

The Swedish version of the Anterior Cruciate Ligament Quality of Life Measure (ACL-QOL): translation and measurement properties

S.R Filbay, H Tigerstrand Grevnerts, S Sonesson, H Hedevik, J Kvist

Online Resource 2. Psychometric properties for the Swedish ACL-QOL 33-item Version (including additional item)

Participant characteristics

Table 1. Participant characteristics

| | ≤ 1.5 year follow-up | | 2-10 year follow-up | | 15-25 year follow-up | | >30 year follow-up | | Total | |
|----------------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|
| | Surgical (n=598) | Non-surgical (n=339) | Surgical (n=370) | Non-surgical (n=121) | Surgical (n=42) | Non-surgical (n=35) | Surgical (n=112) | Non-surgical (n=66) | Surgical (n=1122) | Non-surgical (n=561) |
| (%) female | 384 (64%) ₀ | 173 (51%) ₂ | 197 (53%) ₀ | 56 (46%) ⁰ | 12 (29%) ⁰ | 12 (34%) ⁰ | 29 (26%) ₀ | 19 (29%) ⁰ | 622 (55%) ₀ | 260 (47%) ₂ |
| Age at follow-up (years) | 24 (7) ² | 27 (8) ⁵ | 27 (8) ¹ | 31 (9) ⁰ | 45 (5) ⁰ | 43 (4) ⁰ | 59 (6) ⁰ | 59 (7) ⁰ | 29 (13) ³ | 33 (13) ⁵ |
| Symptoms/physical domain | 81 (16) ⁴ | 70 (19) ⁰ | 78 (18) ⁴ | 76 (20) ⁰ | 82 (19) ¹ | 81 (18) ¹ | 78 (20) ¹ | 76 (20) ⁰ | 80 (17) ¹⁰ | 72 (20) ¹ |
| Work-related domain | 69 (23) ⁵⁰ | 58 (26) ¹¹ | 72 (23) ²⁴ | 70 (25) ⁷ | 80 (20) ⁰ | 81 (21) ³ | 74 (23) ¹⁴ | 77 (22) ⁸ | 71 (23) ⁸⁸ | 64 (26) ²⁹ |
| Recreational/sports domain | 56 (25) ⁸ | 39 (23) ⁵ | 59 (24) ² | 50 (25) ¹ | 67 (23) ⁰ | 60 (31) ¹ | 59 (28) ⁰ | 60 (27) ⁰ | 58 (25) ¹⁰ | 45 (26) ⁷ |
| Lifestyle domain | 65 (23) ¹¹ | 51 (24) ⁶ | 69 (23) ³ | 66 (24) ⁰ | 79 (20) ⁰ | 73 (22) ⁰ | 68 (26) ¹ | 70 (25) ¹ | 67 (24) ¹⁵ | 58 (25) ⁷ |
| Social/emotional domain | 60 (21) ¹¹ | 52 (22) ⁷ | 66 (22) ³ | 64 (22) ¹ | 84 (17) ⁰ | 78 (22) ⁰ | 75 (23) ⁰ | 77 (21) ⁰ | 64 (22) ¹⁴ | 59 (24) ⁸ |
| ACL-QOL Total Score | 64 (20) ¹⁵ | 51 (20) ⁷ | 66 (20) ⁵ | 62 (21) ¹ | 76 (18) ⁰ | 71 (23) ⁰ | 69 (23) ⁰ | 69 (22) ⁰ | 65 (21) ²⁰ | 57 (22) ⁸ |

Descriptives are count (%) or mean (standard deviation); numbers in superscript represent the number of cases with missing data

Reliability

Internal consistency

Table 2. Internal consistency for the 33-item version of the Swedish ACL-QOL

| | All patients | YEARS SINCE ACL INJURY | | | |
|---------------------|----------------|------------------------|---------------|--------------|---------------|
| | | ≤ 1.5 years | 2-10 years | 15-25 years | >30 years |
| Surgical | | | | | |
| Total ACL-QOL | 0.971 (n=1057) | 0.970 (n=542) | 0.970 (n=340) | 0.963 (n=41) | 0.980 (n=96) |
| Social/emotional | 0.887 (n=1148) | 0.868 (n=587) | 0.888 (n=367) | 0.857 (n=42) | 0.915 (n=112) |
| Non-surgical | | | | | |
| Total ACL-QOL | 0.975 (n=528) | 0.971 (n=322) | 0.972 (n=112) | 0.972 (n=30) | 0.977 (n=57) |
| Social/ emotional | 0.906 (n=562) | 0.888 (n=332) | 0.888 (n=120) | 0.879 (n=35) | 0.901 (n=66) |

Data represents the Cronbach's alpha

Test re-test reliability and measurement error

Table 3. Reliability of the 33-item version of the Swedish ACL-QOL administrated 1-4 weeks between test and retest

| ACL-QoL Domain | n | Mean difference (95% CI) | SEM (95% CI) | ICC (95% CI) |
|----------------------|----|-----------------------------|-----------------|------------------|
| ACL-QoL total score | 37 | -4.0 (-6.5 to -1.4) | 5.4 | 0.93 (0.87-0.96) |
| Social and emotional | 37 | -5.3 (-9.6 to -0.9) | 9.4 | 0.83 (0.70-0.91) |

Construct validity

Structural validity

Table 4. Fit indices for confirmatory factor analysis model, for the 33-item version of the Swedish ACL-QOL

| Model fit indices | CFI | RMSEA (95% CI) | SRMR |
|--|-------|------------------------|-------|
| Surgical (n=1061) | | | |
| Model 1: 1 factor | 0.792 | 0.107 (0.104 to 0.109) | 0.063 |
| Model 2A: 2 factor (Symptoms+Work, Sport+Lifestyle+SocEmo) | 0.823 | 0.099 (0.096 to 0.101) | 0.057 |
| Model 2B: 2 factor (Symptoms+Work+Sport, Lifestyle+SocEmo) | 0.808 | 0.103 (0.100 to 0.105) | 0.063 |
| Model 3A: 3 factor (Symptoms+Work+Sport, Lifestyle, SocEmo) | 0.822 | 0.099 (0.097 to 0.102) | 0.062 |
| Model 3B: 3 factor (Symptoms+Work, Sport, Lifestyle+SocEmo) | 0.843 | 0.093 (0.091 to 0.095) | 0.056 |
| Model 4A: 4 factor (Symptoms+Work, Sport, Lifestyle, SocEmo) | 0.857 | 0.089 (0.087 to 0.091) | 0.055 |
| Model 4B: 4 factor (Symptoms, Work, Sport, Lifestyle+SocEmo) | 0.847 | 0.092 (0.090 to 0.095) | 0.054 |
| Model 5: 5 factor (Symptoms, Work, Sport, Lifestyle, SocEmo) | 0.860 | 0.088 (0.086 to 0.091) | 0.053 |
| Non-surgical (n=534) | | | |
| Model 1: 1 factor | 0.830 | 0.101 (0.097 to 0.104) | 0.056 |
| Model 2A: 2 factor (Symptoms+Work, Sport+Lifestyle+SocEmo) | 0.859 | 0.092 (0.089 to 0.095) | 0.050 |
| Model 2B: 2 factor (Symptoms+Work+Sport, Lifestyle+SocEmo) | 0.846 | 0.096 (0.093 to 0.099) | 0.056 |
| Model 3A: 3 factor (Symptoms+Work+Sport, Lifestyle, SocEmo) | 0.851 | 0.095 (0.091 to 0.098) | 0.056 |
| Model 3B: 3 factor (Symptoms+Work, Sport, Lifestyle+SocEmo) | 0.883 | 0.084 (0.080 to 0.087) | 0.046 |
| Model 4A: 4 factor (Symptoms+Work, Sport, Lifestyle, SocEmo) | 0.889 | 0.082 (0.078 to 0.085) | 0.046 |
| Model 4B: 4 factor (Symptoms, Work, Sport, Lifestyle+SocEmo) | 0.888 | 0.082 (0.079 to 0.086) | 0.045 |
| Model 5: 5 factor (Symptoms, Work, Sport, Lifestyle, SocEmo) | 0.894 | 0.080 (0.077 to 0.084) | 0.044 |

CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR =

Standardized Root Mean Square Residual; A CFI close to 0.95 or higher, RMSEA close to 0.06 or

lower, and a SRMR close to 0.08 or lower, are representative of good fitting models

Hypothesis testing

Table 5. Hypothesis testing to evaluate construct validity in the 33-item version of the Swedish ACL-QOL

| Hypothesis | Surgical (n=1163) | Non-surgical (n=570) |
|--|---------------------------------|---------------------------------|
| The ACL-QOL score should be at least moderately ($r \geq 0.3$), positively correlated with the PCS SF-36 score | $r=0.70^{**}$ (0.64 to 0.76) | $r=0.71^{**}$ (0.63 to 0.77) |
| The ACL-QOL score should be at least moderately ($r \geq 0.3$), positively correlated with the SF-36 MCS score | $r=0.39^{**}$ (0.30 to 0.49) | $r=0.33^{**}$ (0.15 to 0.49) |
| The ACL-QOL score should be at least moderately, positively correlated with KOOS Pain subscale scores ($r \geq 0.30$) | $r=0.70^{**}$ (0.67 to 0.73) | $r=0.69^{**}$ (0.64 to 0.73) |
| The ACL-QOL score should be at least moderately, positively correlated with KOOS Sport/Rec subscale scores ($r \geq 0.30$) | $r=0.74^{**}$ (0.71 to 0.77) | $r=0.76^{**}$ (0.70 to 0.81) |
| The ACL-QOL score should be at least moderately ($r \geq 0.30$), positively correlated with the EQ-5D index score | $r=0.63^{**}$ (0.56 to 0.69) | $r=0.57^{**}$ (0.47 to 0.65) |
| Patients who were satisfied with current knee function should report better ACL-QOL scores than those who were not (mean ≥ 10 points) | MD=33 | MD=34 |
| Patients who returned to pre-injury sport should report better ACL-QOL scores than those who did not (mean ≥ 10 points) | MD=11 | MD=28 |

Results are reported as r =Pearson correlation (95% CI); MD=Mean difference;

* Correlation (r) / Paired-sample t-test (MD) is significant at the 0.01 level (2-tailed);

Confirmation of at least 75% of the predefined hypotheses is considered necessary to represent good construct validity; SF-36=The Optum SF™ Health Surveys SF-36; PCS=Physical Component Score; MCS=Mental Component Score; KOOS=Knee Injury and Osteoarthritis Outcome Score; EQ-5D=The EuroQol-5D

Responsiveness

Table 6. Evaluation of responsiveness of the 33-item version of the Swedish ACL-QOL using a construct approach

| Hypothesis | Surgical | Non-surgical |
|--|--|--|
| Change (3 to 12 months post ACL surgery) in ACL-RSI score should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL score | $r = 0.719$ 95% CI: 0.566 to 0.818 $p < .001$ $n = 62$ | $r = 0.734$ 95% CI: 0.606 to 0.825 $p < .001$ $n = 73$ |
| ACL-QOL scores at 12 months post ACL surgery, should be higher (mean ≥ 1 points) than ACL-QOL scores at 3 months post ACL surgery | <u>Paired-sample t-test</u> Mean diff = 22.7 95% CI: 19.6 to 25.0 $p < .001$ $n = 107$ | <u>Paired-sample t-test</u> Mean diff = 13.1 95% CI: 10.0 to 16.1 $p < .001$ $n = 113$ |
| Change (3 to 12 months post ACL surgery) in KOOS Pain subscale score should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QoL score | $r = 0.401$ 95% CI: 0.118 to 0.624 $p = .007$ $n = 44$ | $r = 0.713$ 95% CI: 0.502 to 0.844 $p < .001$ $n = 36$ |
| ACL-QOL scores at 6 months post ACL surgery should be higher (mean ≥ 1 points) than ACL-QOL scores at 6 weeks post ACL surgery | <u>Paired-sample t-test</u> Mean diff = 19.6 95% CI: 15.6 to 23.6 $p < .001$ $n = 40$ | N/A |
| Pre-operative ACL-QOL scores should be lower (mean ≥ 1 points) than ACL-QOL scores 12 months post ACL surgery | <u>Paired-sample t-test</u> Mean diff = 29.9 95% CI: 25.7 to 34.1 $p < .001$ $n = 51$ | N/A |
| Change (3 to 12 months post ACL surgery) in the SF-36 Mental Component Score should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL score | $r = 0.503$ 95% CI: 0.222 to 0.706 $p = .001$ $n = 39$ | N/A |
| Change (3 to 12 months post ACL surgery) in the SF-36 Physical Component Score should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL score | $r = 0.628$ 95% CI: 0.390 to 0.787 $p < .001$ $n = 39$ | N/A |
| Change (1 to 3 months post ACL injury) in IKDC should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL Lifestyle domain | | $n=158$ $r=0.36^*$ 0.21 to 0.49 |
| Change (1 to 3 months post ACL injury) in IKDC should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL Social/emotional domain | | $n=157$ $r=0.32^*$ 0.17 to 0.45 |
| Change (1 to 12 months post ACL injury) in IKDC should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL Lifestyle domain | | $n=78$ $r=0.63^*$ 0.47 to 0.75 |

Change (1 to 12 months post ACL injury) in IKDC should be at least moderately positively correlated ($r > 0.30$) with change in ACL-QOL Social/emotional domain

n=79
r=0.50*
0.32 to 0.65

Interpretability

Floor and ceiling effects

Table 7. Floor and ceiling effects for the 33-item Swedish ACL-QOL

| | | Count (%) |
|---------------------------------|------------------------|-----------|
| ACL-QOL Total Score | Lowest possible score | 0 (0) |
| | Highest possible score | 19 (1.1) |
| Social / Emotional Domain Score | Lowest possible score | 4 (0.2) |
| | Highest possible score | 81 (4.7) |