	8	0.410	0.0738	5.55	< .001	0.049
	9	0.670	0.0946	7.08	< .001	0.097

Table 4. Factor loadings >.40 of TOQ items.

In order to reject the null hypothesis about the lack of model fit, χ2 should not be significant (>.05). Nevertheless, this index is considerably influenced by the sample size, so the data analysis comprised further model fit indices to verify the goodness-of-fit. Table 5 shows goodness of fit indices for each factorial models tested. In the first model, which included the entire pool of 24

items, the goodness of fit indices indicated scarce model fit (χ2/df 559/249; RMSEA .103 .091; SRMR .102; CFI/TLI .711/.680). In this model items 10 ("*I find myself thinking that I could have done it perfectly well without the transplant*"), 20 ("*I find myself resenting the person who donated the organ*") and 23 ("*I find myself feeling resentful towards the transplant*") from Psychological rejection factor were deleted due to poor loading. For the Donor subscale item 16 ("*I find myself thinking that I have come to resemble the person who donated the organ*") showed a factor loading of <.40 like item 24 ("*I find myself feeling responsible for my transplant*") in Positive attitude subscale. Excluding these items from Model A (Table 5) led to an improvement of the goodness-of-fit (χ2/df 383/149; RMSEA .116; SRMR .104; CFI/TLI .752/.717), then the correlation analysis of the residual-variance allowed to fix the Modification Indices (MI) as follows. Covariance parameters that led to a decrease in χ2 greater than 15 were included in the Model B. The MI showed that the goodness of fit indices could be improved by estimating the correlations between measurement errors, in particular items 7 and 8 (MI D 32.318), 4 and 19 (MI D 22.998), 1 and 3 (MI D 16.449), 21 and 22 (MI D 39.734). This procedure allowed correcting error covariance, which indicates that the model is penalized from semantic overlap between some items, and it significantly improved goodness-of-fit (χ2/df 272/145; RMSEA .080; SRMR .079; CFI/TLI .866/.842).

Table 5. Goodness-of-fit indices deriving by CFAs on Transplanted Organ Questionnaire.

χ2 = chi square; df = freedom degrees; RMSEA = root mean square of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index; TLI = Tucker-Lewis index; MI = Modification Indices.

Models	χ^2	df	*p*	RMSEA	SRMR	CFI/TLI
Original model with 24 items	559	249	<.001	0.103	0.102	0.711/0.680
Model wthout items 10, 16, 20, 23, 24 **Model A**	383	149	<.001	0.116	0.104	0.752/0.717
Model A with MI **Model B**	272	145	<.001	0.080*	0.079	0.866/0.842

Table 5. Goodness-of-fit indices deriving by CFAs on Transplanted Organ Questionnaire.

χ^2 = chi square; df = freedom degrees; RMSEA = root mean square of approximation; SRMR = standardized root mean square residual; CFI = comparative fit index; TLI = Tucker-Lewis index; MI = Modification Indices.

In the Model B, the RMSEA advises a good level of fit (0.080), thus equivalent to the threshold values (Hu & Bentler, 1999); CFI and TLI approach close to critical threshold (>.90), showing an acceptable fit of the data, while SMRS exceed the proposed acceptability threshold. As a

result, the solution of 19 items distributed in the original factorial structure has a perfectible but sufficient goodness-of-fit, since the model explains the 52,1% of the total variance.

With regard to the correlations between TOQ factors, analyses shows that Positive attitude towards the transplant is positively associated with Donor and higher Psychological Rejection scores are negatively associated to positive representations of the organ and the donor. Furthermore, as regards to the predictive validity of the TOQ, the correlations showed that higher scores of Psychological rejection are positively associated with all the psychopathology dimensions, while Donor is weakly associated with Psychoticism, Somatization, Obsession-Compulsion, Anxiety, Hostility and Phobic Anxiety.

Table 6. Spearman's correlations. Note: * p < .05, ** p < .01, *** p < .001; GSI: Global Severity Index.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Donor	--													
2. Psychological rejection	,109	--												
3. Positive attitude	**,539****	**-,212***	--											
4. Psychoticism	**,301****	**,353****	,159	--										
5. Somatization	**,385****	**,391****	,170	**,606****	--									
6. Obsession-Compulsion	**,188***	**,344****	,138	**,586****	**,580****	--								
7. Interpersonal sensitivity	,060	**,368****	,034	**,702****	**,441****	**,555****	--							
8. Depression	,144	**,422****	,030	**,731****	**,567****	**,628****	**,656****	--						
9. Anxiety	**,196***	**,424****	,009	**,674****	**,595****	**,582****	**,621****	**,699****	--					
10. Hostility	**,186***	**,420****	-,017	**,582****	**,435****	**,444****	**,585****	**,534****	**,601****	--				
11. Phobic Anxiety	**,230***	**,427****	,097	**,487****	**,488****	**,446****	**,462****	**,453****	**,438****	**,375****	--			
12. Paranoid Ideation	,124	**,387****	,036	**,595****	**,413****	**,550****	**,685****	**,589****	**,507****	**,512****	**,381****	--		
13. GSI	**,278****	**,479****	,127	**,826****	**,781****	**,783****	**,750****	**,840****	**,836****	**,677****	**,619****	**,690****	--	
14. Time since transplant	-,073	-,001	,008	,082	-,019	-,102	,071	,002	-,046	,066	,030	,082	,014	--

Therefore, it emerges that the dimension of Psychological rejection, which indicates feelings of strangeness and rejection of the organ, has a direct association with mental health problems, thus – given the limited association of the dimensions investigated by the TOQ with psychopathology – the data shows a partial confirmation of predictive validity.

4. Discussion

The current study explored the psychometric characteristics of the TOQ in a sample of Italian solid organ transplant recipients. Through CFAs results, the data acquired an acceptable goodness of fit, corroborating the original three-factor structure. As previously suggested, five items were deleted from the original questionnaire (item 10, 16, 20, 23, 24) based on factor

loadings criteria. The low factor loading could be ascribable to the misinterpretation of the single item according to different principles from the latent variable. For the Psychological Rejection subscale, item 10 "*I find myself thinking that I could have done it perfectly well without the transplant*" may be misleading for transplanted participants because the allograft is often vital for them, and without the transplant they might be deceased or subjected to organ failure therapies, such as haemodialysis and its side effects (Zalai et al., 2012) or the asthenic and respiratory symptomatology in cardiac failure waiting for transplant (DiMartini et al., 2008). Items 20 "*I find myself resenting the person who donated the organ*" and 23 "*I find myself feeling resentful towards the transplant*" may be interpreted under cultural and religious influence, where the narrative representation that revolves around organ donation promotes an altruistic and sympathetic point of view (Monaco et al., 2021). This may imply that the only natural reaction for a transplant recipient should be gratitude, thus keeping out the possible expression of ambivalent feelings owing to social desirability. For the Donor subscale, answers to item 16 "*I find myself thinking that I have come to resemble the person who donated the organ*" may be influenced by the sample characteristic, where the majority of transplants were from deceased donors. Therefore, most of the time they are unaware about their donor, because of the current legislation. In the Positive attitude subscale, the low factor loading in item 24 "*I find myself feeling responsible for my transplant*" can be ascribable to a misleading wording, since the item may be understood both as a sense of responsibility for transplant management and as a responsibility on the causes that lead to disease and consequent transplantation. Concerning the results, the TOQ has the potential to measure aspects not systematized in scientific research so far, deepening the role of transplant representations in the rates of negative mental health outcomes in the transplanted population (Birkefeld et al., 2022; Zimbrean et al., 2023). In fact, the data analysis traces psychopathology as associated with the difficulties given by organ integration and negative representations of transplantation, consistent with the literature on the topic (Látos et al., 2016; Goetzmann et al., 2018). Furthermore, the data emerging from the present study disagree with the evidence of a previous research (Hennemann et al., 2021) in which the relationship between psychological rejection and being transplanted for a long time was negatively associated, thus suggesting that a better organ integration is related to time. Our results suggest that psychological integration may require greater efforts, since health and psychological impairments post-transplantation can lead to higher risk of adjustment disorders (Bachem et al., 2019; Birkefeld et al., 2022). An interesting consideration emerges from the relationship, weak but positive, between the Donor dimension and the psychopathology reported. This can be explained by the affections and fantasies related to this figure, translated into higher scores in this dimension of the TOQ, which

can be indicative of both a better integration of the organ – in which gratitude for the gift implies new spiritual and existential meanings (Martín-Rodríguez et al., 2018; Tomaszek et al., 2021) – and as a form of symbiotic identification related to regressive modalities to cope with psychosomatic adjustment (Lefebvre et al., 1973; Goetzmann et al., 2018; Eichenlaub et al., 2021; Neukom et al., 2012). In this sense, it is plausible that the Donor subscale of the TOQ should be refined to discern mature and adaptive affects from dysfunctional and fusional relationship modalities with the donor.

5. Limitations

The present study, net of the results and practical implications for psychological intervention in healthcare, has intrinsic limitations and should be interpreted cautiously. First, the cross-sectional design of this work prevents to consider predictive validity as fully explored, thus it is necessary to develop further research. Indeed, the sample size was not randomized and it was insufficient to acquire representative data for the main transplant recipients; specifically, the sample about the organ transplanted was unbalanced, with a vast majority of renal recipient participants, hence it was not possible to explore comparisons between groups about allograft or deceased/living donor.

This unbalance can be partially explained by the evidence that in Italy renal transplantation is the wider surgery executed since the implementation of transplantology, possibly because kidneys are both more preservable for travel and recurrent, thanks to donations from living donors (Centro Nazionale Trapianti, 2021). It is advisable to develop long-range research in order to verify the reliability of the current results for different solid organ transplantation in order to provide an accurate tool for the complex emotional experiences leaded by the specific transplantation (Sambucini et al., 2022). Furthermore, the sample regarding the time passed after the surgery is heterogeneous, since some participants had just received a transplant – someone during the out-and-out hospitalization – while others were long-term patients. It is plausible that the exclusion criteria were unspecific and the cross-sectional design produced this heterogeneity.

Recruiting a convenience sample exposes this research to volunteer bias, therefore participants may be associated per personal and economical characteristics, such as energy or motivation to answer the survey, and adequate technological devices or skills. Indeed, distribution strategy through social networks may exclude potential participants who do not have familiarity with new technologies and media, implying the need to develop innovative distribution channels to recruit a major size of transplant recipients on a national level. For future research, emerges the

imperative necessity to create shared research protocols on a multicentric level, promoting synergy between health institutions, the national transplant network and research institutions. This way, it could be more accessible to design longitudinal research aimed at solidly demonstrating the causal relationships between the variables considered. This approach could also enhance the possibility of collecting trends on psychological integration in the national population, a factor currently not investigated even at local level (Toti et al., 2022), so comparing sample data with transplanted people at national level – and verifying generalizability – is currently challenging. Proceeding on this field, despite the limitations, could provide further support to the hypothesis that psychological rejection has a considerable role on health outcomes. The corroboration of these results may guide continuous psychological interventions, in order to support and accompany the transplanted patient in the process of adaptation to chronicity, in consideration of the peculiarities given by the transplant phase and the transplant-specific criticalities. The auspice for the future is that the Transplant network and the health professionals involved will take advantage of methodological supports and shared practices to produce high quality longitudinal studies on the dynamic relationship between the process of psychological integration of the organ, the risk of psychopathology and health outcomes.

6. Conclusions and future research lines

This study is the first proposal for a tool to evaluate transplant representations, and the related difficulties in the integration process, in the Italian context. Disposing of standardized tools to explore the process of psychological integration of the transplanted organ configures a new opportunity for both researchers and clinicians. Longitudinal designs aimed at evaluating the development of organ integration over time, and by physiological cross-measurements, could improve the understanding about the role of psychological factors in post-transplant physiological recovery and duration of the graft (Sambucini et al., 2022). This new understanding might be achieved in healthcare settings where professionals are engaged in the whole transplantation process. Thus, following-up the transplant recipients on a long term – in order to assess the changes experienced over time and the resulting psychological implications on their global well-being – can be increasingly achievable through the employment of standardized tools.

Ethical approval

All procedures performed in the present study were in accordance with the ethical standards of the 1964 Helsinki declaration; furthermore, the study was approved by the Ethical Committee of Psychological Research of the first author's university (approval n° 5/2021).

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest statement

The authors declare no conflict of interest.

Authors' contribution

BM, and GM conceived and designed the study; BM, GM and EC wrote the main manuscript text; BM and FP managed data collection and statistical analyses. BM, GM and EC refined the literature search. BM and FP prepared tables 1-6. All authors reviewed and agreed the final manuscript.

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