

A Bifactor Model Supports Unidimensionality of the IKDC in Young Active Patients with ACL Tears

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- The International Knee Documentation Committee Subjective Knee Form (IKDC) is the most highly recommended patient reported outcome measure for assessing patients following anterior cruciate ligament (ACL) injury and reconstruction¹
- The IKDC was developed as a unidimensional instrument², however its structural validity has not been definitively confirmed for the young athletic ACL population
- Structural validity = the degree to which the scores of a patient reported outcome are an adequate reflection of the dimensionality of the construct to be measured
 - Provides information about the appropriateness and interpretability of a single score or subscale scores

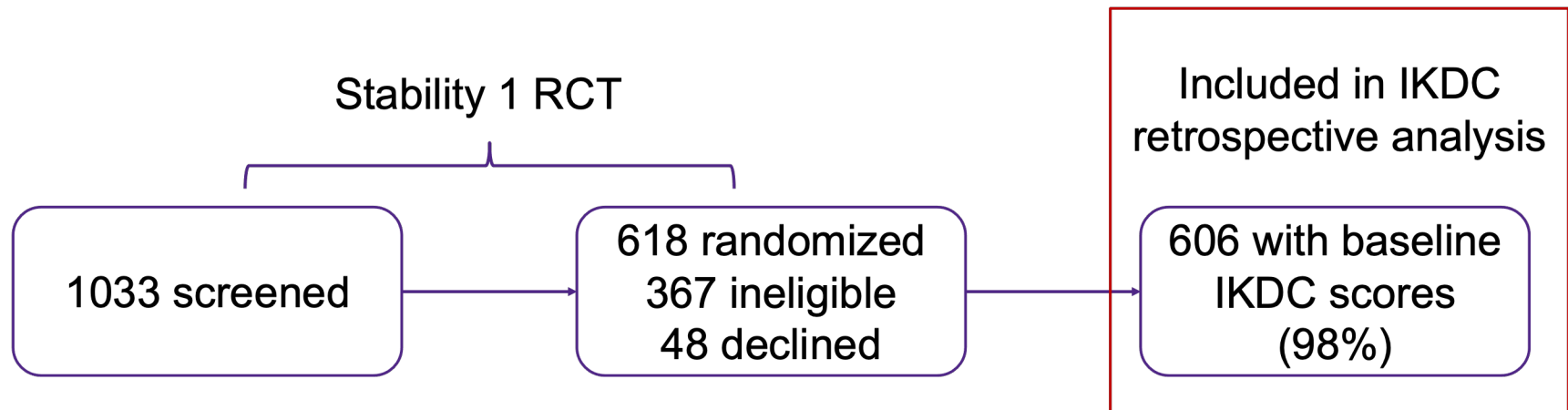
To determine the most appropriate structure of the IKDC in young active patients with ACL injury (unidimensional with a single score or multidimensional with subscale scores)

Structural validity of the IKDC was assessed using the Stability 1 randomized controlled trial baseline dataset of young active patients undergoing ACL reconstruction³

Eligibility Criteria

- Under 25 years old
- Deemed at high risk of graft failure/re-injury based on meeting 2 of the following:
 - Pivot shift grade 2+
 - Participation in high-risk/pivoting sports
 - Generalized ligamentous laxity

Participants



STABILITY

Patient Demographics

	N (%) or Mean \pm SD
Sex	
Male	294 (48.5)
Female	312 (51.5)
Age	19.0 \pm 3.2
Sports Played	
Soccer	310 (51)
Running	208 (34)
Basketball	176 (29)
Volleyball	134 (22)
Hockey	105 (17)
Downhill skiing	96 (16)
Football	84 (14)
Rugby	78 (13)
Baseball/Softball	64 (11)

Structural Validity Assessment

Exploratory and confirmatory factor analysis of 3 potential questionnaire structural models:

1. Unidimensional (as developed)
2. Two factor model (proposed in the literature)
3. Bifactor model (general factor with all items + secondary factors with subsets of items)

Model Fit Assessment

Measures and threshold for acceptable fit:

- Comparative fit index (CFI) > 0.9
- Tucker Lewis Index (TLI) > 0.9
- Root mean square error of approximation (RMSEA) < 0.08
- Standardized root mean square residual (SRMR) < 0.08
- Covariance between factors < 0.85
- Loadings of questionnaire item to factor > 0.3

Results

	Model Structure Tested	CFI	TLI	RMSEA (90% CI)	SRMR	Covariances < 0.85?	Loadings > 0.3?
1	Original Unidimensional	0.843	0.822	0.162 (0.156 to 0.167)	0.106	N/A	Yes
2	Modified Unidimensional	0.975	0.967	0.069 (0.063 to 0.076)	0.042	N/A	Yes
3	Proposed Two-factor	0.943	0.933	0.099 (0.093 to 0.105)	0.058	Yes	Yes
4	Modified Two-factor	0.981	0.977	0.058 (0.051 to 0.064)	0.038	Yes	No
5	Bifactor	0.965	0.954	0.050 (0.043 to 0.052)	0.047	Yes	Yes*

*Includes only loadings onto the general factor

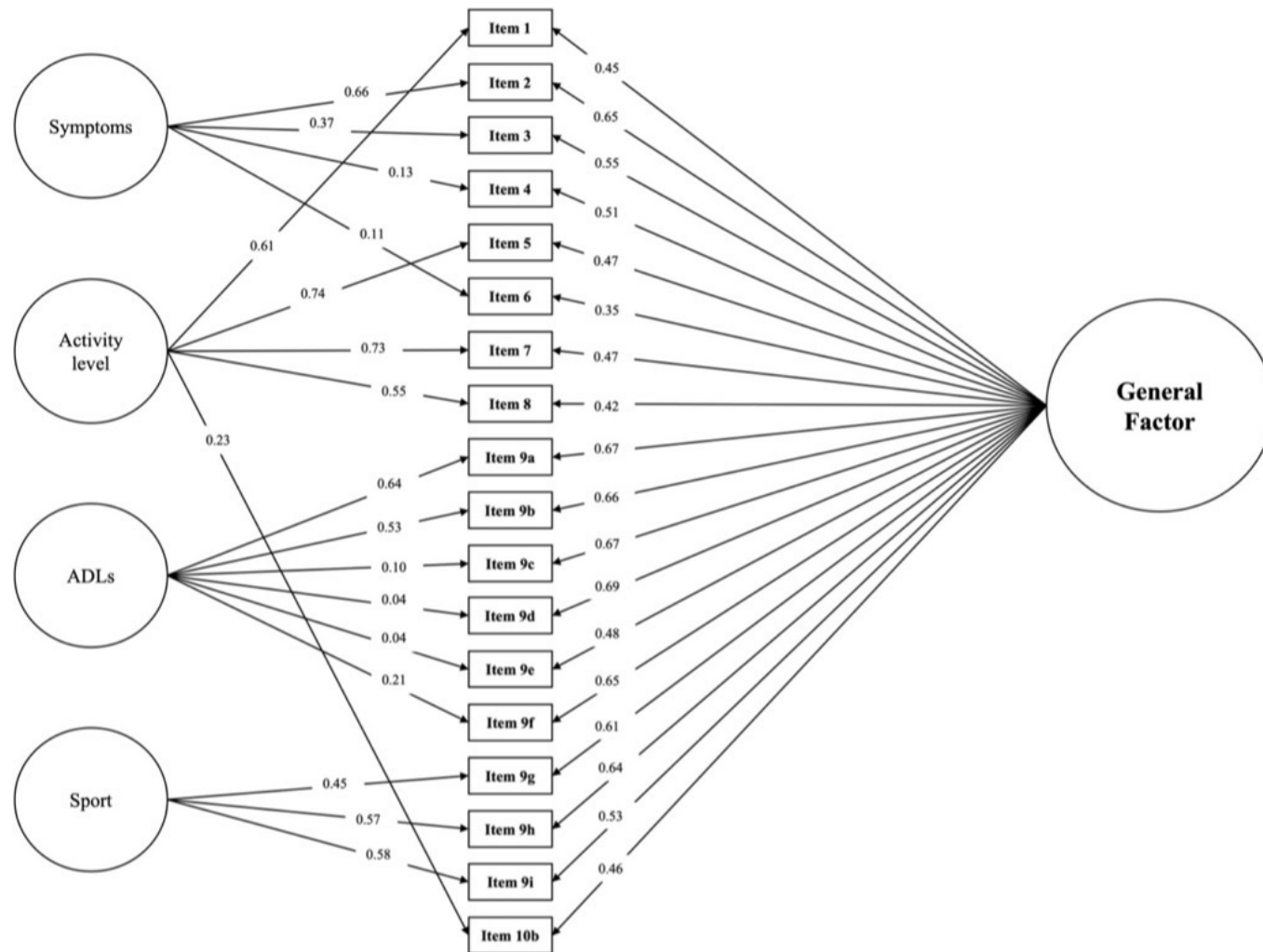
Structural Validity Assessment

- Bifactor model showed acceptable fit without modifications unlike others
- General factor = intended single construct of “symptoms, function and sports”
 - Accounts for 87% of reliable variance in scores
 - Adequate internal reliability
 - Provides single total IKDC score
- Secondary factors = similarly worded items tended to group together but may not represent distinct constructs
 - Accounts for 12% of reliable variance in scores
 - 4 factors labelled symptoms, activity level, ADLs, and sport
 - Provide nuanced information about item grouping
- Overall, results indicate “essential unidimensionality” of the IKDC⁴

Limitations

- Only baseline data used, cannot be sure that results would be replicated at later timepoints or in other datasets

Bifactor Model of IKDC Questionnaire



Path diagram with standardized factor loadings for the proposed bifactor structure of the IKDC in young active patients with anterior cruciate ligament tears.

- **The bifactor model supports the IKDC as a unidimensional score, recognizing secondary factors made up of items with similar formatting/content**
- **Clinically, the IKDC can be administered and scored as intended (single score) for young active patients with ACL tears**
- **Secondary factors are available for further interpretability of IKDC outcome scores**

References

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