

# IS THE EQ-5D-5L A RELIABLE INSTRUMENT IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY?

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## ABSTRACT

**Objective:** The EQ-5D-5L is increasingly used in cardiovascular surgery. However, its psychometric properties have not yet been examined with coronary artery bypass graft patients. The purpose of the study was to assess the psychometric properties of the EQ-5D-5L with coronary artery bypass graft patients and to determine the most suitable index score for the countries with no value set.

**Material and Method:** The EQ-5D-5L was administered to 200 coronary artery bypass graft patients. Intraclass correlation coefficients and test-retest analysis were used to evaluate the reliability of the scale. The test-retest analysis used Gwet's agreement coefficient.

**Results:** The intraclass correlation coefficients indicated that the EQL-VAS and index scores were very reliable. The five dimensions of the EQ-5D-5L had an almost perfect agreement with the test-retest (Gwet's AC: 0.83-0.97, percentage agreement: 89.6-97.6%). Both the United Kingdom and United States index scores had a positive and moderate relationship with the EQL-VAS ( $p < 0.001$ ).

**Conclusion:** The EQ-5D-5L is a reliable and practical instrument in cardiovascular surgery. This study showed that both United Kingdom and United States value sets can be used to calculate the index score of the scale in Türkiye.

**Keywords:** Cardiovascular surgery, EQ-5D-5L, quality of life, reliability.

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## KORONER ARTER BYPASS GREFT AMELİYATI GEÇİREN HASTALARDA EQ-5D-5L GÜVENİLİR BİR ÖLÇÜM ARACI MIDIR?

### ÖZET

**Amaç:** EQ-5D-5L kardiyovasküler cerrahide giderek daha fazla kullanılmaktadır. Ancak koroner arter bypass greft cerrahisi geçiren hastalarda ölçeğin psikometrik özellikleri henüz incelenmemiştir. Bu çalışmanın amacı, koroner arter bypass greft cerrahisi geçiren hastalarda EQ-5D-5L'in psikometrik özelliklerini değerlendirmek ve puanlama seti olmayan ülkeler için en uygun indeks skorunu belirlemektir.

**Materyal ve Metot:** EQ-5D-5L koroner arter bypass greft cerrahisi yapılan 200 hastaya uygulanmıştır. Ölçeğin güvenilirliğin değerlendirilmesinde sınıf içi korelasyon katsayıları ve test-tekrar test analizi kullanılmıştır.

Test-tekrar test analizinde Gwet'in uzlaşma katsayısı kullanılmıştır.

**Bulgular:** Sınıf içi korelasyon katsayıları EQL-VAS ve indeks puanlarının oldukça güvenilir olduğunu göstermiştir. EQ-5D-5L'in beş boyutu test-tekrar test analizinde mükemmel bir uyum göstermiştir (Gwet's AC: 0,83-0,97, uzlaşma yüzdesi: 89,6-97,6). Hem Birleşik Krallık hem de Amerika Birleşik Devletleri indeks puanlarının EQL-VAS puanı ile arasında pozitif orta derecede ilişki bulunmuştur ( $p < 0,001$ ).

**Sonuç:** EQ-5D-5L kardiyovasküler cerrahi alanında güvenilir ve pratik bir ölçüm aracıdır. Bu çalışma, Türkiye'de ölçeğin indeks puanının hesaplanmasında hem İngiltere hem de Amerika puanlama setinin kullanılabilceğini göstermiştir.

**Anahtar kelimeler:** EQ-5D-5L, kardiyovasküler cerrahi, yaşam kalitesi, güvenilirlik.

### INTRODUCTION

The generic measurement tools for health-related quality of life (HRQoL) used frequently with Coronary Artery Bypass Graft (CABG) patients include the SF-36, the Health Utilities Index and the Euro Quality of life 5 Dimensions (EQ-5D).<sup>1-3</sup> Among the current generic measures, the EQ-5D has begun to be used widely due to the ease of its administration, scoring and assessment.<sup>4</sup> The EuroQol Research Foundation developed the EQ-5D instrument in 1990. The EQ-5D has two versions. The Euro Quality of life 5 Dimensions 3 Level (EQ-5D-3L) has been translated into 60 languages. It is easy to use and can be self-administered by patients. The Washington Cost-effectiveness in Health and Medicine Panel recommended it to the United Kingdom Health and Care Institution for evaluating health benefits and economic burden.<sup>5</sup> However, some studies found that it lacked the sensitivity to discern small changes in health status.<sup>6,7</sup> A 5-level version of the instrument was developed to resolve this problem, and this version has been translated into 171 languages.<sup>8</sup> The Euro Quality of life 5 Dimensions 5 Level (EQ-5D-5L) includes five subscales that are used to assess health status: mobility, self-care, usual activities, pain/discomfort and anxiety/depression and the Euro Quality of life Visual Analog Scale (EQVAS).<sup>9</sup> The EQ-5D-5L is used to evaluate both benefit estimation of economic evaluations and quality of life criteria, so it is important to examine its psychometric characteristics. Various studies indicated that it has good psychometric

characteristics with both general populations and patients who have specific health issues.<sup>10</sup> No study evaluating the psychometric properties of the EQ-5D-5L in CABG patients was found. The aims of this study are: (1) to examine the reliability of the EQ-5D-5L with coronary artery bypass graft patients and, (2) to determine which of the United Kingdom and United States value sets for the index score is more suitable for the countries with no value set.

### MATERIAL AND METHOD

#### Sample

This methodological study was conducted in the cardiovascular surgery unit of a public hospital in Ankara from January 2020 to December 2020. The study population included patients who had coronary artery bypass graft surgery in 2019. Studies on measurement tools require sample sizes of 100 to 200, or 5-10 times the number of scale items to check total score correlations.<sup>11,12</sup> This study's sample included 200 patients. The study inclusion criteria were: (1) being 18 or older, (2) having coronary artery bypass graft surgery at least one month ago, (3) having no diagnosed mental problems and (4) having no auditory or visual problems.

#### Data Collection

This study used the EQ-5D-5L's Turkish translation by the EuroQol group. A pilot study was conducted

with 10 patients, and no revisions to the data collection forms were made, so the pilot study data were included in the study. The study was conducted with 200 patients who met the inclusion criteria and voluntarily agreed to participate. Their telephone numbers were obtained from the hospital records, and they were informed about the study by telephone. The descriptive information form and the EQ-5D-5L telephone interview form were completed during roughly 15-minute telephone calls with the patients.

### **Ethical Considerations**

Ethical committee approval for the study was obtained from the Non-Invasive Clinical Studies Ethics Committee (GO19/1166) of Hacettepe University. Study application approval was obtained from the cardiovascular surgery unit of the study hospital. Informed consent was obtained from the participants by recording the calls. This study was conducted in accordance with the Declaration of Helsinki.

### **Psychometric Characteristics**

Internal consistency analysis and the test-retest method were used to evaluate the instrument's reliability. Its internal consistency was evaluated using intraclass correlation coefficients (ICCs).<sup>13</sup> The instrument was re-administered to 100 of the study participants one month after the initial administration to assess test-retest reliability. Gwet's agreement coefficient (Gw AC) was used for the test-retest reliability analysis.<sup>14</sup> The instrument's validity was evaluated using the correlations between the United Kingdom (UK) and United States (US) index scores and EQVAS scores.

### **Instruments**

The study data were collected using a descriptive information form and the EQ-5D-5L.

The Descriptive Information Form includes questions about patients' age, gender, marital status, education level, occupation, employment status, date of surgery, chronic disorders and if someone is helping with their care.

The EQ-5D-5L was developed by the EuroQol Group in 2006.<sup>15</sup> Its first section has five subscales that are used to assess health status: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. The responses to each item have five options for describing participants' difficulties: none, slight,

moderate, severe and extreme. The second section is the EQVAS scale, which participants use to rate their health status from 0 to 100 on a scale that resembles a thermometer with 0 being the lowest score the participant can imagine and 100 being the highest score the participant can imagine. A higher score indicates better perceived health. The index scores of the instrument are evaluated using a value set. There are value sets for 10 countries: Denmark, France, Germany, Japan, Holland, Spain, Thailand, the United Kingdom, the United States and Zimbabwe.<sup>15</sup> This study used index scores from the UK and US value sets. The index scores were compared with the UK and US value sets so that they can guide future research.

### **Statistical Analysis**

All of the statistical analyses were performed using SPSS 25.0 software (IBM SPSS Statistics 25, Armonk, NY: IBM Corp.) and Rstudio Software.<sup>16</sup> We used the irrCAC package for Gwet's agreement coefficients.<sup>17</sup> Frequencies and percentages were used as descriptive statistics for the categorical data. Means±standard deviations, medians, minimum and maximum values were used for the other variables stated with the measurement. The reliability of the instrument was evaluated using Gwet's agreement coefficients and intraclass correlation coefficients. The guideline for the reliability of the ICC values: <0.5=poor, 0.5±0.75=moderate, 0.75±0.9=good and >0.90=excellent.<sup>13</sup> The United Kingdom and United States value sets were used to obtain the EQ-5D-5L utility index scores.<sup>15</sup> The validity of the instrument was evaluated using the correlations between the EQVAS, and the UK and US index scores. The relationship between the scores was evaluated using Spearman's correlation. The threshold for statistical significance was  $p<0.05$  for all data.

## **RESULTS**

The descriptive characteristics of the patients included in the study are shown in (Table 1). Most of the participants were male. Their mean age was 60.84±8.65. The mean time elapsed since their surgeries was 12.42±1.45 months.

The participants' responses to the EQ-5D-5L subscales are shown in (Table 2). Their most frequent responses were none or slight. The mean index scoreUK was 0.82±0.15, and the mean index scoreUS was 0.85±0.12. Their mean EQVAS score was 78.3±13.97.

**IS THE EQ-5D-5L A RELIABLE INSTRUMENT IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY?**

Table 1. Descriptive characteristics (n=200)			
		n	%
Gender	Female	27	13.5
	Male	173	86.5
Marital status	Married	183	91.5
	Single	17	8.5
Education level	Primary school	127	63.5
	High school	42	21.0
	Bachelors' degree	31	15.5
Employment before surgery	Yes	97	48.5
	No	46	23.0
	Retired	57	28.5
Employment after surgery	Yes	55	27.5
	No	79	39.5
	Retired	66	33.0
Chronic diseases*	Hypertension	97	48.5
	Diabetes mellitus	72	36.0
	COPD	5	2.5
	Heart failure	1	0.5
		<b>Mean±SD</b>	<b>Median (Min-Max)</b>
Age (years)		60.84±8.65	61.5 (35-85)
Time elapsed since surgery (months)		12.42±1.45	13 (9-14)
*n folded. COPD: Chronic Obstructive Pulmonary Disease, SD: Standard deviation, Max: maximum value, Min: minimum value			

The reliability of the EQ-5D-5L was evaluated using the test-retest method and intraclass correlation coefficient (ICC) analysis. This study found a slight increase in all the retest scores (Table 3). The most significant difference in the test-retest was in the

Table 2. Frequencies and percentages of responses to the EQ-5D-5L items, and mean index and EQVAS scores					
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Based on n=200, n (%)					
EQ-5D-5L Health status	None	Slight	Moderate	Severe	Extreme
EQ-5D-5L Mobility	132 (66%)	51 (25.5%)	15 (7.5%)	1 (0.5%)	1 (0.5%)
EQ-5D-5L Self-care	178 (89%)	17 (8.5%)	4 (2%)	0 (0%)	1 (0.5%)
EQ-5D-5L Usual activities	153 (76.5%)	35 (17.5%)	10 (5%)	1 (0.5%)	1 (0.5%)
EQ-5D-5L Pain/discomfort	103 (51.5%)	76 (38%)	19 (9.5%)	2 (1%)	0 (0%)
EQ-5D-5L Anxiety/depression	122 (61%)	50 (25%)	23 (11.5%)	4 (2%)	1 (0.5%)
Index scores/EQVAS scores	Mean±SD		Median (min-max)		
Index score UK	0.82±0.15		0.84 (0.03-1)		
Index score US	0.85±0.12		0.86 (0.18-1)		
EQVAS score	78.3±13.97		80 (35-100)		
EQVAS: EuroQol Visual Analog Scale, Max: maximum value, Min: minimum value, SD: standard deviation, UK: United Kingdom, US: United States, VAS: Visual Analog Scale					

EQVAS mean score (-3±9.24). Gwet's AC was calculated based on the test-retest results for each subscale. The EQ-5D-5L indicated almost perfect agreement between the two tests regarding the five dimensions (Gwet's AC: 0.83-0.97 and percentage agreement: 89.6-97.6%). The ICC coefficients indicated that the EQVAS, UK and US index scores were reliable. The EQVAS scores had the highest reliability (0.85). The analyses found that the UK and US index scores were reliable (0.83 and 0.82, respectively) (Table 4).

To evaluate the validity of the EQ-5D-5L, correlations between EQVAS scores and UK and US index scores were examined (Table 5), and both the UK and US index scores had a positive, moderate relationship with the EQVAS ( $p<0.001$ ). There was a positive, strong correlation between the UK and US index scores ( $p<0.001$ ).

## DISCUSSION

The EQ-5D-5L is commonly used to evaluate the quality of life of different populations. It has been used frequently in many studies and fields; however, to our knowledge, no studies have been conducted to examine its psychometric characteristics for CABG patients. This study determined that the EQ-5D-5L is a reliable, and easy-to-use instrument for patients undergoing coronary artery bypass graft surgery.

After CABG surgery, a reduction in symptoms and an improvement in the quality of life of patients are expected.<sup>18-21</sup> In this study, the mean post-operative duration was 12.42±1.45 months. The participants' most common responses to the subscales were none and slight. The index scores were very high. These results are similar to those in the literature regarding improved quality of life after the CABG surgery.<sup>18-20</sup> This indicates that the scale assessed the CABG patients as expected.

This study used both UK and US index scores to guide the choice of value sets in future research for the countries with no value set. The UK and US index scores were similar, but the UK set had a higher reliability coefficient. In the study of Bharmal *et al.* four value sets of EQ-5D-5L were compared and all four scoring algorithms were found to have good and similar psychometric properties.<sup>22</sup> This study's results indicate that both the UK and US value sets

for index scores can be used for CABG patients in the countries with no value set.

This study found a slight increase in all the retest scores; however, this increase was not considered to be a clinically significant difference. The time interval for test-retest studies should be short enough to exclude changes in the study characteristic and long enough to exclude recollection effects.<sup>23</sup> The slight increase in the retest scores may have been due to its having been administered one month later. The time elapsed since surgery was expected to increase quality of life. The most significant difference in the test-retest was in the mean EQVAS scores. Since EQVAS was used to evaluate the health status of the day when the scale was administered, the difference in the retest carried out one month after was an expected result.

The index scores and EQVAS had good test-retest reliability with ICC values of 0.82-0.85, respectively. The ICC values of this study were greater than those of the other studies.<sup>24,25</sup> The EQVAS score had the highest reliability in this study. Similar to our study, the study conducted with cardiac rehabilitation patients found the EQVAS score reliability to be high based on the index score in an evaluation done three months after discharge.<sup>26</sup> The five dimensions of the EQ-5D-5L indicated almost perfect agreement between the two tests with Gwet's AC (0.83-0.97) and percentage agreement (89.6-97.6%) in this study. The Gwet's AC values of this study are similar to those of the study of Indonesia's general population.<sup>27</sup> The validity of the EQ-5D-5L was confirmed by the correlations between the EQ-5D-5L index scores and the EQVAS. The results indicate a strong correlation between the US and UK index scores and a moderate correlation between index scores and the EQVAS. Nolan *et al.* also found a moderate relationship between index scores and the EQVAS score similar to this study.<sup>7</sup> The validation of the EQ-5D-5L was only analyzed with the correlations between the index scores and the EQVAS. In future studies, the validation of the instrument can be analyzed using different methods.

## CONCLUSION

In conclusion, the results of this study showed the EQ-5D-5L has good practicability, and satisfactory reliability with CABG patients. The EQ-5D-5L can

**Table 3.** Test-retest results for the EQ-5D-5L index scores and EQVAS scores

n=100	Test	Retest	Difference
	Mean ± SD	Mean ± SD	Mean ± SD
	Median (min-max)	Median (min-max)	Median (min-max)
Index score UK	0.83±0.13	0.89±0.12	-0.05±0.1
	0.84 (0.32-1)	0.88 (0.46-1)	0 (-0.4-0.16)
Index score US	0.86±0.1	0.9±0.09	-0.04±0.07
	0.86 (0.53-1)	0.88 (0.62-1)	0 (-0.27-0.14)
EQVAS score	79.15±12.51	82.15±13.41	-3±9.24
	80 (50-100)	85 (40-100)	0 (-30-30)

EQVAS: EuroQol Visual Analog Scale, Max: maximum value, Min: minimum value, SD: standard deviation, UK: United Kingdom, US: United States

**Table 4.** Test-retest reliability of the EQ-5D-5L and intraclass correlation coefficients

	Gw AC	Percentage Agreement	
EQ-5D-5L Mobility	0.89	93.2	
EQ-5D-5L Self-care	0.97	97.6	
EQ-5D-5L Usual activities	0.95	96.4	
EQ-5D-5L Pain/discomfort	0.83	90	
EQ-5D-5L Anxiety/depression	0.84	89.6	
	ICC	95% Confidence Interval	
		Lower Bound	Upper Bound
EQVAS score	0.85	0.78	0.90
Index score UK	0.83	0.75	0.88
Index score US	0.82	0.74	0.88

EQVAS: EuroQol Visual Analog Scale, Gw AC: Gwet's agreement coefficient, ICC: intraclass correlation coefficient, UK: United Kingdom, US: United States

**Table 5.** The correlation between the EQVAS, UK and US index scores

		Index score UK	Index score US
EQVAS score	r	0.469*	0.464*
	p	<0.001	<0.001
Index score UK	r	1	0.988*
	p	-	<0.001

\*p<statistically significant correlation, Spearman's correlation analysis  
EQVAS: EuroQol Visual Analog Scale, UK: United Kingdom, US: United States

be used to assess the HRQoL of coronary artery bypass graft patients as a reliable and practical instrument. Both the UK and US value sets can be used to calculate the index score in the countries with no value set.

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\*The authors declare that there are no conflicts of interest.



**IS THE EQ-5D-5L A RELIABLE INSTRUMENT IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT SURGERY?**

## REFERENCES

1. Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. *J Health Econ* 2002; 21: 271-292.
2. Furlong WJ, Feeny DH, Torrance GW, Barr RD. The Health Utilities Index (HUI) system for assessing health-related quality of life in clinical studies. *Ann Med* 2001; 33: 375-384.
3. Rabin R, Charro F. EQ-5D: a measure of health status from the EuroQol Group. *Ann Med* 2001; 33: 337-343.
4. Dyer MT, Goldsmith KA, Sharples LS, Buxton, MJ. A review of health utilities using the EQ-5D in studies of cardiovascular disease. *Health Qual Life Outcomes* 2010; 8-13.
5. Devlin NJ, Brooks R. EQ-5D and the EuroQol group: past, present and future. *Appl Health Econ Health Policy* 2017; 15: 127-137.
6. Daskapan A, Hofer S, Oldridge N, et al. The validity and reliability of the Turkish version of the MacNew Heart Disease Questionnaire in patients with angina. *J Eval Clin Pract* 2008; 14: 209-213.
7. Nolan CM, Longworth L, Lord J, et al. The EQ-5D-5L health status questionnaire in COPD: validity, responsiveness and minimum important difference. *Thorax* 2016; 71: 493-500.
8. Gillespie P, O'Shea E, Casey D, et al. The cost-effectiveness of a structured education pulmonary rehabilitation programme for chronic obstructive pulmonary disease in primary care: the PRINCE cluster randomised trial. *BMJ Open* 2013; 3: e003479.
9. Cross J, Elender F, Barton G, et al. A randomised controlled equivalence trial to determine the effectiveness and cost-utility of manual chest physiotherapy techniques in the management of exacerbations of chronic obstructive pulmonary disease (MATREX). *Health Technol Assess* 2010; 14: 1-147.
10. Herdman M, Gudex C, Lloyd A, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Qual Life Res* 2011; 20: 1727-1736.
11. MacCallum RC, Widaman KF, Zhang S, Hong S. Sample size in factor analysis: the role of model error. *Multivariate Behav Res* 2001; 36: 611-637.
12. Sencan H. Validity and reliability in social and behavioral measurements. Ankara: Seçkin Publishing; 2005.
13. Koo TK, Li MY. A Guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med* 2016; 15: 155-163.
14. Wongpakaran N, Wongpakaran T, Wedding D, Gwet KL. A comparison of Cohen's Kappa and Gwet's AC1 when calculating inter-rater reliability coefficients: a study conducted with personality disorder samples. *BMC Med Res Methodol* 2013; 13: 61.
15. EuroQol. EQ-5D-5L Instrument, Website: <https://euroqol.org/eq-5d-instruments/eq-5d-5l-about/>. [Accessed 12 July 2020].
16. Team R. RStudio: Integrated Development for R. RStudio. MA, ed. PBC, Boston: Rstudio; 2020.
17. Gwet K. irrCAC: Computing chance-corrected agreement coefficients (CAC). R package version. 2019.
18. Pacaric S, Turk T, Eric I, et al. Assessment of the Quality of Life in Patients before and after Coronary Artery Bypass Grafting (CABG): A Prospective Study. *Int J Environ Res Public Health* 2020; 17: 1417.
19. Perrotti A, Ecarnot F, Monaco F, et al. Quality of life 10 years after cardiac surgery in adults: a long-term follow-up study. *Health Qual Life Outcomes* 2019; 17: 88.
20. Mark DB, Knight JD, Velazquez EJ, et al. Quality-of-life outcomes with coronary artery bypass graft surgery in ischemic left ventricular dysfunction: a randomized trial. *Ann Intern Med* 2014; 161: 392-399.
21. Merkouris A, Apostolakis E, Pistolas D. Quality of life after coronary artery bypass graft surgery in the elderly. *Eur J Cardiovasc Nurs* 2009; 8: 74-81.
22. Bharmal M, Hunger M, Schlichting M. Psychometric properties of EQ-5D-5L scoring algorithms for the United Kingdom in metastatic Merkel cell carcinoma. *Value Health* 2019; 22: 1170-1177.
23. Agt HM, Essink Bot ML, Krabbe PFM, et al. Test-retest reliability of health state valuations collected with the EuroQol questionnaire. *Soc Sci Med* 1994; 39: 1537-1544.
24. Sakthong P, Sonsa-Ardjit N, Sukarnjanaset P, Munpan W. Psychometric properties of the EQ-5D-5L in Thai patients with chronic diseases. *Qual Life Res* 2015; 24: 3015-3022.
25. Kim TH, Jo MW, Lee SI, Kim SH, Chung SM. Psychometric properties of the EQ-5D-5L in the general population of South Korea. *Qual Life Res* 2013; 22: 2245-2253.
26. Schweikert B, Hahmann H, Leidl R. Validation of the EuroQol questionnaire in cardiac rehabilitation. *Heart* 2006; 92: 62-67.
27. Purba FD, Hunfeld JAM, Iskandarsyah A, et al. Quality of life of the Indonesian general population: Test-retest reliability and population norms of the EQ-5D-5L and WHOQOL-BREF. *PLoS One* 2018; 13: e0197098.