



University of Pittsburgh

Psychometric Properties of the PROMIS Physical Function CAT and IKDC Subjective Knee Form in Individuals Recovering from ACL Reconstruction



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Introduction

Evidence to Interpret Health Outcomes:

- **Test Re-Test Reliability** – health outcome score remains consistent when an individual's health condition is unchanged
- **Responsiveness** – health outcome score changes as individual's health condition improves or worsens

Kirschner & Guyatt 1985



Purpose

- **To evaluate the psychometric properties of the PROMIS Physical Function Computer Adaptive Test (PF CAT) & IKDC Subjective Knee Form (IKDC-SKF) in individuals undergoing ACL reconstruction**
- **We evaluated:**
 - **Test-retest reliability & minimal detectable change (MDC)**
 - **Responsiveness (effect sizes), minimal clinically important differences (MCIDs), & thresholds for the patient acceptable symptom state (PASS)**



Methods

Subjects:

Reliability Cohort

- Individuals at least 2 yrs. after ACL reconstruction
- Baseline data collected at time of enrollment (2 or more yrs. post-ACLR)
- Follow-up data collection occurred at 1 month and 3 months after baseline

Responsiveness Cohort

- Individuals with recent ACL injury scheduled for surgery.
- Baseline data collected before surgery
- Follow-up data collection occurred at 12 and 24 months after surgery



Methods

Patient-Reported Outcomes

- **PROMIS PF CAT**
 - Administered through Assessment Center
- **IKDC-SKF**
 - Knee joint specific measure of function and symptoms
 - 18 items
 - Widely used in research registries and clinical trials
 - Sponsored by the American Orthopaedic Society for Sports Medicine (AOSSM)

Global Assessments

- **15-point Global Rating of Change (GRC)**
 - Overall, how would you rate the change in the status of your knee in the last (12 or 24 months)?
- **Patient Acceptable Symptom State (PASS)**
 - Taking into account all the activities you have during your daily life, your level of pain and also your functional limitations, do you consider your current state is satisfactory?



Reliability Cohort

- Participants identified as “stable” if they responded “hardly any worse” (-1), “about the same” (0), or “hardly any better” (1) on the GRC.
- Assessed test-retest reliability in stable cohort at both 1 and 3 months
 - Intraclass correlation coefficient (ICC),
 - SEM and MDC for the scores were calculated from the ICC and the standard deviation of the baseline scores.

	Very Much Better	+7
	Much Better	+6
	A Good Deal Better	+5
	Moderately Better	+4
	Somewhat Better	+3
	A Little Better	+2
Stable	Hardly Any Better	+1
	No Different	0
	Hardly Any Better	-1
	A Little Better	-2
	Somewhat Better	-3
	Moderately Better	-4
	A Good Deal Better	-5
	Much Better	-6
	Very Much Better	-7



Responsiveness Cohort

- Dichotomized subjects into those who made a clinically important change in status (GRC of “a good deal better” (5) or greater) & those who did not make clinically important change
- Receiver-operator characteristic curve (ROC) & used the Youden Index to identify the change score with the best balance of sensitivity & specificity for differentiating between those who had made an important change & those who had not (i.e. the MCID).

Better	Very Much Better	+7
	Much Better	+6
	A Good Deal Better	+5
	Moderately Better	+4
	Somewhat Better	+3
	A Little Better	+2
	Hardly Any Better	+1
	No Different	0
	Hardly Any Better	-1
	A Little Better	-2
	Somewhat Better	-3
	Moderately Better	-4
	A Good Deal Better	-5
	Much Better	-6
Very Much Better	-7	



Results

Reliability Cohort

- **141 subjects completed baseline assessment (average 29.9 ± 11 y.o.; 71 females).**
 - **Active in sports at baseline; Marx Activity Score: median 13; IQR 9 to 16**
- **1 month follow-up (n=116, 83%)**
 - **95 subjects classified as stable**
- **3 month follow-up (n=110, 79%)**
 - **85 subjects classified as stable**



Results

Reliability Cohort

Table - Reliability Assessment: Intraclass Correlation Coefficients (ICC), Standard Error of Measurement (SEM) and Minimal Detectable Change (MDC)

Measure	Time Frame	N	Initial Session Mean (SD)	Follow-up Mean (SD)	ICC (95% CI)	SEM (95% CI)	MDC (95% CI)
PROMIS PF-CAT	1m	95	58.5 (8.9)	56.5 (7.8)	.67 (.53, .77)	5.1 (4.3, 6.1)	14.2 (11.8, 16.9)
	3m	85	58.4 (8.5)	56.2 (7.5)	.55 (.39, .69)	5.7 (4.8, 6.7)	15.7 (13.2, 18.5)
IKDC-SKF	1m	95	86.4 (11.9)	87.6 (11.6)	.9 (.85, .93)	3.8 (3.1, 4.6)	10.5 (8.6, 12.7)
	3m	85	87 (11.1)	87.5 (11.7)	.85 (.77, .9)	4.3 (3.6, 5.3)	12.0 (9.9, 14.6)



Results

Responsiveness Cohort

- **110 subjects (average age 24 ± 8.6 years; 58 females) completed baseline assessment and either:**
- **12 month follow-up (n=82, 75%) or**
- **24 month follow-up (n=59, 54%)**

(Follow-Up Is Ongoing)



Results – Responsiveness Cohort

Measure	Time Frame	N	Initial Session Mean (SD)	Follow-up Mean (SD)	Cohen's d	SRM	MCID	PASS
PROMIS PFCAT	12m	82	42.9 (8.1)	57.6 (9.4)	1.81	1.35	9.1	48.5
	24m	59	44.1 (8.9)	59.6 (9.2)	1.74	1.33	14.3	54.3
IKDC-SKF	12m	82	49.4 (16.7)	86.2 (17.5)	2.21	1.94	28.2	82.2
	24m	59	51.5 (18.3)	89.1 (11.6)	2.10	2.25	37.4	81.6



Discussion

Test Re-Test Reliability

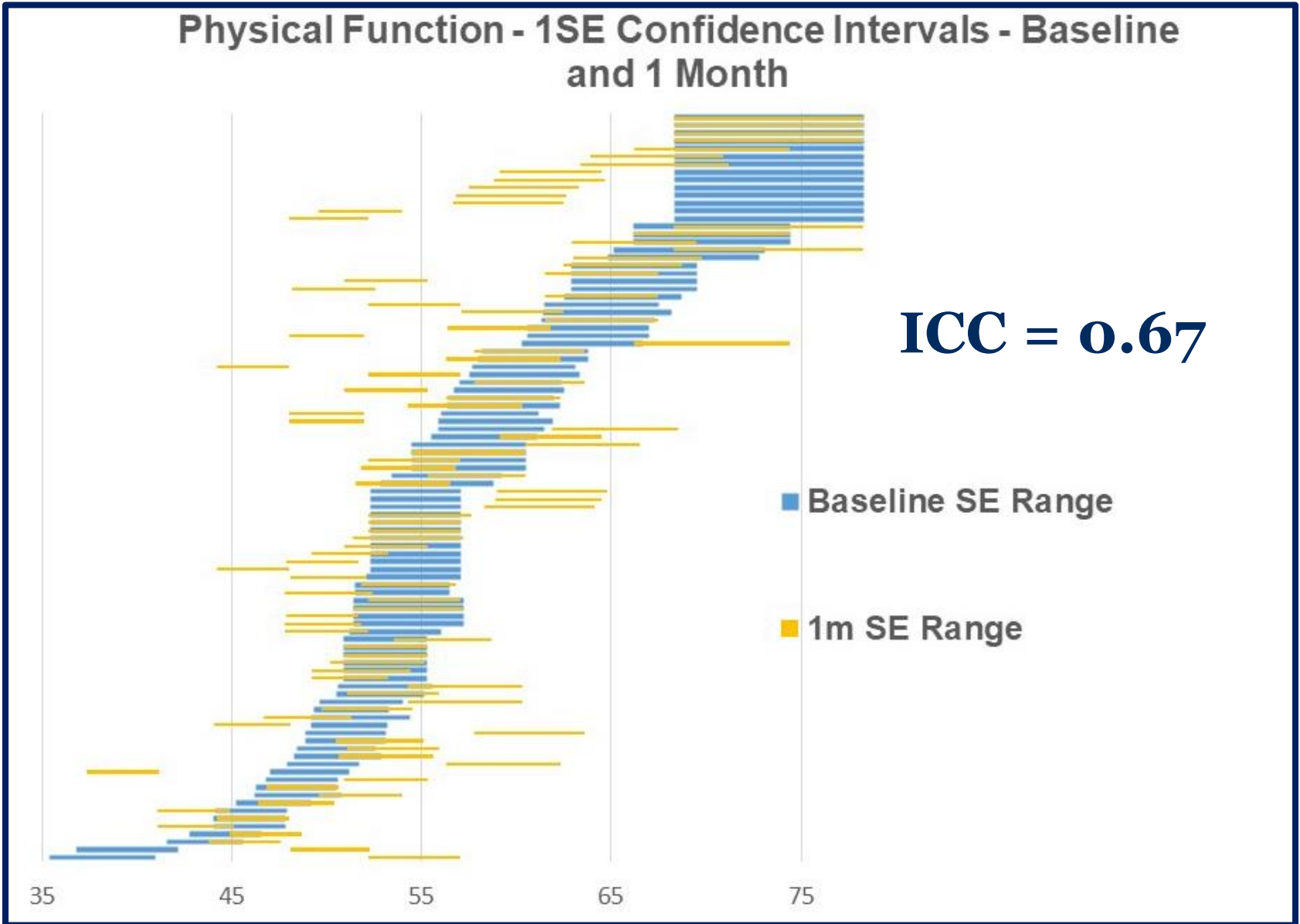
- **PROMIS PF CAT demonstrated sub-optimal levels of test re-test reliability over clinically relevant time periods (1 & 3 months) in individuals > 2 yrs s/p ACL reconstruction**
- **Based on observed reliability for IKDC SKF (ICC = 0.85 – 0.90), construct for assessing reliability was appropriate**
- **Less precise estimates of PF at the upper ranges of the PF scale may have contributed to the lower estimates of test re-test reliability**



Physical Function - 1SE Confidence Intervals - Baseline and 1 Month

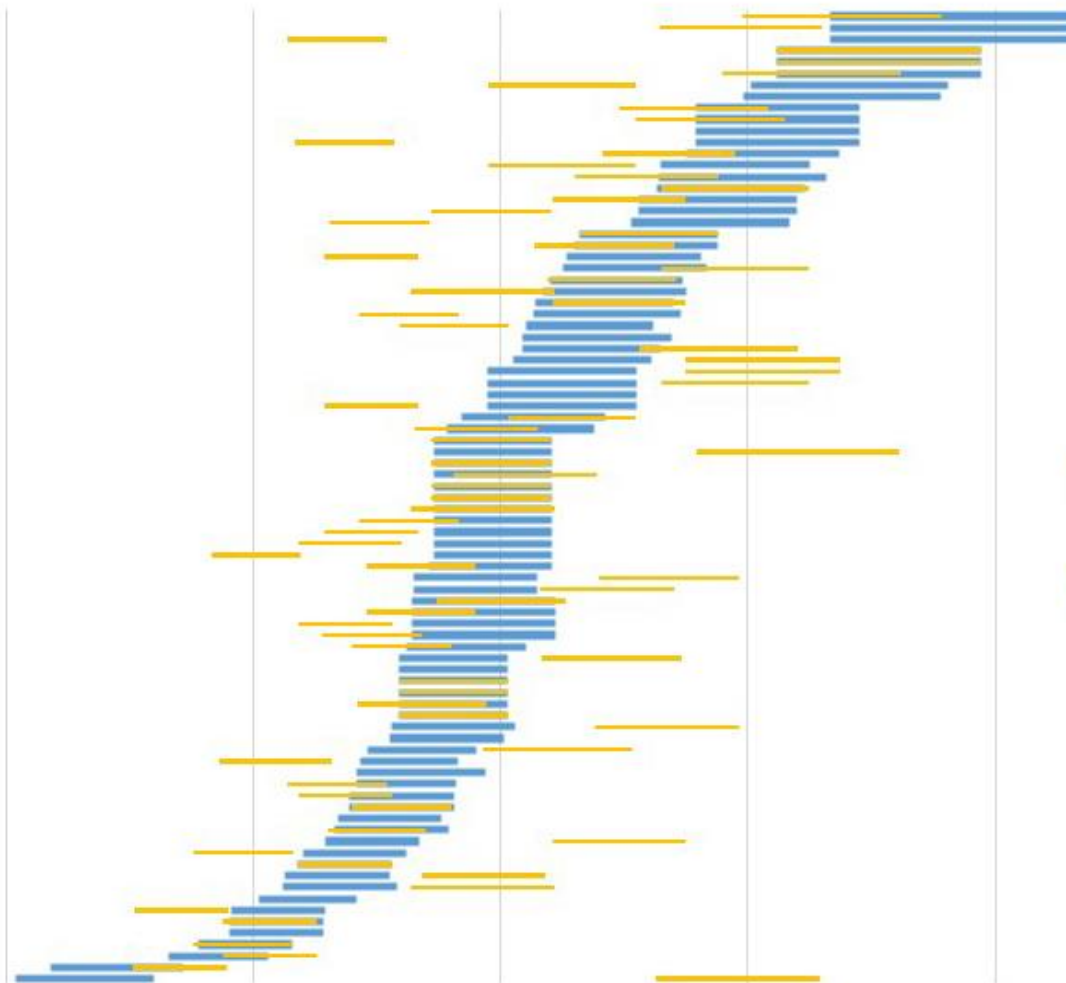
ICC = 0.67

- Baseline SE Range
- 1m SE Range





Physical Function - 1SE Confidence Intervals - Baseline and 3 Month



ICC = 0.55

■ Baseline SE Range

■ 3m SE Range



Discussion

Responsiveness

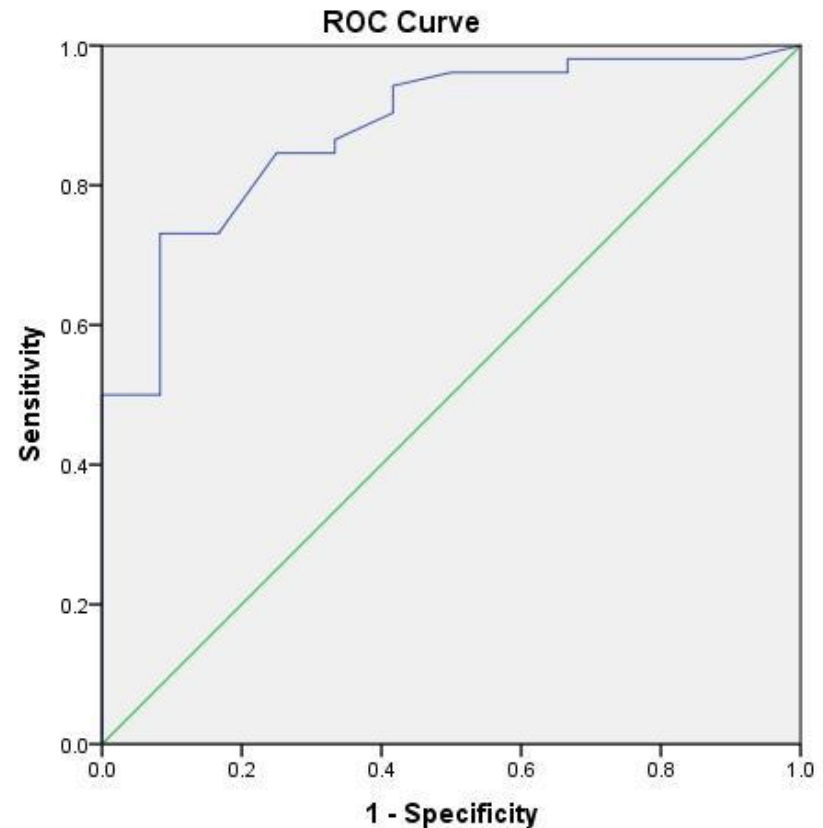
- **Large effects sizes (> 1.7) observed for PF CAT scores 12 & 24 months after ACL reconstruction**
- **However, effect sizes for IKDC – SKF were larger over same time periods**
- **MCIDs were 9 to 14 – implying that changes in PF scores greater than this are likely perceived to be important changes by an individual following ACL reconstruction**



Discussion

PASS

- **PF CAT scores greater than 48 & 54 at 1 and 2 years after ACL reconstruction, respectively, imply that an acceptable symptom state has likely been achieved**



Diagonal segments are produced by ties.



Conclusion

- **Following ACL reconstruction, the PROMIS PF CAT moderate test re-test reliability & excellent responsiveness**
- **Limited questions in the PF item bank that reflect higher levels of physical functioning may have contributed to poorer reliability & greater measurement error in comparison to the IKDC-SKF**



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Thank You



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NIAMS

National Institute of Arthritis
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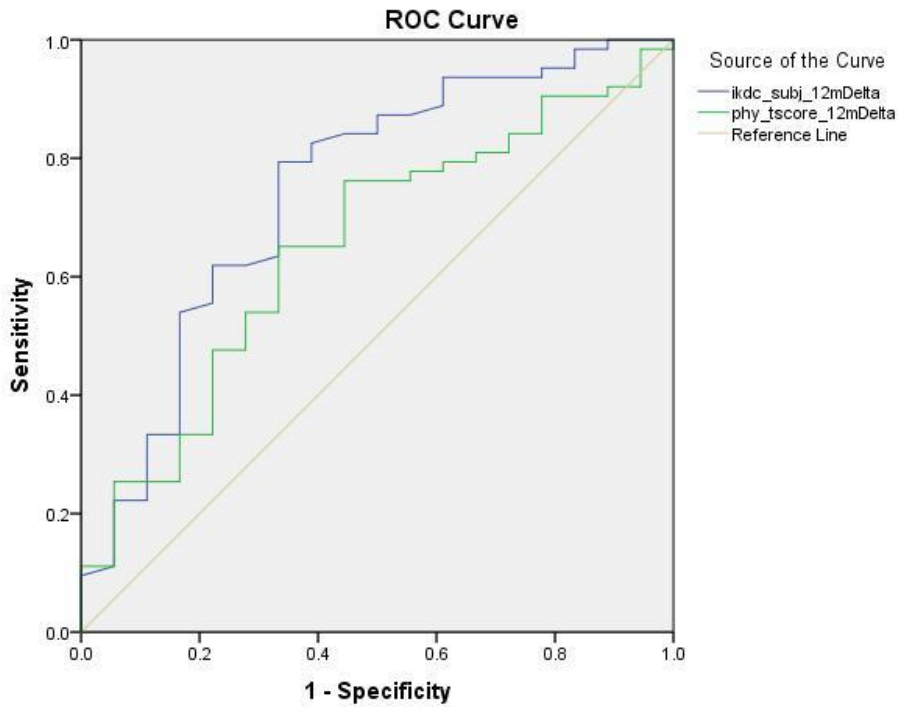




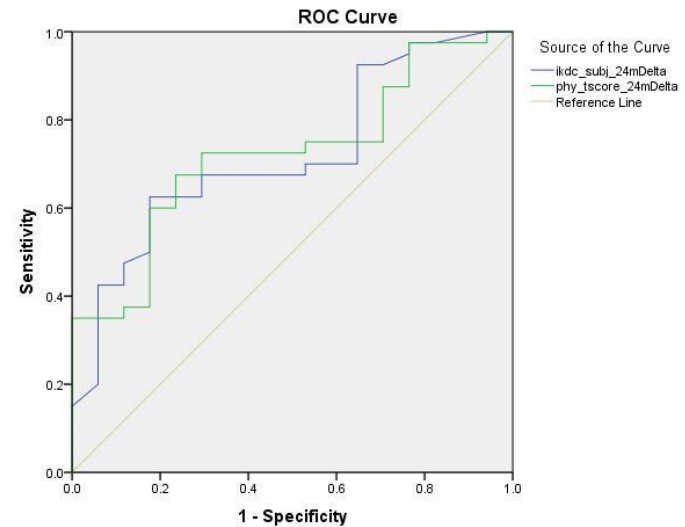
Results – Responsiveness:

12 month follow-up
(63 positive, 18 negative)

24 month follow-up
(40 positive, 17 negative)



Diagonal segments are produced by ties.



Diagonal segments are produced by ties.

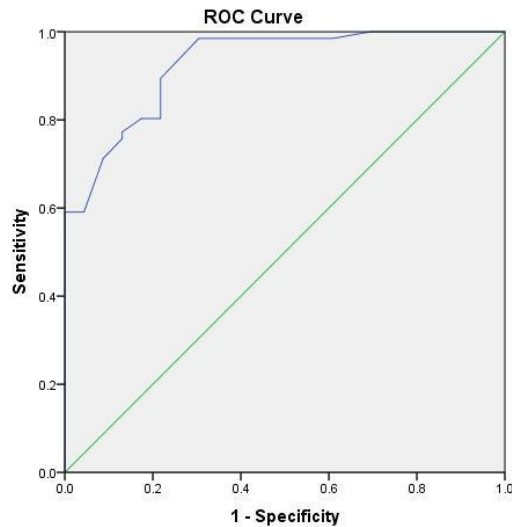


Results – Responsiveness:

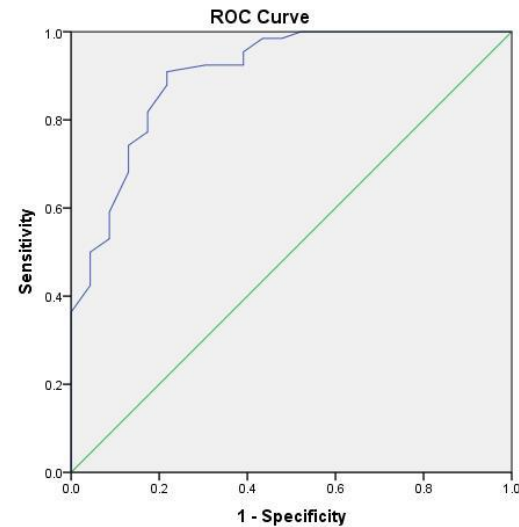
State

**12 month follow-up PFCAT
(66 positive, 23 negative)**

**12 month follow-up IKDC-SKF
(66 positive, 23 negative)**



Diagonal segments are produced by ties.



Diagonal segments are produced by ties.

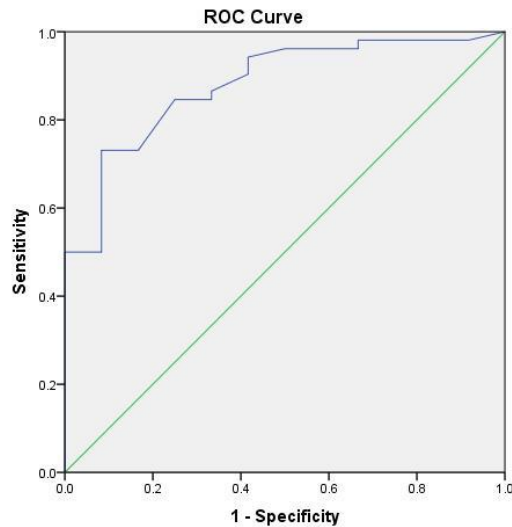


Results – Responsiveness:

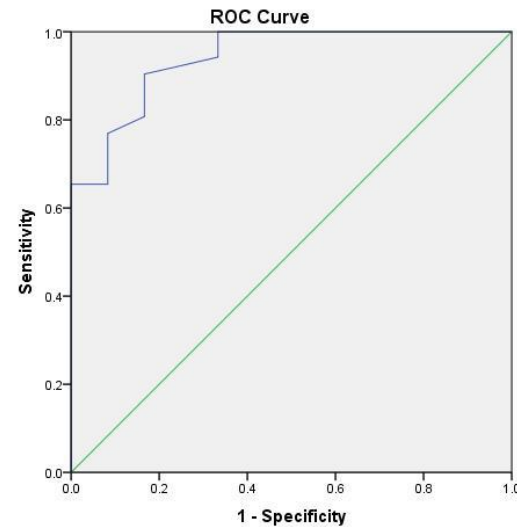
State

**24 month follow-up PFCAT
(52 positive, 12 negative)**

**24 month follow-up IKDC-SKF
(52 positive, 12 negative)**



Diagonal segments are produced by ties.



Diagonal segments are produced by ties.