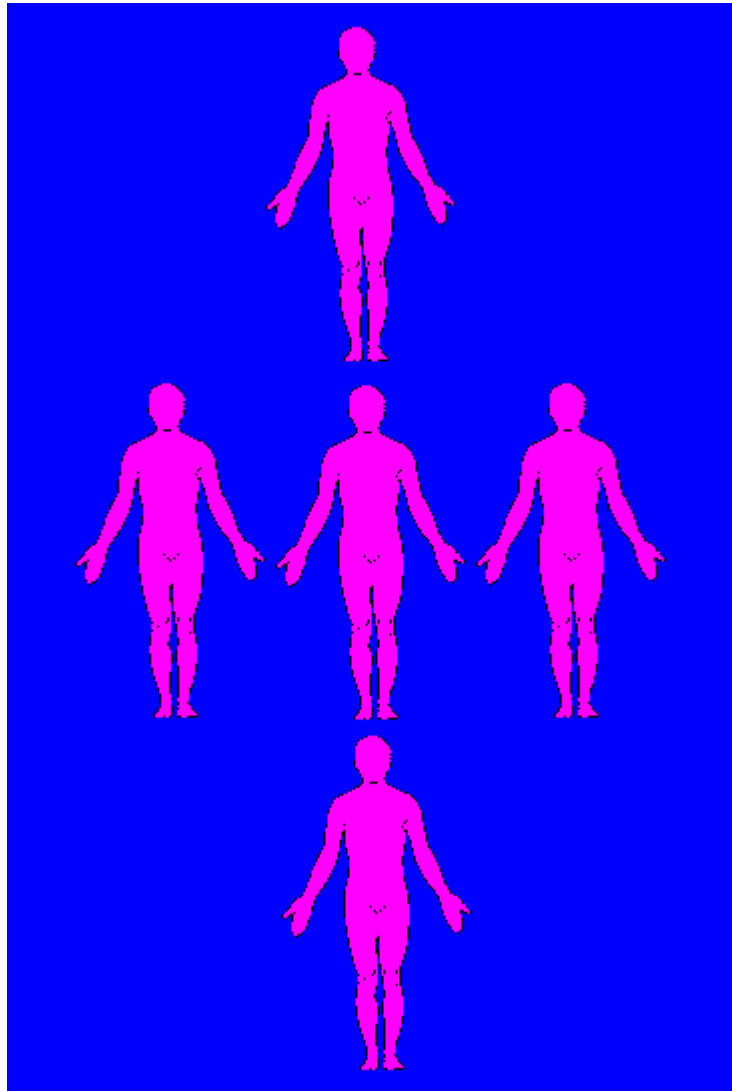




American Academy of Orthopaedic Surgeons



The American Academy of Orthopaedic Surgeons Outcomes Questionnaires:

Normative Data Study Reliability and Validity Tests

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Introduction

Twelve condition-specific self-report musculoskeletal measurement instruments were developed by researchers at the Academy of Orthopaedic Surgeons (AAOS), in collaboration with the Council of Musculoskeletal Specialty Societies (COMSS) and the Council of Spine Societies (COSS), for use by physicians in clinical and research settings. These instruments were designed to collect patient-based data, specifically data regarding the functional status of patients with unique orthopedic conditions. In the current study fielded by National Research Corporation (NRC), those clinical measures were modified into self-report survey questionnaire form in order to collect data from the general U.S. population. Modifications generally involved rewording of item banners for readability. Several screening questions were added on each survey to provide stratification markers. The modifications were kept to minimum in order to keep the survey instruments isomorphic with the clinical measures and to make comparisons between the two data sets meaningful. The survey data will provide standards, or norms, against which scores generated with clinical or research populations can be compared. In the NRC study, surveys were distributed by direct mail to a representative sample of the general U.S. population (n=40,862). The overall response rate across all twelve conditions was 66.8 percent, yielding 27, 283 valid returns.

Reported here are the results of reliability and validity tests of those survey measures. As in the clinical measures described above, each survey instrument contains a number of scales intended to measure the functional status of respondents. Multitrait scaling analyses were performed to evaluate questionnaire items and scales in terms of the characteristics that contribute most to their usefulness as measures.

Rationale

Constructs (e.g., physical health, neurogenic symptoms, pain and disability, etc.) can be measured with single-item or multi-item measures. A measure constructed from multiple items usually has several advantages over a score estimated from a single item. These advantages include better representation of the concept (content validity) and gains in reliability from replication across items. The practical implication of these advantages is usually that multi-item measures provide more information and greater statistical power for purposes of difference and hypothesis testing compared to single item measures, as well as generating more meaningful descriptive statistics.

Multi-item scales achieve greater score reliability by pooling the reliable information that items have in common. At each level of reliability, a scale constructed from multiple items yields a more reliable scale score. Multiple items can also increase validity, if items are carefully selected. It is easier to achieve a representative sample of descriptive information about a construct of interest by using multiple items than it is by using a single-item description. Finally, it is much easier to describe a fuller range of levels that are possible for a given concept using multiple items.

Methods

Survey Design

The modified questionnaires cover five general areas of musculoskeletal care: lower extremity, upper extremity, pediatrics, spine, and general musculoskeletal function. The condition-specific measures are: cervical spine, foot and ankle, hip and knee, lower limb, lumbar spine, musculoskeletal, pediatric-adolescent, pediatric parent-adolescent, pediatric parent-child, scoliosis, sports knee, and upper limb. A co-morbidity checklist of 12-16 common health conditions was included in all the measures. Eight surveys contained the SF-36 Health Survey. For each of those, a number of responses from the SF-36 were incorporated into scoring algorithms developed by AAOS and used as scale items. (Note: The parent-child, parent-adolescent, adolescent and general musculoskeletal surveys did not contain the SF-36) Therefore, although there were a number of common measures across the twelve survey instruments, each contained unique items for scale construction and scoring based on the particular musculoskeletal area of interest. Each of the various scale components from each instrument was analyzed.

Validity and Reliability Analyses

Multitrait scaling is a straightforward yet elegant methodology for scale analysis. In multitrait scaling, scale items are evaluated in terms of four scaling criteria to determine whether:

Each item in a scale is substantially linearly related to the total score for other items in that group (a traditional convergent validity criterion usually expressed in terms of internal consistency).

Each item correlates higher with the construct it is presumed to measure than it correlates with other constructs (item discriminant validity criterion).

Items in the same scale contain the same proportion of information about the construct (test for equal item-total correlations).

Items measuring the same construct have approximately equal variance and therefore do not need to be standardized before combining them in the same scale (equal variance criterion).

Multitrait scaling involves examining item frequencies; item and scale descriptive statistics (e.g., mean, standard deviation, variance); scale internal consistency estimates; item-scale correlations (corrected for overlap); and correlations among scales. Multitrait scaling goes beyond traditional tests of internal-consistency primarily because it tests item discrimination across scales (step two above). Thus items are evaluated with respect to how well they represent a particular construct *relative* to other constructs.

In multitrait scaling analysis, related scale items within a measurement instrument are summated. These summated rating scales are then statistically compared to each other in order to test assumptions of validity and reliability within the instrument. Questions are grouped into conceptually related scales based upon the underlying concept that they are theoretically intended to measure. In order to preserve as much of the sample for analysis as possible, mean replacement of missing data is performed on a case by case basis. If an individual respondent was missing data for less than half of the items within a given scale, that person's mean score for the items to which he or she responded was substituted for all missing data points within the scale (called the "halfscale" run option). Cases missing values for more than half of the scale items were assigned missing values and thus excluded from the analysis. The mean replacement approach was used

solely for the reliability and validity tests. All decisions regarding or how to deal with item nonresponse for the normative data project were made by researchers at AAOS.

Multitrait scaling analyses were then performed on the 12 survey instruments based upon the three conceptual models presented below. These analyses were designed to assess the 1) item internal consistency validity, 2) item discriminant validity, and 3) internal consistency reliability of the AAOS questionnaires.

Results

It would be very difficult, at best, to report all of the statistics computed to test the reliability and validity of 12 separate, multiple-scale instruments in a traditional results section format. Therefore, in order to make presentation and interpretation of the findings more efficient, the results for each of the surveys are presented in a series of appendixes that follow this report.

Presented here are general descriptions of various analyses conducted and the method for reporting those results in the appendixes. Each appendix presents results for one of the 12 instruments in a series of tables. There are a total of 10 tables for each survey. Each of the tables contains footnotes that provide explanations of the data presented, as well as the criteria for assessing scales as either “satisfactory” or “unsatisfactory.”

Table 1 provides summary information about the outcomes of the analyses for each of the individual scales.

Summary of Run Options.

Standard Error Option. All 12 “run options” are identical for all appendixes. That is, a standard error of 2.00 was selected for testing the significance of all item-to-scale correlations.

Missing Data Option. All 12 scales were assessed using a “halfscale” option for item nonresponse, i.e.; responses had to be present for 50% or more of items on each questionnaire. If that criterion was met, all missing items were assigned values equal to the mean of all completed items. Scales with less than 50% of the items completed were assigned missing values and excluded from further analyses.

Number of Items. The number of items used in scale analyses.

Total, Missing and Computable Data.

Total Number of Subjects in Original Data File.

Subjects with Complete Data. Count and percent of surveys in which all items were completed (i.e., no missing or out-of-range values).

Subjects with Computable Scores. The number and percent of surveys with enough data to compute scores using mean replacement.

Data Quality Indicators.

Item Internal Consistency. Presents the percentage of scale items that meet an item-to-scale correlation (corrected for overlap) minimum of 0.40 or greater. Scale items that fail to meet this criterion are listed under item/scale failures. A satisfactory rating (“yes”) is given if 90% of the scale items meet this standard.

Scaling Success. Presents the percentage of items with item-to-scale correlations at least two standard errors greater than the correlations of that item to other scales. Scale items that failed meet this criterion are listed under item/scale failures. Scales are considered satisfactory (“yes” Table 1.) if 80% of item-to-scale correlations in the total data set AND within each scale meet this standard.

Reliable Scales. Percentage of scales with Cronbach’s Alpha coefficients equal to or greater than 0.70. (“Yes” indicates that all scales meet this standard)

Table 2 provides information regarding the assignment of items to their scales. This includes scale naming conventions, a shortened description of the scale, number of items in the scale, item names/numbers, item labels, minimum and maximum values for each item and whether or not the item was recoded (e.g., 5=1, 4=2, 2=5, 1=5).

Table 3 provides descriptive statistics for the raw data for each scale, including sample size, allowed range of possible responses, percent of missing cases, and response values frequencies.

Table 4 provides the information about analysis data, that is, the data set following mean replacement of scale items. Included are response values frequencies, imputed responses, mean scores and standard deviation for the items, and names and labels for the items and the scales.

Table 5 contains item descriptive statistics and Pearson item-scale correlations corrected for overlap (i.e., the relevant item removed from its scale prior to computing correlations). The mean and standard deviation are reported for each item as well.

Table 6 presents item-level discriminant validity test results. Items are scored on whether or not their item-to-scale correlations are greater for hypothesized scales than for competing scales.

Scores of +2 indicate the item-to-scale correlation is greater and significant.

Scores of +1 indicate the correlation is greater but not significantly.

Scores of -1 indicate the correlation is lower but not significantly.

Scores of -2 indicate the item-to-scale correlation is significantly lower.

Table 7 displays the frequency and percentage of item-to-scale correlations at each level of scaling success.

Table 8 provides scale descriptive statistics (mean, standard deviation, range and % at the floor and ceiling for raw scores and for scores transformed to a 100-point metric. Scale scores, as opposed to individual item scores, are report on a standaradized100-point metric for easier interpretation.

Table 9 presents scale reliability and homogeneity estimates in terms of the number of scale items (k), Cronbach’s Alpha (Rtt), alpha estimates if the scale contained 10 items (R10) and the average inter-item correlations (Rii).

Table 10 presents scale internal consistency results showing reliability coefficients (Cronbach’s Alpha) and inter-scale correlations in a symmetrical matrix.

Discussion

A review of the tests reported here indicate that almost without exception the scales in the surveys used in the normative data project meet *a priori* assumptions for reliability and validity. The standard deviations scores for scale items are roughly equivalent within the scale (e.g., around 1.0 for items with five response options), precluding the need to standardize items prior to scaling. Mean scores show greater variability. This is to be expected for items measuring physical activities (from self-care to strenuous activities) because most populations vary in their underlying ability to perform these activities.

The item-to-scale scores across all 12 surveys reveal that all but four of the scaled items have greater item-to-scale correlations with their hypothesized scales than with competing scales, that is, acceptable discriminant validity scores. These four items are q26, q29, q49 and q54 on the parent-child survey. Q26, q29, and q54 ask the parents to rate the degree of ease or difficulty for their child to 1) use a fork and spoon, 2) put on socks, and 3) turn door knobs. Q49 asks how often the child uses an assistive device for walking or climbing (see Appendix I, Table 5).

All but four items met the 0.40 standard for internal consistency (see Appendix I, Table 1 and Table 5). The four items, also on the parent-child survey (q29, q49, q82, and q88) yielded lower than desired scores on tests of item internal consistency. Q29 and Q49 (see above for question descriptions) were again identified as exhibiting less than desirable scaling scores, along with q82 and q88. Q82 requires parents to estimate how frequently in the past week their child got together with friends to do things, while q88 is an estimate of how often the child participated in gym or recess in the past week.

All the items that failed to meet minimum scaling standards are found on one instrument, the pediatric parent-child survey. This is noteworthy because in this condition, a parent completed the survey for a child under ten years of age. One might anticipate greater variability for responses estimating another's functional status. Parents are more likely to overestimate or underestimate their child's physical functioning capabilities for any number of reasons. Additionally, it is reasonable to expect that young children will vary greatly in their ability to perform even very simple tasks. However, despite these scaling failures, none of the suspect items had a significant affect on reducing the reliability or validity scores for the scales in which they are embedded. Each scale in the parent-child survey still met minimum standards for reliability and validity despite scaling failures by these few items.

It should also be noted that the sample sizes for the upper limb survey (n=1142) and the sports knee survey (n=563) are substantially lower than the other surveys where the sample sizes ranged from about 1,500 to over 3,000. The reduced sample size is caused by the "skip patterns" in these two surveys. Respondents were asked to provide information about their ability to function *pre-injury* and *post-injury*. For the majority of the general population, these questions are irrelevant and were skipped. This resulted in a large number of surveys with less than half of the items completed. As discussed previously, when this occurred, those surveys were dropped from reliability and validity analyses.

One last issue needs to be addressed. In those scales which contained items from the SF-36 Health Survey, the sample size for the SF-36 items is much smaller than for the other scale items. This is because four versions of the SF-36 were used in the various surveys (Standard and Acute, Versions 1 and 2). Because the scoring algorithms created by AAOS rely on Standard SF-36 Version 1 Health Survey responses, those scores were the only ones that could be used to generate scale values and in tests of a survey's reliability and validity. This fact presents no difficulty in interpreting the reliability and validity results. The sample size for the Standard SF-36 Version 1 Health Survey was still significantly greater than the 300 deemed

acceptable for conducting multitrait analyses (standard error .06). Taken together, the results of study confirm the reliability and validity of the 12 AAOS musculoskeletal survey instruments employed in the normative data project.

Appendix A: AAOS Cervical Spine Multi-trait Analysis

Appendix A: AAOS Cervical Spine Multi-trait Analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	33

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1821
Subjects with Complete Data (No missing or out of range) -----	323 (18 %)
Subjects with Computable scales (3) -----	1756 (96 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity) Significantly Greater (5a) -----	98	Yes	
Greater (5b) -----	100		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
	PHP	PHYS HLTH & PAIN	16	Q20A	Vigorous	1	3	
				Q20B	Moderate	1	3	
				Q20C	Lifting	1	3	
				Q20D	Climbsev	1	3	
				Q20E	Climbone	1	3	
				Q20F	Bending	1	3	
				Q20G	Walkmile	1	3	
				Q20H	Walksev	1	3	
				Q20I	Walkone	1	3	
				Q20J	Bathing	1	3	
				Q21A	Pcutdown	1	2	
				Q21B	Plessdon	1	2	
				Q21C	Plimited	1	2	
				Q21D	Pdiffclt	1	2	
				Q24	Bodypain	1	6	R
				Q25	Painintf	1	5	R
	NEURO	NEUROGENIC SYMPTOMS	6	Q39	SARM	1	6	
				Q40	SNUMB	1	6	
				Q41	SWEAK	1	6	
				Q43	BARM	1	6	
				Q44	BNUMB	1	6	
				Q45	BWEAK	1	6	
	PAIN	PAIN/DISABILITY	11	Q38	SNECK	1	6	
				Q42	BNECK	1	6	
				Q46	DRESS	1	6	
				Q47	LIFTING	1	6	
				Q48	WALKING	1	6	
				Q49	SITTING	1	6	
				Q50	STANDING	1	6	
				Q51	SLEEPING	1	6	
				Q52	SOCIAL	1	6	
				Q53	TRAVEL	1	6	
	Q54	SEXLIFE	1	6				

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

APPENDIX A: Aaos Cervical Spine Multi-Trait Analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6
Total Sample (N=1821)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	1-3	45	2.5	483	596	697	0	0	0
Q20B	Moderate	1-3	30	1.6	139	330	1322	0	0	0
Q20C	Lifting	1-3	37	2.0	95	269	1420	0	0	0
Q20D	Climbsev	1-3	54	3.0	244	411	1112	0	0	0
Q20E	Climbone	1-3	50	2.7	108	236	1427	0	0	0
Q20F	Bending	1-3	55	3.0	177	456	1133	0	0	0
Q20G	Walkmile	1-3	45	2.5	262	353	1161	0	0	0
Q20H	Walksev	1-3	54	3.0	154	210	1403	0	0	0
Q20I	Walkone	1-3	59	3.2	93	161	1508	0	0	0
Q20J	Bathing	1-3	31	1.7	41	109	1640	0	0	0
Q21A	Pcutdown	1-2	1362	74.8	72	387	0	0	0	0
Q21B	Plessdon	1-2	1364	74.9	153	304	0	0	0	0
Q21C	Plimited	1-2	1368	75.1	111	342	0	0	0	0
Q21D	Pdiffclt	1-2	1368	75.1	106	347	0	0	0	0
Q24	Bodypain	1-6	25	1.4	439	526	348	346	114	23
Q25	Painintf	1-5	37	2.0	990	431	195	139	29	0
Missing			5984	20.5%						
Out-of-range			0	0.0%						

Scale = NEURO - NEUROGENIC SYMPTOMS

Q39	SARM	1-6	62	3.4	1228	232	172	66	35	26
Q40	SNUMB	1-6	60	3.3	1225	237	186	42	40	31
Q41	SWEAK	1-6	60	3.3	1311	176	148	52	40	34
Q43	BARM	1-6	110	6.0	1237	242	116	61	40	15
Q44	BNUMB	1-6	107	5.9	1254	240	111	55	40	14
Q45	BWEAK	1-6	105	5.8	1309	184	107	56	41	19
Missing			504	4.6%						
Out-of-range			0	0.0%						

Scale = PAIN - PAIN/DISABILITY

Q38	SNECK	1-6	55	3.0	1094	321	193	69	55	34
Q42	BNECK	1-6	93	5.1	1123	339	107	82	53	24
Q46	DRESS	1-6	125	6.9	1434	154	71	26	9	2
Q47	LIFTING	1-6	101	5.5	1173	246	69	119	94	19
Q48	WALKING	1-6	90	4.9	1126	333	100	78	61	33
Q49	SITTING	1-6	63	3.5	1443	134	118	52	9	2
Q50	STANDING	1-6	58	3.2	1172	298	120	104	65	4
Q51	SLEEPING	1-6	53	2.9	1177	318	38	69	16	150
Q52	SOCIAL	1-6	47	2.6	1431	143	11	115	35	39

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Item Label	Allowed Range	Missing		Response Values					
			Freq	%	1	2	3	4	5	6
Q53	TRAVEL	1-6	54	3.0	1463	187	59	30	12	16
Q54	SEXLIFE	1-6	142	7.8	1474	84	21	21	38	41
	Missing		881	4.4%						
	Out-of-range		0	0.0%						
Grand Totals					25341	9336	15113	1582	826	526
	Missing		7369	12.3%						
	Out-of-range		0	0.0%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=1756)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.14	0.80	30	464	588	704	0	0	0
Q20B	Moderate	2.67	0.61	19	132	317	1307	0	0	0
Q20C	Lifting	2.75	0.54	21	91	261	1404	0	0	0
Q20D	Climbsev	2.50	0.72	34	236	413	1107	0	0	0
Q20E	Climbone	2.75	0.55	30	103	239	1414	0	0	0
Q20F	Bending	2.54	0.67	39	174	455	1127	0	0	0
Q20G	Walkmile	2.51	0.73	30	255	350	1151	0	0	0
Q20H	Walksev	2.71	0.61	33	148	213	1395	0	0	0
Q20I	Walkone	2.80	0.51	38	92	171	1493	0	0	0
Q20J	Bathing	2.90	0.37	17	40	101	1615	0	0	0
Q21A	Pcutdown	1.81	0.28	1304	253	1503	0	0	0	0
Q21B	Plessdon	1.77	0.32	1307	332	1424	0	0	0	0
Q21C	Plimited	1.79	0.30	1309	293	1463	0	0	0	0
Q21D	Pdiffclt	1.79	0.30	1311	289	1467	0	0	0	0
Q24	Bodypain	4.43	1.29	14	24	110	335	334	518	435
Q25	Painintf	4.24	1.03	22	28	140	188	422	978	0
Scale = NEURO - NEUROGENIC SYMPTOMS										
Q39	SARM	1.59	1.09	31	1229	233	170	65	33	26
Q40	SNUMB	1.60	1.11	34	1218	237	188	41	41	31
Q41	SWEAK	1.55	1.12	28	1304	177	148	53	40	34
Q43	BARM	1.51	1.02	73	1280	243	115	61	41	16
Q44	BNUMB	1.48	1.00	75	1300	240	110	51	39	16
Q45	BWEAK	1.47	1.02	67	1348	190	103	55	41	19
Scale = PAIN - PAIN/DISABILITY										
Q38	SNECK	1.73	1.18	27	1089	320	192	69	53	33
Q42	BNECK	1.64	1.12	60	1148	344	106	84	51	23
Q46	DRESS	1.27	0.68	94	1460	178	77	31	8	2
Q47	LIFTING	1.70	1.24	65	1190	262	74	118	94	18
Q48	WALKING	1.68	1.18	56	1137	343	105	78	61	32
Q49	SITTING	1.34	0.79	34	1428	142	121	54	9	2
Q50	STANDING	1.64	1.10	29	1160	308	114	104	66	4
Q51	SLEEPING	1.80	1.48	27	1167	314	42	74	16	143
Q52	SOCIAL	1.48	1.14	24	1400	155	15	117	32	37
Q53	TRAVEL	1.31	0.82	31	1436	192	64	35	14	15
Q54	SEXLIFE	1.36	1.04	110	1491	116	38	35	37	39
Grand Totals				=====	=====	=====	=====	=====	=====	=====
				6423	24739	13209	15022	1881	2172	925

APPENDIX A: Aaos Cervical Spine Multi-Trait Analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations			
				PHP	NEURO	PAIN	Total

(Standard Error = .02)

Scale = PHP - PHYS HLTH & PAIN

Q20A	Vigorous	2.14	0.80	0.67*	-0.33	-0.53	-0.17*
Q20B	Moderate	2.67	0.61	0.81*	-0.38	-0.64	-0.21*
Q20C	Lifting	2.75	0.54	0.78*	-0.37	-0.63	-0.20*
Q20D	Climbsev	2.50	0.72	0.79*	-0.35	-0.57	-0.14*
Q20E	Climbone	2.75	0.55	0.78*	-0.31	-0.56	-0.10*
Q20F	Bending	2.54	0.67	0.77*	-0.33	-0.58	-0.15*
Q20G	Walkmile	2.51	0.73	0.79*	-0.31	-0.57	-0.11*
Q20H	Walksev	2.71	0.61	0.80*	-0.30	-0.57	-0.10*
Q20I	Walkone	2.80	0.51	0.73*	-0.27	-0.52	-0.07*
Q20J	Bathing	2.90	0.37	0.55*	-0.29	-0.44	-0.15*
Q21A	Pcutdown	1.81	0.28	0.84*	-0.36	-0.64	-0.13*
Q21B	Plessdon	1.77	0.32	0.79*	-0.34	-0.59	-0.12*
Q21C	Plimited	1.79	0.30	0.86*	-0.36	-0.64	-0.13*
Q21D	Pdiffclt	1.79	0.30	0.85*	-0.37	-0.64	-0.14*
Q24	Bodypain	4.43	1.29	0.62*	-0.46	-0.67	-0.43*
Q25	Painintf	4.24	1.03	0.74*	-0.47	-0.74	-0.42*

Scale = NEURO - NEUROGENIC SYMPTOMS

Q39	SARM	1.59	1.09	-0.40	0.77*	0.54	0.63*
Q40	SNUMB	1.60	1.11	-0.34	0.78*	0.46	0.60*
Q41	SWEAK	1.55	1.12	-0.42	0.84*	0.54	0.64*
Q43	BARM	1.51	1.02	-0.43	0.80*	0.57	0.65*
Q44	BNUMB	1.48	1.00	-0.38	0.82*	0.51	0.64*
Q45	BWEAK	1.47	1.02	-0.44	0.85*	0.57	0.66*

Scale = PAIN - PAIN/DISABILITY

Q38	SNECK	1.73	1.18	-0.36	0.54	0.56*	0.56*
Q42	BNECK	1.64	1.12	-0.38	0.53	0.60*	0.57*
Q46	DRESS	1.27	0.68	-0.56	0.58	0.69*	0.52*
Q47	LIFTING	1.70	1.24	-0.70	0.45	0.70*	0.30*
Q48	WALKING	1.68	1.18	-0.77	0.40	0.70*	0.20*
Q49	SITTING	1.34	0.79	-0.47	0.44	0.65*	0.46*
Q50	STANDING	1.64	1.10	-0.67	0.40	0.70*	0.29*
Q51	SLEEPING	1.80	1.48	-0.40	0.38	0.51*	0.35*
Q52	SOCIAL	1.48	1.14	-0.67	0.42	0.75*	0.35*
Q53	TRAVEL	1.31	0.82	-0.62	0.43	0.76*	0.42*
Q54	SEXLIFE	1.36	1.04	-0.54	0.36	0.64*	0.34*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

APPENDIX A: Aaos Cervical Spine Multi-Trait Analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	PHP	NEURO	PAIN	Total
Scale = PHP - PHYS HLTH & PAIN							
Q20A	Vigorous	2.14	0.80	**	2	2	2
Q20B	Moderate	2.67	0.61	**	2	2	2
Q20C	Lifting	2.75	0.54	**	2	2	2
Q20D	Climbsev	2.50	0.72	**	2	2	2
Q20E	Climbone	2.75	0.55	**	2	2	2
Q20F	Bending	2.54	0.67	**	2	2	2
Q20G	Walkmile	2.51	0.73	**	2	2	2
Q20H	Walksev	2.71	0.61	**	2	2	2
Q20I	Walkone	2.80	0.51	**	2	2	2
Q20J	Bathing	2.90	0.37	**	2	2	2
Q21A	Pcutdown	1.81	0.28	**	2	2	2
Q21B	Plessdon	1.77	0.32	**	2	2	2
Q21C	Plimited	1.79	0.30	**	2	2	2
Q21D	Pdiffclt	1.79	0.30	**	2	2	2
Q24	Bodypain	4.43	1.29	**	2	2	2
Q25	Painintf	4.24	1.03	**	2	2	2
Scale = NEURO - NEUROGENIC SYMPTOMS							
Q39	SARM	1.59	1.09	2	**	2	2
Q40	SNUMB	1.60	1.11	2	**	2	2
Q41	SWEAK	1.55	1.12	2	**	2	2
Q43	BARM	1.51	1.02	2	**	2	2
Q44	BNUMB	1.48	1.00	2	**	2	2
Q45	BWEAK	1.47	1.02	2	**	2	2
Scale = PAIN - PAIN/DISABILITY							
Q38	SNECK	1.73	1.18	2	1	**	-1
Q42	BNECK	1.64	1.12	2	2	**	1
Q46	DRESS	1.27	0.68	2	2	**	2
Q47	LIFTING	1.70	1.24	2	2	**	2
Q48	WALKING	1.68	1.18	2	2	**	2
Q49	SITTING	1.34	0.79	2	2	**	2
Q50	STANDING	1.64	1.10	2	2	**	2
Q51	SLEEPING	1.80	1.48	2	2	**	2
Q52	SOCIAL	1.48	1.14	2	2	**	2
Q53	TRAVEL	1.31	0.82	2	2	**	2
Q54	SEXLIFE	1.36	1.04	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - PHYS HLTH & PAIN	0	0.0	0	0.0	0	0.0	32	100.0	32	100.0
NEURO - NEUROGENIC SYMPTOMS	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
PAIN - PAIN/DISABILITY	0	0.0	0	0.0	1	4.5	21	95.5	22	100.0
Total	0	0.0	0	0.0	1	1.5	65	98.5	66	100.0

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

APPENDIX A: Aaos Cervical Spine Multi-Trait Analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
PHP - PHYS HLTH & PAIN	42.09	7.59	16/16	49/49	33/33	0.1	14.5
NEURO - NEUROGENIC SYMPTOMS	9.19	5.55	6/6	36/36	30/30	56.5	0.2
PAIN - PAIN/DISABILITY	16.96	8.51	11/11	59/66	48/55	33.6	0.0
Total	68.24	8.97	43/33	130/151	87/118	0.0	0.0

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
PHP - PHYS HLTH & PAIN	79.06	22.99	0/0	100/100	100/100	0.1	14.5
NEURO - NEUROGENIC SYMPTOMS	10.63	18.49	0/0	100/100	100/100	56.5	0.2
PAIN - PAIN/DISABILITY	10.84	15.48	0/0	88/100	88/100	33.6	0.0
Total	29.86	7.60	8/0	82/100	74/100	0.0	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : (Observed scale score - lowest possible scale score) /
 (highest possible scale score - lowest possible scale score) * 100.
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - PHYS HLTH & PAIN	16	0.94	0.90	0.48
NEURO - NEUROGENIC SYMPTOMS	6	0.94	0.96	0.71
PAIN - PAIN/DISABILITY	11	0.90	0.89	0.45
Total	33	0.69	0.40	0.06

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

APPENDIX A: AAOS CERVICAL SPINE MULTI-TRAIT ANALYSIS

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	NEURO	PAIN
PHP - PHYS HLTH & PAIN	(.94)		
NEURO - NEUROGENIC SYMPTOMS	-.5	(.94)	
PAIN - PAIN/DISABILITY	-.8	.61	(.90)
Total	-.2	.81	.68
Scale-Total Correlation Corrected for Overlap			
Total	-.7	.31	-.3

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	41

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1856
Subjects with Complete Data (No missing or out of range) -----	26 (1 %)
Subjects with Computable scales (3) -----	1556 (84 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	98	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	99	Yes	
Greater (5b) -----	99		
Reliable Scales (6) -----	100	Yes	

- The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
- The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
- Only subjects for whom all scales are computable are included in Analysis Data.
- Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
- Scaling Success (Item discriminant validity) :
 - Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
- Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Scale Name Coding(1)	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
R	PHP	Phys Hlth & Pain	16	Q20A	Vigorous	1	3
				Q20B	Moderate	1	3
				Q20C	Lifting	1	3
				Q20D	Climbsev	1	3
				Q20E	Climbone	1	3
				Q20F	Bending	1	3
				Q20G	Walkmile	1	3
				Q20H	Walksev	1	3
				Q20I	Walkone	1	3
				Q20J	Bathing	1	3
				Q21A	Pcutdown	1	2
				Q21B	Plessdon	1	2
				Q21C	Plimited	1	2
				Q21D	Pdiffcft	1	2
				Q24	Bodypain	1	6
				R			Q25
R	GLBL_FA	GLOBAL FT ANK SCALE	20	Q37	STIFF	1	5
				Q38	SWOLLEN	1	5
				Q39	UNEVEN	1	6
				Q40	FLAT	1	6
				Q41	STAIRS	1	6
				Q42	LIE_BED	1	6
				Q43	HVYPHYS	1	4
				Q44	MODPHYS	1	4
				Q45	LGTPHYS	1	4
				Q46	GETARND	1	7
				Q47	BALANCE	1	6
				Q48	SOCKSOFF	1	6
				Q49	STRENACT	1	6
				Q50	MODACT	1	6
				Q51	LGTACT	1	6
				Q52	STANDHR	1	6
Q53	STANDMIN	1	6				
Q54	UNEVEN	1	6				
Q65	INTFWORK	1	6				
Q66	INTFLIFE	1	6				
R	SHOECMFT	SHOE COMFORT	5	Q60	ANYSHOE	1	2
				Q61	MOSTSHOE	1	2
				Q62	TYPESHOE	1	2
				Q63	PRESCRIP	1	2
				Q64	ALLSHOE	1	2

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Total Sample (N=1856)											
Scale = PHP - Phys Hlth & Pain											
Q20A	Vigorous	1-3	46	2.5	527	592	691	0	0	0	0
Q20B	Moderate	1-3	38	2.0	177	336	1305	0	0	0	0
Q20C	Lifting	1-3	55	3.0	114	299	1388	0	0	0	0
Q20D	Climbsev	1-3	60	3.2	255	436	1105	0	0	0	0
Q20E	Climbone	1-3	54	2.9	114	252	1436	0	0	0	0
Q20F	Bending	1-3	60	3.2	211	476	1109	0	0	0	0
Q20G	Walkmile	1-3	42	2.3	297	349	1168	0	0	0	0
Q20H	Walksev	1-3	55	3.0	161	231	1409	0	0	0	0
Q20I	Walkone	1-3	53	2.9	93	204	1506	0	0	0	0
Q20J	Bathing	1-3	47	2.5	41	90	1678	0	0	0	0
Q21A	Pcutdown	1-2	1391	74.9	83	382	0	0	0	0	0
Q21B	Plessdon	1-2	1389	74.8	143	324	0	0	0	0	0
Q21C	Plimited	1-2	1392	75.0	107	357	0	0	0	0	0
Q21D	Pdiffclt	1-2	1389	74.8	114	353	0	0	0	0	0
Q24	Bodypain	1-6	25	1.3	442	557	336	355	111	30	0
Q25	Painintf	1-5	25	1.3	1011	474	191	123	32	0	0
Missing			6121	20.6%							
Out-of-range			0	0.0%							

Scale = GLBL_FA - GLOBAL FT ANK SCALE

Q37	STIFF	1-5	41	2.2	1336	262	159	47	11	0	0
Q38	SWOLLEN	1-5	40	2.2	1461	203	104	37	11	0	0
Q39	UNEVEN	1-6	75	4.0	1308	249	124	54	17	5	24
Q40	FLAT	1-6	89	4.8	1440	190	92	23	8	0	14
Q41	STAIRS	1-6	85	4.6	1364	204	96	55	25	1	26
Q42	LIE BED	1-6	84	4.5	1482	182	68	26	5	0	9
Q43	HVYPHYS	1-4	99	5.3	1391	69	5	32	260	0	0
Q44	MODPHYS	1-4	96	5.2	1438	82	5	38	197	0	0
Q45	LGTPHYS	1-4	76	4.1	1598	98	6	6	72	0	0
Q46	GETARND	1-7	92	5.0	1577	112	49	10	7	7	2
Q47	BALANCE	1-6	35	1.9	1480	227	68	23	17	6	0
Q48	SOCKSOFF	1-6	35	1.9	1498	214	67	23	10	9	0
Q49	STRENACT	1-6	99	5.3	1188	145	79	12	6	34	293
Q50	MODACT	1-6	95	5.1	1261	160	61	15	6	35	223
Q51	LGFACT	1-6	89	4.8	1393	203	86	13	5	7	60
Q52	STANDHR	1-6	98	5.3	1220	275	121	30	16	19	77
Q53	STANDMIN	1-6	88	4.7	1537	122	62	6	8	3	30
Q54	UNEVEN	1-6	49	2.6	1129	395	165	34	25	9	50
Q65	INTFWORK	1-6	53	2.9	1263	269	135	76	38	22	0
Q66	INTFLIFE	1-6	52	2.8	1344	274	93	53	31	9	0
Missing			1470	4.0%							
Out-of-range			1335	3.6%							

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Item Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Scale = SHOECMFT - SHOE COMFORT											
Q60	ANYSHOE	1-2	140	7.5	874	639	203	0	0	0	0
Q61	MOSTSHOE	1-2	117	6.3	1274	314	151	0	0	0	0
Q62	TYPESHOE	1-2	94	5.1	1698	39	25	0	0	0	0
Q63	PRESCRIP	1-2	184	9.9	175	224	1273	0	0	0	0
Q64	ALLSHOE	1-2	179	9.6	915	512	250	0	0	0	0
	Missing		714	7.7%							
	Out-of-range		1902	20.5%							
Grand Totals					36534	11375	16869	1091	918	196	808
	Missing		8305	10.9%							
	Out-of-range		3237	4.3%							

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Total Sample (N=1556)											
Scale = PHP - Phys Hlth & Pain											
Q20A	Vigorous	2.13	0.81	19	422	513	621	0	0	0	0
Q20B	Moderate	2.65	0.63	19	130	283	1143	0	0	0	0
Q20C	Lifting	2.73	0.55	31	83	245	1228	0	0	0	0
Q20D	Climbsev	2.51	0.71	33	202	364	990	0	0	0	0
Q20E	Climbone	2.76	0.53	28	78	212	1266	0	0	0	0
Q20F	Bending	2.53	0.68	36	162	394	1000	0	0	0	0
Q20G	Walkmile	2.52	0.74	21	230	286	1040	0	0	0	0
Q20H	Walksev	2.71	0.61	19	125	199	1232	0	0	0	0
Q20I	Walkone	2.80	0.50	16	70	164	1322	0	0	0	0
Q20J	Bathing	2.91	0.34	20	29	76	1451	0	0	0	0
Q21A	Pcutdown	1.81	0.28	1164	235	1321	0	0	0	0	0
Q21B	Plessdon	1.78	0.31	1162	279	1277	0	0	0	0	0
Q21C	Plimited	1.80	0.29	1164	253	1303	0	0	0	0	0
Q21D	Pdiffclt	1.79	0.30	1161	261	1295	0	0	0	0	0
Q24	Bodypain	4.46	1.27	13	20	92	288	295	478	383	0
Q25	Painintf	4.29	1.00	14	24	106	149	392	885	0	0
Scale = GLBL_FA - GLOBAL FT ANK SCALE											
Q37	STIFF	1.40	0.79	13	1160	223	125	39	9	0	0
Q38	SWOLLEN	1.29	0.71	7	1274	163	77	34	8	0	0
Q39	UNEVEN	1.42	0.86	30	1171	208	110	46	17	4	0
Q40	FLAT	1.27	0.66	32	1285	163	79	22	7	0	0
Q41	STAIRS	1.37	0.83	44	1223	183	81	47	21	1	0
Q42	LIE BED	1.23	0.60	26	1311	161	59	21	4	0	0
Q43	HVYPHYS	1.17	0.51	252	1378	130	20	28	0	0	0
Q44	MODPHYS	1.18	0.54	189	1369	137	17	33	0	0	0
Q45	LGTPHYS	1.10	0.36	68	1428	109	13	6	0	0	0
Q46	GETARND	1.17	0.59	39	1390	101	45	9	6	4	1
Q47	BALANCE	1.27	0.70	6	1274	195	50	21	13	3	0
Q48	SOCKSOFF	1.26	0.69	8	1287	185	53	18	5	8	0
Q49	STRENACT	1.43	0.94	286	1191	197	107	24	8	29	0
Q50	MODACT	1.41	0.94	212	1208	201	83	25	8	31	0
Q51	LGTACT	1.29	0.70	69	1262	185	82	15	6	6	0
Q52	STANDHR	1.46	0.90	97	1123	261	114	27	14	17	0
Q53	STANDMIN	1.19	0.59	44	1367	112	62	5	7	3	0
Q54	UNEVEN	1.55	0.91	44	1007	351	137	30	23	8	0
Q65	INTFWORK	1.55	1.04	15	1109	217	118	68	30	14	0
Q66	INTFLIFE	1.41	0.87	18	1176	232	75	42	26	5	0
Scale = SHOECMFT - SHOE COMFORT											
Q60	ANYSHOE	1.41	0.48	99	917	639	0	0	0	0	0
Q61	MOSTSHOE	1.20	0.40	48	1240	316	0	0	0	0	0
Q62	TYPESHOE	1.03	0.17	22	1506	50	0	0	0	0	0
Q63	PRESCRIP	1.29	0.38	1192	1041	515	0	0	0	0	0
Q64	ALLSHOE	1.37	0.45	240	986	570	0	0	0	0	0
				=====	=====	=====	=====	=====	=====	=====	=====
Grand Totals				8020	33286	13934	13237	1247	1575	516	1

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations			
				PHP	GLBL_F	SHOECM	Total

(Standard Error = .03)

Scale = PHP - Phys Hlth & Pain

Q20A	Vigorous	2.13	0.81	0.68*	-0.43	-0.34	-0.08*
Q20B	Moderate	2.65	0.63	0.80*	-0.49	-0.33	-0.06*
Q20C	Lifting	2.73	0.55	0.77*	-0.46	-0.29	-0.04*
Q20D	Climbsev	2.51	0.71	0.78*	-0.49	-0.38	-0.09*
Q20E	Climbone	2.76	0.53	0.77*	-0.51	-0.31	-0.10*
Q20F	Bending	2.53	0.68	0.76*	-0.48	-0.33	-0.09*
Q20G	Walkmile	2.52	0.74	0.80*	-0.52	-0.40	-0.12*
Q20H	Walksev	2.71	0.61	0.80*	-0.54	-0.36	-0.13*
Q20I	Walkone	2.80	0.50	0.73*	-0.51	-0.30	-0.13*
Q20J	Bathing	2.91	0.34	0.48*	-0.29	-0.14	-0.01*
Q21A	Pcutdown	1.81	0.28	0.83*	-0.54	-0.35	-0.08*
Q21B	Plessdon	1.78	0.31	0.80*	-0.51	-0.36	-0.07*
Q21C	Plimited	1.80	0.29	0.85*	-0.54	-0.37	-0.06*
Q21D	Pdiffclt	1.79	0.30	0.85*	-0.53	-0.36	-0.06*
Q24	Bodypain	4.46	1.27	0.62*	-0.49	-0.36	-0.23*
Q25	Painintf	4.29	1.00	0.73*	-0.56	-0.36	-0.22*

Scale = GLBL_FA - GLOBAL FT ANK SCALE

Q37	STIFF	1.40	0.79	-0.45	0.74*	0.30	0.59*
Q38	SWOLLEN	1.29	0.71	-0.47	0.70*	0.29	0.52*
Q39	UNEVEN	1.42	0.86	-0.50	0.84*	0.38	0.68*
Q40	FLAT	1.27	0.66	-0.46	0.81*	0.33	0.68*
Q41	STAIRS	1.37	0.83	-0.54	0.83*	0.35	0.63*
Q42	LIE_BED	1.23	0.60	-0.38	0.65*	0.27	0.54*
Q43	HVYPHYS	1.17	0.51	-0.45	0.78*	0.30	0.64*
Q44	MODPHYS	1.18	0.54	-0.43	0.77*	0.29	0.64*
Q45	LGTPHYS	1.10	0.36	-0.43	0.68*	0.22	0.53*
Q46	GETARND	1.17	0.59	-0.56	0.60*	0.25	0.31*
Q47	BALANCE	1.27	0.70	-0.58	0.61*	0.28	0.32*
Q48	SOCKSOFF	1.26	0.69	-0.58	0.56*	0.28	0.26*
Q49	STRENACT	1.43	0.94	-0.47	0.85*	0.34	0.70*
Q50	MODACT	1.41	0.94	-0.47	0.85*	0.33	0.71*
Q51	LGFACT	1.29	0.70	-0.53	0.87*	0.33	0.69*
Q52	STANDHR	1.46	0.90	-0.52	0.84*	0.38	0.66*
Q53	STANDMIN	1.19	0.59	-0.50	0.79*	0.30	0.61*
Q54	UNEVEN	1.55	0.91	-0.61	0.79*	0.40	0.51*
Q65	INTFWORK	1.55	1.04	-0.41	0.63*	0.25	0.47*
Q66	INTFLIFE	1.41	0.87	-0.52	0.82*	0.35	0.64*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).

Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.

b: Less than desirable item discriminant validity: item correlation with competing scale is significantly

higher than its correlation with its own scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Item Label	Mean	SD	Pearson Item-Scale Correlations			
				PHP	GLBL_F	SHOECM	Total
Scale = SHOECMFT - SHOE COMFORT							
Q60	ANYSHOE	1.41	0.48	-0.38	0.36	0.74*	0.23*
Q61	MOSTSHOE	1.20	0.40	-0.33	0.34	0.60*	0.24*
Q62	TYPESHOE	1.03	0.17	-0.19	0.24	0.21*a	0.18*
Q63	PRESCRIP	1.29	0.38	-0.31	0.21	0.69*	0.11*
Q64	ALLSHOE	1.37	0.45	-0.40	0.37	0.76*	0.23*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	PHP	GLBL_F	SHOECM	Total
Scale = PHP - Phys Hlth & Pain							
Q20A	Vigorous	2.13	0.81	**	2	2	2
Q20B	Moderate	2.65	0.63	**	2	2	2
Q20C	Lifting	2.73	0.55	**	2	2	2
Q20D	Climbsev	2.51	0.71	**	2	2	2
Q20E	Climbone	2.76	0.53	**	2	2	2
Q20F	Bending	2.53	0.68	**	2	2	2
Q20G	Walkmile	2.52	0.74	**	2	2	2
Q20H	Walksev	2.71	0.61	**	2	2	2
Q20I	Walkone	2.80	0.50	**	2	2	2
Q20J	Bathing	2.91	0.34	**	2	2	2
Q21A	Pcutdown	1.81	0.28	**	2	2	2
Q21B	Plessdon	1.78	0.31	**	2	2	2
Q21C	Plimited	1.80	0.29	**	2	2	2
Q21D	Pdiffclt	1.79	0.30	**	2	2	2
Q24	Bodypain	4.46	1.27	**	2	2	2
Q25	Painintf	4.29	1.00	**	2	2	2
Scale = GLBL_FA - GLOBAL FT ANK SCALE							
Q37	STIFF	1.40	0.79	2	**	2	2
Q38	SWOLLEN	1.29	0.71	2	**	2	2
Q39	UNEVEN	1.42	0.86	2	**	2	2
Q40	FLAT	1.27	0.66	2	**	2	2
Q41	STAIRS	1.37	0.83	2	**	2	2
Q42	LIE BED	1.23	0.60	2	**	2	2
Q43	HVYPHYS	1.17	0.51	2	**	2	2
Q44	MODPHYS	1.18	0.54	2	**	2	2
Q45	LGTPHYS	1.10	0.36	2	**	2	2
Q46	GETARND	1.17	0.59	2	**	2	2
Q47	BALANCE	1.27	0.70	2	**	2	2
Q48	SOCKSOFF	1.26	0.69	2	**	2	2
Q49	STRENACT	1.43	0.94	2	**	2	2
Q50	MODACT	1.41	0.94	2	**	2	2
Q51	LGTACT	1.29	0.70	2	**	2	2
Q52	STANDHR	1.46	0.90	2	**	2	2
Q53	STANDMIN	1.19	0.59	2	**	2	2
Q54	UNEVEN	1.55	0.91	2	**	2	2
Q65	INTFWORK	1.55	1.04	2	**	2	2
Q66	INTFLIFE	1.41	0.87	2	**	2	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Name	Item Label	Mean	SD	PHP	GLBL_F	SHOECM	Total
Scale = SHOECMFT - SHOE COMFORT							
Q60	ANYSHOE	1.41	0.48	2	2	**	2
Q61	MOSTSHOE	1.20	0.40	2	2	**	2
Q62	TYPESHOE	1.03	0.17	2	-1	**	1
Q63	PRESCRIP	1.29	0.38	2	2	**	2
Q64	ALLSHOE	1.37	0.45	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - Phys Hlth & Pain	0	0.0	0	0.0	0	0.0	32	100.0	32	100.0
GLBL FA - GLOBAL FT ANK SCALE	0	0.0	0	0.0	0	0.0	40	100.0	40	100.0
SHOECMFT - SHOE COMFORT	0	0.0	1	10.0	0	0.0	9	90.0	9	90.0
Total	0	0.0	1	1.2	0	0.0	81	98.8	81	98.8

Levels of Scaling Success Presented in the Table

2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.

1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.

-1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.

-2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						% at Floor	% at Ceiling
	Mean	SD	Observed/ Possible Lowest	Observed/ Possible Highest	Values Range			
PHP - Phys Hlth & Pain	42.18	7.46	16/16	49/49	33/33	0.2	15.4	
GLBL_FA - GLOBAL FT ANK SCALE	26.42	11.54	20/20	97/113	77/93	41.1	0.0	
SHOECMFT - SHOE COMFORT	6.31	1.48	5/5	10/10	5/5	49.2	1.1	
Total	74.91	9.28	50/41	136/172	86/131	0.0	0.0	

Scale	Transformed Scores (0-100)						% at Floor	% at Ceiling
	Mean	SD	Observed/ Possible Lowest	Observed/ Possible Highest	Values Range			
PHP - Phys Hlth & Pain	79.33	22.60	0/0	100/100	100/100	0.2	15.4	
GLBL_FA - GLOBAL FT ANK SCALE	6.91	12.41	0/0	83/100	83/100	41.1	0.0	
SHOECMFT - SHOE COMFORT	26.11	29.55	0/0	100/100	100/100	49.2	1.1	
Total	25.88	7.08	7/0	72/100	65/100	0.0	0.0	

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - Phys Hlth & Pain	16	0.94	0.90	0.48
GLBL FA - GLOBAL FT ANK SCALE	20	0.96	0.93	0.56
SHOECMFT - SHOE COMFORT	5	0.81	0.89	0.46
Total	41	0.80	0.49	0.09

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix B: AAOS Foot/Ankle Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	GLBL_F	SHOECM
PHP - Phys Hlth & Pain	(.94)		
GLBL_FA - GLOBAL FT ANK SCALE	-.6	(.96)	
SHOECMFT - SHOE COMFORT	-.4	.40	(.81)
Total	-.1	.80	.31
Scale-Total Correlation Corrected for Overlap			
Total	-.7	-.6	.16

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal. Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	35

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1936
Subjects with Complete Data	
(No missing or out of range) -----	344 (18 %)
Subjects with Computable scales (3) -----	1738 (90 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	99	Yes	
Greater (5b) -----	100		
Reliable Scales (6) -----	100	Yes	

- The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
- The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
- Only subjects for whom all scales are computable are included in Analysis Data.
- Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
- Scaling Success (Item discriminant validity) :
 - Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
- Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
	PHP	PHYS HLTH & PAIN	16	Q20A	Vigorous	1	3	
				Q20B	Moderate	1	3	
				Q20C	Lifting	1	3	
				Q20D	Climbsev	1	3	
				Q20E	Climbone	1	3	
				Q20F	Bending	1	3	
				Q20G	Walkmile	1	3	
				Q20H	Walksev	1	3	
				Q20I	Walkone	1	3	
				Q20J	Bathing	1	3	
				Q21A	Pcutdown	1	2	
				Q21B	Plessdon	1	2	
				Q21C	Plimited	1	2	
				Q21D	Pdiffclt	1	2	
				Q24	Bodypain	1	6	R
				Q25	Painintf	1	5	R
	HK_CORE	HIP/KNEE CORE	7	Q37	STIFF	1	5	
				Q38	SWOLLEN	1	5	
				Q39	FLATMAX	1	6	
				Q40	STAIRMAX	1	6	
				Q41	LIEBEDMX	1	6	
				Q42	GETARND	1	7	
				Q43	SOCKSOFF	1	6	
	RHP	RIGHT HIP PAIN	3	Q39A	FLAT RH	1	6	
				Q40A	STAIRSRH	1	6	
				Q41A	LIEBEDRH	1	6	
	LHP	LEFT HIP PAIN	3	Q39B	FLAT LH	1	6	
				Q40B	STAIRSLH	1	6	
				Q41B	LIEBEDLH	1	6	
	RKP	RIGHT KNEE PAIN	3	Q39C	FLAT RK	1	6	
				Q40C	STAIRSRK	1	6	
				Q41C	LIEBEDRK	1	6	
	LKP	LEFT KNEE PAIN	3	Q39D	FLAT LK	1	6	
				Q40D	STAIRSLK	1	6	
				Q41D	LIEBEDLK	1	6	

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Total Sample (N=1936)											
Scale = PHP - PHYS HLTH & PAIN											
Q20A	Vigorous	1-3	44	2.3	564	637	691	0	0	0	0
Q20B	Moderate	1-3	24	1.2	171	370	1371	0	0	0	0
Q20C	Lifting	1-3	32	1.7	125	334	1445	0	0	0	0
Q20D	Climbsev	1-3	39	2.0	254	500	1143	0	0	0	0
Q20E	Climbone	1-3	38	2.0	134	264	1500	0	0	0	0
Q20F	Bending	1-3	32	1.7	223	508	1173	0	0	0	0
Q20G	Walkmile	1-3	40	2.1	324	355	1217	0	0	0	0
Q20H	Walksev	1-3	43	2.2	195	237	1461	0	0	0	0
Q20I	Walkone	1-3	47	2.4	112	220	1557	0	0	0	0
Q20J	Bathing	1-3	26	1.3	42	126	1742	0	0	0	0
Q21A	Pcutdown	1-2	1454	75.1	94	388	0	0	0	0	0
Q21B	Plessdon	1-2	1453	75.1	156	327	0	0	0	0	0
Q21C	Plimited	1-2	1453	75.1	124	359	0	0	0	0	0
Q21D	Pdiffclt	1-2	1453	75.1	116	367	0	0	0	0	0
Q24	Bodypain	1-6	33	1.7	488	544	358	364	127	22	0
Q25	Painintf	1-5	48	2.5	1025	481	213	135	34	0	0
	Missing		6259	20.2%							
	Out-of-range		0	0.0%							

Scale = HK_CORE - HIP/KNEE CORE

Q37	STIFF	1-5	58	3.0	1164	384	225	76	29	0	0
Q38	SWOLLEN	1-5	66	3.4	1596	155	86	23	10	0	0
Q39	FLATMAX	1-6	53	2.7	1336	296	148	64	27	4	8
Q40	STAIRMAX	1-6	73	3.8	1172	397	160	65	30	20	19
Q41	LIEBEDMX	1-6	68	3.5	1388	252	147	50	18	4	9
Q42	GETARND	1-7	74	3.8	1645	114	58	19	12	11	3
Q43	SOCKSOFF	1-6	44	2.3	1501	257	80	22	18	14	0
	Missing		436	3.2%							
	Out-of-range		36	0.3%							

Scale = RHP - RIGHT HIP PAIN

Q39A	FLAT RH	1-6	139	7.2	1571	126	60	23	7	3	7
Q40A	STAIRSRH	1-6	174	9.0	1512	139	52	20	11	11	17
Q41A	LIEBEDRH	1-6	168	8.7	1525	129	74	25	8	2	5
	Missing		481	8.3%							
	Out-of-range		29	0.5%							

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Scale = LHP - LEFT HIP PAIN											
Q39B	FLAT LH	1-6	151	7.8	1587	105	44	34	5	3	7
Q40B	STAIRSLH	1-6	171	8.8	1552	121	35	19	12	12	14
Q41B	LIEBEDLH	1-6	176	9.1	1559	100	68	19	7	2	5
	Missing		498	8.6%							
	Out-of-range		26	0.4%							
Scale = RKP - RIGHT KNEE PAIN											
Q39C	FLAT RK	1-6	126	6.5	1491	188	82	26	11	4	8
Q40C	STAIRSRK	1-6	147	7.6	1366	245	102	33	16	12	15
Q41C	LIEBEDRK	1-6	147	7.6	1560	124	70	20	5	4	6
	Missing		420	7.2%							
	Out-of-range		29	0.5%							
Scale = LKP - LEFT KNEE PAIN											
Q39D	FLAT LK	1-6	137	7.1	1515	163	71	26	15	2	7
Q40D	STAIRSLK	1-6	154	8.0	1399	213	93	32	16	13	16
Q41D	LIEBEDLK	1-6	152	7.9	1580	107	64	16	7	2	8
	Missing		443	7.6%							
	Out-of-range		31	0.5%							
Grand Totals					32166	9632	15590	1111	425	145	154
	Missing		8537	12.6%							
	Out-of-range		151	0.2%							

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Total Sample (N=1738)											
Scale = PHP - PHYS HLTH & PAIN											
Q20A	Vigorous	2.12	0.80	25	467	595	676	0	0	0	0
Q20B	Moderate	2.67	0.61	9	137	294	1307	0	0	0	0
Q20C	Lifting	2.74	0.55	18	97	265	1376	0	0	0	0
Q20D	Climbsev	2.53	0.69	23	195	430	1113	0	0	0	0
Q20E	Climbone	2.77	0.53	17	94	219	1425	0	0	0	0
Q20F	Bending	2.56	0.66	14	161	449	1128	0	0	0	0
Q20G	Walkmile	2.53	0.74	22	256	307	1175	0	0	0	0
Q20H	Walksev	2.72	0.61	22	145	200	1393	0	0	0	0
Q20I	Walkone	2.81	0.49	24	80	178	1480	0	0	0	0
Q20J	Bathing	2.91	0.34	13	33	88	1617	0	0	0	0
Q21A	Pcutdown	1.81	0.27	1302	249	1489	0	0	0	0	0
Q21B	Plessdon	1.78	0.31	1300	305	1433	0	0	0	0	0
Q21C	Plimited	1.80	0.29	1300	272	1466	0	0	0	0	0
Q21D	Pdiffclt	1.80	0.28	1301	264	1474	0	0	0	0	0
Q24	Bodypain	4.52	1.26	23	16	99	306	329	519	469	0
Q25	Painintf	4.31	0.97	33	25	106	172	439	996	0	0
Scale = HK_CORE - HIP/KNEE CORE											
Q37	STIFF	1.55	0.89	26	1136	343	183	55	21	0	0
Q38	SWOLLEN	1.19	0.57	32	1521	130	65	16	6	0	0
Q39	FLATMAX	1.43	0.86	1	1295	252	115	52	19	5	0
Q40	STAIRMAX	1.56	0.97	14	1149	358	137	53	26	15	0
Q41	LIEBEDMX	1.38	0.81	6	1336	223	122	38	16	3	0
Q42	GETARND	1.18	0.67	38	1571	87	47	16	5	9	3
Q43	SOCKSOFF	1.28	0.71	14	1420	216	67	13	15	7	0
Scale = RHP - RIGHT HIP PAIN											
Q39A	FLAT RH	1.18	0.60	9	1542	117	49	19	7	4	0
Q40A	STAIRSRH	1.21	0.69	35	1518	135	47	16	11	11	0
Q41A	LIEBEDRH	1.20	0.62	30	1522	121	65	20	7	3	0
Scale = LHP - LEFT HIP PAIN											
Q39B	FLAT LH	1.16	0.58	8	1572	93	39	27	3	4	0
Q40B	STAIRSLH	1.18	0.65	29	1558	110	34	15	12	9	0
Q41B	LIEBEDLH	1.17	0.57	30	1561	92	62	16	4	3	0
Scale = RKP - RIGHT KNEE PAIN											
Q39C	FLAT RK	1.24	0.67	12	1470	166	66	23	8	5	0
Q40C	STAIRSRK	1.35	0.81	26	1365	231	88	27	15	12	0
Q41C	LIEBEDRK	1.18	0.59	21	1541	113	58	17	6	3	0

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Scale = LKP - LEFT KNEE PAIN											
Q39D	FLAT LK	1.21	0.63	18	1502	149	56	18	10	3	0
Q40D	STAIRSLK	1.31	0.77	34	1407	205	80	23	13	10	0
Q41D	LIEBEDLK	1.15	0.54	24	1567	99	54	10	6	2	0
				=====	=====	=====	=====	=====	=====	=====	=====
Grand Totals				5853	30349	12332	14602	1242	1725	577	3

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations						Total
				PHP	HK_COR	RHP	LHP	RKP	LKP	
(Standard Error = .02)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.12	0.80	0.65*	-0.43	-0.30	-0.29	-0.31	-0.29	0.04*
Q20B	Moderate	2.67	0.61	0.80*	-0.52	-0.39	-0.40	-0.36	-0.36	0.06*
Q20C	Lifting	2.74	0.55	0.77*	-0.50	-0.40	-0.39	-0.35	-0.35	0.06*
Q20D	Climbsev	2.53	0.69	0.78*	-0.51	-0.35	-0.34	-0.39	-0.37	0.06*
Q20E	Climbone	2.77	0.53	0.77*	-0.55	-0.40	-0.38	-0.43	-0.42	-0.00*
Q20F	Bending	2.56	0.66	0.75*	-0.58	-0.37	-0.38	-0.44	-0.43	-0.04*
Q20G	Walkmile	2.53	0.74	0.78*	-0.51	-0.37	-0.36	-0.40	-0.36	0.04*
Q20H	Walksev	2.72	0.61	0.79*	-0.52	-0.38	-0.39	-0.39	-0.38	0.05*
Q20I	Walkone	2.81	0.49	0.73*	-0.48	-0.38	-0.37	-0.36	-0.35	0.05*
Q20J	Bathing	2.91	0.34	0.50*	-0.34	-0.25	-0.26	-0.24	-0.24	0.04*
Q21A	Pcutdown	1.81	0.27	0.84*	-0.55	-0.41	-0.42	-0.41	-0.38	0.08*
Q21B	Plessdon	1.78	0.31	0.79*	-0.53	-0.37	-0.36	-0.39	-0.37	0.07*
Q21C	Plimited	1.80	0.29	0.85*	-0.58	-0.42	-0.40	-0.41	-0.40	0.07*
Q21D	Pdiffclt	1.80	0.28	0.86*	-0.59	-0.42	-0.42	-0.42	-0.42	0.06*
Q24	Bodypain	4.52	1.26	0.60*	-0.59	-0.43	-0.41	-0.42	-0.44	-0.22*
Q25	Painintf	4.31	0.97	0.70*	-0.60	-0.43	-0.44	-0.45	-0.45	-0.16*
Scale = HK_CORE - HIP/KNEE CORE										
Q37	STIFF	1.55	0.89	-0.53	0.77*	0.59	0.52	0.66	0.61	0.44*
Q38	SWOLLEN	1.19	0.57	-0.44	0.68*	0.47	0.46	0.60	0.59	0.45*
Q39	FLATMAX	1.43	0.86	-0.59	0.83*	0.65	0.66	0.72	0.69	0.51*
Q40	STAIRMAX	1.56	0.97	-0.59	0.84*	0.63	0.60	0.76	0.72	0.50*
Q41	LIEBEDMX	1.38	0.81	-0.53	0.75*	0.68	0.65	0.64	0.63	0.50*
Q42	GETARND	1.18	0.67	-0.52	0.49*	0.41	0.44	0.38	0.41	0.15*
Q43	SOCKSOFF	1.28	0.71	-0.59	0.62*	0.49	0.51	0.47	0.46	0.20*
Scale = RHP - RIGHT HIP PAIN										
Q39A	FLAT RH	1.18	0.60	-0.46	0.67	0.86*	0.64	0.52	0.49	0.49*
Q40A	STAIRSRH	1.21	0.69	-0.48	0.69	0.85*	0.65	0.55	0.51	0.48*
Q41A	LIEBEDRH	1.20	0.62	-0.41	0.61	0.76*	0.59	0.46	0.44	0.45*
Scale = LHP - LEFT HIP PAIN										
Q39B	FLAT LH	1.16	0.58	-0.45	0.64	0.60	0.85*	0.42	0.49	0.44*
Q40B	STAIRSLH	1.18	0.65	-0.48	0.67	0.65	0.85*	0.51	0.55	0.48*
Q41B	LIEBEDLH	1.17	0.57	-0.42	0.62	0.62	0.76*	0.40	0.48	0.45*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Name	Item Label	Mean	SD	Pearson Item-Scale Correlations						Total
				PHP	HK_COR	RHP	LHP	RKP	LKP	
Scale = RKP - RIGHT KNEE PAIN										
Q39C	FLAT RK	1.24	0.67	-0.47	0.73	0.52	0.45	0.85*	0.59	0.49*
Q40C	STAIRSRK	1.35	0.81	-0.48	0.72	0.49	0.44	0.82*	0.61	0.47*
Q41C	LIEBEDRK	1.18	0.59	-0.43	0.66	0.51	0.44	0.75*	0.56	0.47*
Scale = LKP - LEFT KNEE PAIN										
Q39D	FLAT LK	1.21	0.63	-0.46	0.70	0.48	0.52	0.59	0.86*	0.49*
Q40D	STAIRSLK	1.31	0.77	-0.47	0.71	0.48	0.51	0.62	0.83*	0.48*
Q41D	LIEBEDLK	1.15	0.54	-0.42	0.65	0.48	0.50	0.56	0.76*	0.49*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	PHP	HK_COR	RHP	LHP	RKP	LKP	Total
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.12	0.80	**	2	2	2	2	2	2
Q20B	Moderate	2.67	0.61	**	2	2	2	2	2	2
Q20C	Lifting	2.74	0.55	**	2	2	2	2	2	2
Q20D	Climbsev	2.53	0.69	**	2	2	2	2	2	2
Q20E	Climbone	2.77	0.53	**	2	2	2	2	2	2
Q20F	Bending	2.56	0.66	**	2	2	2	2	2	2
Q20G	Walkmile	2.53	0.74	**	2	2	2	2	2	2
Q20H	Walksev	2.72	0.61	**	2	2	2	2	2	2
Q20I	Walkone	2.81	0.49	**	2	2	2	2	2	2
Q20J	Bathing	2.91	0.34	**	2	2	2	2	2	2
Q21A	Pcutdown	1.81	0.27	**	2	2	2	2	2	2
Q21B	Plessdon	1.78	0.31	**	2	2	2	2	2	2
Q21C	Plimited	1.80	0.29	**	2	2	2	2	2	2
Q21D	Pdiffclt	1.80	0.28	**	2	2	2	2	2	2
Q24	Bodypain	4.52	1.26	**	2	2	2	2	2	2
Q25	Painintf	4.31	0.97	**	2	2	2	2	2	2
Scale = HK_CORE - HIP/KNEE CORE										
Q37	STIFF	1.55	0.89	2	**	2	2	2	2	2
Q38	SWOLLEN	1.19	0.57	2	**	2	2	2	2	2
Q39	FLATMAX	1.43	0.86	2	**	2	2	2	2	2
Q40	STAIRMAX	1.56	0.97	2	**	2	2	2	2	2
Q41	LIEBEDMX	1.38	0.81	2	**	2	2	2	2	2
Q42	GETARND	1.18	0.67	2	**	2	1	2	2	2
Q43	SOCKSOFF	1.28	0.71	2	**	2	2	2	2	2
Scale = RHP - RIGHT HIP PAIN										
Q39A	FLAT RH	1.18	0.60	2	2	**	2	2	2	2
Q40A	STAIRSRH	1.21	0.69	2	2	**	2	2	2	2
Q41A	LIEBEDRH	1.20	0.62	2	2	**	2	2	2	2
Scale = LHP - LEFT HIP PAIN										
Q39B	FLAT LH	1.16	0.58	2	2	2	**	2	2	2
Q40B	STAIRSLH	1.18	0.65	2	2	2	**	2	2	2
Q41B	LIEBEDLH	1.17	0.57	2	2	2	**	2	2	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	PHP	HK_COR	RHP	LHP	RKP	LKP	Total
Scale = RKP - RIGHT KNEE PAIN										
Q39C	FLAT RK	1.24	0.67	2	2	2	2	**	2	2
Q40C	STAIRSRK	1.35	0.81	2	2	2	2	**	2	2
Q41C	LIEBEDRK	1.18	0.59	2	2	2	2	**	2	2
Scale = LKP - LEFT KNEE PAIN										
Q39D	FLAT LK	1.21	0.63	2	2	2	2	2	**	2
Q40D	STAIRSLK	1.31	0.77	2	2	2	2	2	**	2
Q41D	LIEBEDLK	1.15	0.54	2	2	2	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - PHYS HLTH & PAIN	0	0.0	0	0.0	0	0.0	80	100.0	80	100.0
HK_CORE - HIP/KNEE CORE	0	0.0	0	0.0	1	2.9	34	97.1	35	100.0
RHP - RIGHT HIP PAIN	0	0.0	0	0.0	0	0.0	15	100.0	15	100.0
LHP - LEFT HIP PAIN	0	0.0	0	0.0	0	0.0	15	100.0	15	100.0
RKP - RIGHT KNEE PAIN	0	0.0	0	0.0	0	0.0	15	100.0	15	100.0
LKP - LEFT KNEE PAIN	0	0.0	0	0.0	0	0.0	15	100.0	15	100.0
Total	0	0.0	0	0.0	1	0.6	174	99.4	175	100.0

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Values		Range			
			Lowest	Highest				
PHP - PHYS HLTH & PAIN	42.37	7.28	16/16	49/49	33/33	0.1	15.8	
HK_CORE - HIP/KNEE CORE	9.56	4.38	7/7	40/41	33/34	51.0	0.0	
RHP - RIGHT HIP PAIN	3.60	1.77	3/3	18/18	15/15	83.1	0.2	
LHP - LEFT HIP PAIN	3.51	1.66	3/3	18/18	15/15	85.6	0.2	
RKP - RIGHT KNEE PAIN	3.78	1.90	3/3	18/18	15/15	76.0	0.2	
LKP - LEFT KNEE PAIN	3.67	1.78	3/3	18/18	15/15	78.7	0.1	
Total	66.49	7.58	40/35	129/162	89/127	0.0	0.0	

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)						% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Values		Range			
			Lowest	Highest				
PHP - PHYS HLTH & PAIN	79.91	22.07	0/0	100/100	100/100	0.1	15.8	
HK_CORE - HIP/KNEE CORE	7.54	12.89	0/0	97/100	97/100	51.0	0.0	
RHP - RIGHT HIP PAIN	4.00	11.78	0/0	100/100	100/100	83.1	0.2	
LHP - LEFT HIP PAIN	3.41	11.08	0/0	100/100	100/100	85.6	0.2	
RKP - RIGHT KNEE PAIN	5.17	12.69	0/0	100/100	100/100	76.0	0.2	
LKP - LEFT KNEE PAIN	4.49	11.87	0/0	100/100	100/100	78.7	0.1	
Total	24.80	5.97	4/0	74/100	70/100	0.0	0.0	

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - PHYS HLTH & PAIN	16	0.93	0.90	0.47
HK_CORE - HIP/KNEE CORE	7	0.90	0.93	0.56
RHP - RIGHT HIP PAIN	3	0.91	0.97	0.77
LHP - LEFT HIP PAIN	3	0.91	0.97	0.77
RKP - RIGHT KNEE PAIN	3	0.89	0.97	0.74
LKP - LEFT KNEE PAIN	3	0.90	0.97	0.74
Total	35	0.74	0.45	0.08

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix C: AAOS Hip/Knee Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	HK_COR	RHP	LHP	RKP	LKP
PHP - PHYS HLTH & PAIN	(.93)					
HK_CORE - HIP/KNEE CORE	-.7	(.90)				
RHP - RIGHT HIP PAIN	-.5	.71	(.91)			
LHP - LEFT HIP PAIN	-.5	.70	.68	(.91)		
RKP - RIGHT KNEE PAIN	-.5	.77	.55	.48	(.89)	
LKP - LEFT KNEE PAIN	-.5	.75	.52	.55	.64	(.90)
Total	.10	.61	.58	.56	.60	.60
Scale-Total Correlation Corrected for Overlap						
Total	-.7	.04	.39	.38	.40	.42

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix D: AAOS Lower Limb Multi-trait analysis

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	23

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1925
Subjects with Complete Data (No missing or out of range) -----	369 (19 %)
Subjects with Computable scales (3) -----	1879 (98 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	100	Yes	
Greater (5b) -----	100		
Reliable Scales (6) -----	100	Yes	

- The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
- The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
- Only subjects for whom all scales are computable are included in Analysis Data.
- Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
- Scaling Success (Item discriminant validity) :
 - Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
- Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
	PHP	Phys Hlth & Pain	16	Q20A	Vigorous	1	3	
				Q20B	Moderate	1	3	
				Q20C	Lifting	1	3	
				Q20D	Climbsev	1	3	
				Q20E	Climbone	1	3	
				Q20F	Bending	1	3	
				Q20G	Walkmile	1	3	
				Q20H	Walksev	1	3	
				Q20I	Walkone	1	3	
				Q20J	Bathing	1	3	
				Q21A	Pcutdown	1	2	
				Q21B	Plessdon	1	2	
				Q21C	Plimited	1	2	
				Q21D	Pdiffclt	1	2	
				Q24	Bodypain	1	6	R
				Q25	Painintf	1	5	R
	LL_CORE	LOW LIMB CORE SCALE	7	Q37	STIFF	1	5	
				Q38	SWOLLEN	1	5	
				Q39	FLAT	1	6	
				Q40	STAIRS	1	6	
				Q41	LIE_BED	1	6	
				Q42	GETARND	1	7	
				Q43	SOCKSOFF	1	6	

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Total Sample (N=1925)											
Scale = PHP - Phys Hlth & Pain											
Q20A	Vigorous	1-3	40	2.1	524	688	673	0	0	0	0
Q20B	Moderate	1-3	26	1.4	145	366	1388	0	0	0	0
Q20C	Lifting	1-3	24	1.2	106	300	1495	0	0	0	0
Q20D	Climbsev	1-3	38	2.0	244	517	1126	0	0	0	0
Q20E	Climbone	1-3	51	2.6	99	260	1515	0	0	0	0
Q20F	Bending	1-3	42	2.2	193	495	1195	0	0	0	0
Q20G	Walkmile	1-3	39	2.0	312	372	1202	0	0	0	0
Q20H	Walksev	1-3	45	2.3	161	251	1468	0	0	0	0
Q20I	Walkone	1-3	31	1.6	96	201	1597	0	0	0	0
Q20J	Bathing	1-3	27	1.4	36	107	1755	0	0	0	0
Q21A	Pcutdown	1-2	1464	76.1	74	387	0	0	0	0	0
Q21B	Plessdon	1-2	1463	76.0	146	316	0	0	0	0	0
Q21C	Plimited	1-2	1465	76.1	100	360	0	0	0	0	0
Q21D	Pdiffclt	1-2	1464	76.1	105	356	0	0	0	0	0
Q24	Bodypain	1-6	35	1.8	461	555	364	372	116	22	0
Q25	Painintf	1-5	36	1.9	1026	507	205	123	28	0	0
	Missing		6290	20.4%							
	Out-of-range		0	0.0%							

Scale = LL_CORE - LOW LIMB CORE SCALE

Q37	STIFF	1-5	55	2.9	1050	478	227	88	27	0	0
Q38	SWOLLEN	1-5	44	2.3	1486	221	125	36	13	0	0
Q39	FLAT	1-6	68	3.5	1302	311	169	42	18	3	12
Q40	STAIRS	1-6	71	3.7	1140	381	184	83	33	16	17
Q41	LIE_BED	1-6	78	4.1	1344	338	109	35	13	2	6
Q42	GETARND	1-7	105	5.5	1624	119	46	13	6	11	1
Q43	SOCKSOFF	1-6	39	2.0	1527	231	80	26	12	10	0
	Missing		460	3.4%							
	Out-of-range		35	0.3%							

Grand Totals					13301	8117	14923	818	266	64	36
	Missing		6750	15.2%							
	Out-of-range		35	0.1%							

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Total Sample (N=1879)											
Scale = PHP - Phys Hlth & Pain											
Q20A	Vigorous	2.09	0.79	29	513	683	683	0	0	0	0
Q20B	Moderate	2.66	0.61	13	141	362	1376	0	0	0	0
Q20C	Lifting	2.73	0.55	11	103	293	1483	0	0	0	0
Q20D	Climbsev	2.47	0.71	26	237	524	1118	0	0	0	0
Q20E	Climbone	2.75	0.54	35	98	275	1506	0	0	0	0
Q20F	Bending	2.53	0.67	24	188	500	1191	0	0	0	0
Q20G	Walkmile	2.47	0.76	28	303	381	1195	0	0	0	0
Q20H	Walksev	2.69	0.62	32	158	261	1460	0	0	0	0
Q20I	Walkone	2.79	0.52	20	94	206	1579	0	0	0	0
Q20J	Bathing	2.90	0.35	17	35	110	1734	0	0	0	0
Q21A	Pcutdown	1.81	0.27	1423	268	1611	0	0	0	0	0
Q21B	Plessdon	1.77	0.31	1421	339	1540	0	0	0	0	0
Q21C	Plimited	1.79	0.28	1423	293	1586	0	0	0	0	0
Q21D	Pdiffclt	1.79	0.29	1422	297	1582	0	0	0	0	0
Q24	Bodypain	4.43	1.28	25	22	116	363	366	555	457	0
Q25	Painintf	4.26	0.99	25	27	123	204	510	1015	0	0
Scale = LL_CORE - LOW LIMB CORE SCALE											
Q37	STIFF	1.70	0.95	22	1054	482	228	88	27	0	0
Q38	SWOLLEN	1.34	0.74	15	1483	222	127	34	13	0	0
Q39	FLAT	1.48	0.85	47	1316	325	170	47	18	3	0
Q40	STAIRS	1.66	1.03	53	1159	396	192	84	32	16	0
Q41	LIE_BED	1.40	0.77	44	1366	345	114	39	13	2	0
Q42	GETARND	1.23	0.71	78	1636	141	58	21	11	11	1
Q43	SOCKSOFF	1.30	0.75	15	1517	236	79	26	11	10	0
Grand Totals				=====	=====	=====	=====	=====	=====	=====	=====
				6248	12647	12300	14860	1215	1695	499	1

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Pearson Item-Scale Correlations

Item Name	Label	Mean	SD	PHP	LL_COR	Total
-----------	-------	------	----	-----	--------	-------

(Standard Error = .02)

Scale = PHP - Phys Hlth & Pain

Q20A	Vigorous	2.09	0.79	0.65*	-0.44	0.52*
Q20B	Moderate	2.66	0.61	0.81*	-0.54	0.64*
Q20C	Lifting	2.73	0.55	0.77*	-0.53	0.60*
Q20D	Climbsev	2.47	0.71	0.78*	-0.54	0.59*
Q20E	Climbone	2.75	0.54	0.79*	-0.59	0.58*
Q20F	Bending	2.53	0.67	0.76*	-0.56	0.54*
Q20G	Walkmile	2.47	0.76	0.79*	-0.53	0.62*
Q20H	Walksev	2.69	0.62	0.80*	-0.54	0.62*
Q20I	Walkone	2.79	0.52	0.74*	-0.51	0.58*
Q20J	Bathing	2.90	0.35	0.54*	-0.44	0.37*
Q21A	Pcutdown	1.81	0.27	0.87*	-0.59	0.71*
Q21B	Plessdon	1.77	0.31	0.81*	-0.55	0.64*
Q21C	Plimited	1.79	0.28	0.87*	-0.60	0.69*
Q21D	Pdiffclt	1.79	0.29	0.86*	-0.60	0.68*
Q24	Bodypain	4.43	1.28	0.63*	-0.60	0.29*
Q25	Painintf	4.26	0.99	0.72*	-0.64	0.41*

Scale = LL_CORE - LOW LIMB CORE SCALE

Q37	STIFF	1.70	0.95	-0.54	0.75*	-0.22*
Q38	SWOLLEN	1.34	0.74	-0.44	0.66*	-0.12*
Q39	FLAT	1.48	0.85	-0.55	0.77*	-0.21*
Q40	STAIRS	1.66	1.03	-0.63	0.83*	-0.30*
Q41	LIE_BED	1.40	0.77	-0.50	0.67*	-0.20*
Q42	GETARND	1.23	0.71	-0.58	0.54*	-0.37*
Q43	SOCKSOFF	1.30	0.75	-0.61	0.61*	-0.37*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.

b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Name	Item Label	Mean	SD	PHP	LL_COR	Total
Scale = PHP - Phys Hlth & Pain						
Q20A	Vigorous	2.09	0.79	**	2	2
Q20B	Moderate	2.66	0.61	**	2	2
Q20C	Lifting	2.73	0.55	**	2	2
Q20D	Climbsev	2.47	0.71	**	2	2
Q20E	Climbone	2.75	0.54	**	2	2
Q20F	Bending	2.53	0.67	**	2	2
Q20G	Walkmile	2.47	0.76	**	2	2
Q20H	Walksev	2.69	0.62	**	2	2
Q20I	Walkone	2.79	0.52	**	2	2
Q20J	Bathing	2.90	0.35	**	2	2
Q21A	Pcutdown	1.81	0.27	**	2	2
Q21B	Plessdon	1.77	0.31	**	2	2
Q21C	Plimited	1.79	0.28	**	2	2
Q21D	Pdiffclt	1.79	0.29	**	2	2
Q24	Bodypain	4.43	1.28	**	2	2
Q25	Painintf	4.26	0.99	**	2	2

Scale = LL_CORE - LOW LIMB CORE SCALE

Q37	STIFF	1.70	0.95	2	**	2
Q38	SWOLLEN	1.34	0.74	2	**	2
Q39	FLAT	1.48	0.85	2	**	2
Q40	STAIRS	1.66	1.03	2	**	2
Q41	LIE_BED	1.40	0.77	2	**	2
Q42	GETARND	1.23	0.71	2	**	2
Q43	SOCKSOFF	1.30	0.75	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - Phys Hlth & Pain	0	0.0	0	0.0	0	0.0	16	100.0	16	100.0
LL_CORE - LOW LIMB CORE SCALE	0	0.0	0	0.0	0	0.0	7	100.0	7	100.0
Total	0	0.0	0	0.0	0	0.0	23	100.0	23	100.0

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
PHP - Phys Hlth & Pain	41.94	7.48	16/16	49/49	33/33	0.1	14.2
LL_CORE - LOW LIMB CORE SCALE	10.10	4.55	7/7	36/41	29/34	42.8	0.0
Total	52.04	5.36	31/23	70/90	39/67	0.0	0.0

Scale	Transformed Scores (0-100)						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
PHP - Phys Hlth & Pain	78.61	22.67	0/0	100/100	100/100	0.1	14.2
LL_CORE - LOW LIMB CORE SCALE	9.11	13.39	0/0	85/100	85/100	42.8	0.0
Total	43.34	8.00	11/0	71/100	60/100	0.0	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100$.
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - Phys Hlth & Pain	16	0.94	0.90	0.48
LL_CORE - LOW LIMB CORE SCALE	7	0.89	0.92	0.54
Total	23	0.62	0.41	0.07

k : Number of items.
Rtt : Cronbach's Alpha.
R10 : Alpha estimated for a 10-item scale.
Rii : Average inter-item correlation.

Appendix D: AAOS Lower Limb Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	LL_COR
PHP - Phys Hlth & Pain	(.94)	
LL_CORE - LOW LIMB CORE SCALE	-.7	(.89)
Total	.80	-.1
Scale-Total Correlation Corrected for Overlap		
Total	-.7	-.7

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	33

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1823
Subjects with Complete Data (No missing or out of range) -----	300 (16 %)
Subjects with Computable scales (3) -----	1735 (95 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	98	Yes	
Greater (5b) -----	100		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
	PHP	PHYS HLTH & PAIN	16	Q20A	Vigorous	1	3	
				Q20B	Moderate	1	3	
				Q20C	Lifting	1	3	
				Q20D	Climbsev	1	3	
				Q20E	Climbone	1	3	
				Q20F	Bending	1	3	
				Q20G	Walkmile	1	3	
				Q20H	Walksev	1	3	
				Q20I	Walkone	1	3	
				Q20J	Bathing	1	3	
				Q21A	Pcutdown	1	2	
				Q21B	Plessdon	1	2	
				Q21C	Plimited	1	2	
				Q21D	Pdiffclt	1	2	
				Q24	Bodypain	1	6	R
				Q25	Painintf	1	5	R
	NEURO	NEUROGENIC SYMPTOMS	6	Q39	SPAIN	1	6	
				Q40	SNUMB	1	6	
				Q41	SWEAK	1	6	
				Q43	BLEG	1	6	
				Q44	BNUMB	1	6	
				Q45	BWEAK	1	6	
	PAIN	PAIN/DISABILITY	11	Q38	SBACK	1	6	
				Q42	BBACK	1	6	
				Q46	DRESS	1	6	
				Q47	LIFTING	1	6	
				Q48	WALKING	1	6	
				Q49	SITTING	1	6	
				Q50	STANDING	1	6	
				Q51	SLEEPING	1	6	
				Q52	SOCIAL	1	6	
				Q53	TRAVEL	1	6	
	Q54	SEXLIFE	1	6				

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Item Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6
Total Sample (N=1823)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	1-3	67	3.7	528	608	620	0	0	0
Q20B	Moderate	1-3	53	2.9	166	363	1241	0	0	0
Q20C	Lifting	1-3	59	3.2	115	308	1341	0	0	0
Q20D	Climbsev	1-3	59	3.2	273	404	1087	0	0	0
Q20E	Climbone	1-3	94	5.2	134	260	1335	0	0	0
Q20F	Bending	1-3	60	3.3	220	495	1048	0	0	0
Q20G	Walkmile	1-3	63	3.5	327	347	1086	0	0	0
Q20H	Walksev	1-3	55	3.0	199	238	1331	0	0	0
Q20I	Walkone	1-3	77	4.2	123	197	1426	0	0	0
Q20J	Bathing	1-3	57	3.1	46	110	1610	0	0	0
Q21A	Pcutdown	1-2	1380	75.7	78	365	0	0	0	0
Q21B	Plessdon	1-2	1381	75.8	167	275	0	0	0	0
Q21C	Plimited	1-2	1381	75.8	121	321	0	0	0	0
Q21D	Pdiffclt	1-2	1378	75.6	129	316	0	0	0	0
Q24	Bodypain	1-6	31	1.7	423	537	317	368	124	23
Q25	Painintf	1-5	30	1.6	990	440	204	125	34	0
	Missing		6225	21.3%						
	Out-of-range		0	0.0%						

Scale = NEURO - NEUROGENIC SYMPTOMS

Q39	SPAIN	1-6	68	3.7	997	292	208	106	84	68
Q40	SNUMB	1-6	88	4.8	1229	182	153	66	50	55
Q41	SWEAK	1-6	84	4.6	1256	167	133	68	48	67
Q43	BLEG	1-6	114	6.3	1030	322	120	102	81	54
Q44	BNUMB	1-6	115	6.3	1274	194	93	71	48	28
Q45	BWEAK	1-6	107	5.9	1260	192	95	69	59	41
	Missing		576	5.3%						
	Out-of-range		0	0.0%						

Scale = PAIN - PAIN/DISABILITY

Q38	SBACK	1-6	64	3.5	834	406	236	123	91	69
Q42	BBACK	1-6	89	4.9	871	446	172	113	85	47
Q46	DRESS	1-6	136	7.5	1374	203	67	34	6	3
Q47	LIFTING	1-6	116	6.4	1097	260	83	143	102	22
Q48	WALKING	1-6	91	5.0	1061	339	129	90	76	37
Q49	SITTING	1-6	50	2.7	1384	141	178	62	7	1
Q50	STANDING	1-6	56	3.1	1058	398	128	96	77	10
Q51	SLEEPING	1-6	57	3.1	1135	335	36	71	26	163
Q52	SOCIAL	1-6	61	3.3	1424	129	19	114	35	41

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Item Label	Allowed Range	Missing		Response Values					
			Freq	%	1	2	3	4	5	6
Q53	TRAVEL	1-6	69	3.8	1384	232	65	38	13	22
Q54	SEXLIFE	1-6	159	8.7	1432	112	13	30	41	36
	Missing		948	4.7%						
	Out-of-range		0	0.0%						
Grand Totals					24139	9934	14574	1889	1087	787
	Missing		7749	12.9%						
	Out-of-range		0	0.0%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=1735)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.08	0.80	39	496	606	633	0	0	0
Q20B	Moderate	2.62	0.64	23	157	348	1230	0	0	0
Q20C	Lifting	2.71	0.57	26	105	301	1329	0	0	0
Q20D	Climbsev	2.48	0.73	28	252	401	1082	0	0	0
Q20E	Climbone	2.70	0.59	61	126	268	1341	0	0	0
Q20F	Bending	2.48	0.69	34	206	485	1044	0	0	0
Q20G	Walkmile	2.45	0.77	32	301	345	1089	0	0	0
Q20H	Walksev	2.65	0.66	28	184	230	1321	0	0	0
Q20I	Walkone	2.76	0.56	39	111	199	1425	0	0	0
Q20J	Bathing	2.89	0.38	26	42	112	1581	0	0	0
Q21A	Pcutdown	1.80	0.29	1301	263	1472	0	0	0	0
Q21B	Plessdon	1.75	0.33	1302	351	1384	0	0	0	0
Q21C	Plimited	1.77	0.31	1302	306	1429	0	0	0	0
Q21D	Pdiffclt	1.77	0.31	1299	313	1422	0	0	0	0
Q24	Bodypain	4.40	1.29	15	21	117	352	310	525	410
Q25	Painintf	4.25	1.02	13	33	120	191	432	959	0
Scale = NEURO - NEUROGENIC SYMPTOMS										
Q39	SPAIN	1.97	1.40	33	983	293	207	105	80	67
Q40	SNUMB	1.67	1.26	42	1218	191	157	66	47	56
Q41	SWEAK	1.67	1.30	41	1247	173	137	66	47	65
Q43	BLEG	1.83	1.33	69	1055	327	123	100	78	52
Q44	BNUMB	1.54	1.12	60	1292	201	96	69	49	28
Q45	BWEAK	1.58	1.19	60	1280	200	94	65	56	40
Scale = PAIN - PAIN/DISABILITY										
Q38	SBACK	2.10	1.39	33	823	404	235	119	88	66
Q42	BBACK	1.97	1.30	48	880	442	174	112	83	44
Q46	DRESS	1.31	0.71	99	1381	228	79	38	6	3
Q47	LIFTING	1.80	1.29	79	1100	285	90	142	96	22
Q48	WALKING	1.78	1.24	49	1058	349	131	87	75	35
Q49	SITTING	1.40	0.84	18	1352	141	173	61	7	1
Q50	STANDING	1.73	1.13	25	1034	402	124	93	72	10
Q51	SLEEPING	1.88	1.56	26	1106	328	42	72	27	160
Q52	SOCIAL	1.48	1.15	28	1394	134	28	106	34	39
Q53	TRAVEL	1.37	0.88	36	1355	237	71	38	13	21
Q54	SEXLIFE	1.41	1.07	118	1427	141	41	48	44	34
				=====	=====	=====	=====	=====	=====	=====
Grand Totals				6432	23252	13715	14620	2129	2386	1153

Appendix E: AAOs Lumbar Spine Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations			
				PHP	NEURO	PAIN	Total

(Standard Error = .02)

Scale = PHP - PHYS HLTH & PAIN

Q20A	Vigorous	2.08	0.80	0.68*	-0.44	-0.55	-0.30*
Q20B	Moderate	2.62	0.64	0.81*	-0.51	-0.63	-0.33*
Q20C	Lifting	2.71	0.57	0.78*	-0.50	-0.62	-0.33*
Q20D	Climbsev	2.48	0.73	0.79*	-0.51	-0.56	-0.28*
Q20E	Climbone	2.70	0.59	0.81*	-0.52	-0.58	-0.29*
Q20F	Bending	2.48	0.69	0.76*	-0.53	-0.58	-0.33*
Q20G	Walkmile	2.45	0.77	0.79*	-0.51	-0.55	-0.28*
Q20H	Walksev	2.65	0.66	0.81*	-0.53	-0.57	-0.28*
Q20I	Walkone	2.76	0.56	0.76*	-0.50	-0.53	-0.26*
Q20J	Bathing	2.89	0.38	0.55*	-0.37	-0.42	-0.22*
Q21A	Pcutdown	1.80	0.29	0.82*	-0.55	-0.63	-0.32*
Q21B	Plessdon	1.75	0.33	0.80*	-0.51	-0.62	-0.31*
Q21C	Plimited	1.77	0.31	0.87*	-0.56	-0.66	-0.33*
Q21D	Pdiffclt	1.77	0.31	0.85*	-0.55	-0.65	-0.32*
Q24	Bodypain	4.40	1.29	0.62*	-0.58	-0.68	-0.54*
Q25	Painintf	4.25	1.02	0.73*	-0.63	-0.75	-0.57*

Scale = NEURO - NEUROGENIC SYMPTOMS

Q39	SPAIN	1.97	1.40	-0.58	0.80*	0.66	0.65*
Q40	SNUMB	1.67	1.26	-0.51	0.77*	0.59	0.63*
Q41	SWEAK	1.67	1.30	-0.62	0.85*	0.66	0.66*
Q43	BLEG	1.83	1.33	-0.61	0.83*	0.69	0.68*
Q44	BNUMB	1.54	1.12	-0.55	0.82*	0.62	0.66*
Q45	BWEAK	1.58	1.19	-0.65	0.86*	0.69	0.66*

Scale = PAIN - PAIN/DISABILITY

Q38	SBACK	2.10	1.39	-0.46	0.54	0.66*	0.60*
Q42	BBACK	1.97	1.30	-0.49	0.56	0.70*	0.62*
Q46	DRESS	1.31	0.71	-0.59	0.57	0.70*	0.55*
Q47	LIFTING	1.80	1.29	-0.69	0.55	0.74*	0.47*
Q48	WALKING	1.78	1.24	-0.76	0.67	0.75*	0.51*
Q49	SITTING	1.40	0.84	-0.46	0.49	0.65*	0.55*
Q50	STANDING	1.73	1.13	-0.68	0.63	0.75*	0.55*
Q51	SLEEPING	1.88	1.56	-0.42	0.43	0.47*	0.38*
Q52	SOCIAL	1.48	1.15	-0.65	0.60	0.76*	0.56*
Q53	TRAVEL	1.37	0.88	-0.61	0.58	0.74*	0.57*
Q54	SEXLIFE	1.41	1.07	-0.58	0.54	0.67*	0.50*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.

b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix E: AOS Lumbar Spine Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item	Mean	SD	PHP	NEURO	PAIN	Total
Name	Label					
Scale = PHP - PHYS HLTH & PAIN						
Q20A	Vigorous	2.08 0.80	**	2	2	2
Q20B	Moderate	2.62 0.64	**	2	2	2
Q20C	Lifting	2.71 0.57	**	2	2	2
Q20D	Climbsev	2.48 0.73	**	2	2	2
Q20E	Climbone	2.70 0.59	**	2	2	2
Q20F	Bending	2.48 0.69	**	2	2	2
Q20G	Walkmile	2.45 0.77	**	2	2	2
Q20H	Walksev	2.65 0.66	**	2	2	2
Q20I	Walkone	2.76 0.56	**	2	2	2
Q20J	Bathing	2.89 0.38	**	2	2	2
Q21A	Pcutdown	1.80 0.29	**	2	2	2
Q21B	Plessdon	1.75 0.33	**	2	2	2
Q21C	Plimited	1.77 0.31	**	2	2	2
Q21D	Pdiffclt	1.77 0.31	**	2	2	2
Q24	Bodypain	4.40 1.29	**	2	2	2
Q25	Painintf	4.25 1.02	**	2	2	2
Scale = NEURO - NEUROGENIC SYMPTOMS						
Q39	SPAIN	1.97 1.40	2	**	2	2
Q40	SNUMB	1.67 1.26	2	**	2	2
Q41	SWEAK	1.67 1.30	2	**	2	2
Q43	BLEG	1.83 1.33	2	**	2	2
Q44	BNUMB	1.54 1.12	2	**	2	2
Q45	BWEAK	1.58 1.19	2	**	2	2
Scale = PAIN - PAIN/DISABILITY						
Q38	SBACK	2.10 1.39	2	2	**	2
Q42	BBACK	1.97 1.30	2	2	**	2
Q46	DRESS	1.31 0.71	2	2	**	2
Q47	LIFTING	1.80 1.29	2	2	**	2
Q48	WALKING	1.78 1.24	2	2	**	2
Q49	SITTING	1.40 0.84	2	2	**	2
Q50	STANDING	1.73 1.13	2	2	**	2
Q51	SLEEPING	1.88 1.56	2	1	**	2
Q52	SOCIAL	1.48 1.15	2	2	**	2
Q53	TRAVEL	1.37 0.88	2	2	**	2
Q54	SEXLIFE	1.41 1.07	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - PHYS HLTH & PAIN	0	0.0	0	0.0	0	0.0	32	100.0	32	100.0
NEURO - NEUROGENIC SYMPTOMS	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
PAIN - PAIN/DISABILITY	0	0.0	0	0.0	1	4.5	21	95.5	22	100.0
Total	0	0.0	0	0.0	1	1.5	65	98.5	66	100.0

Levels of Scaling Success Presented in the Table

2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.

1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.

-1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.

-2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
PHP - PHYS HLTH & PAIN	41.54	7.87	16/16	49/49	33/33	0.2	13.1
NEURO - NEUROGENIC SYMPTOMS	10.26	6.68	6/6	36/36	30/30	47.6	1.0
PAIN - PAIN/DISABILITY	18.24	9.41	11/11	60/66	49/55	28.0	0.0
Total	70.04	10.22	43/33	126/151	83/118	0.0	0.0

Scale	Transformed Scores (0-100)						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
PHP - PHYS HLTH & PAIN	77.39	23.84	0/0	100/100	100/100	0.2	13.1
NEURO - NEUROGENIC SYMPTOMS	14.19	22.26	0/0	100/100	100/100	47.6	1.0
PAIN - PAIN/DISABILITY	13.17	17.12	0/0	89/100	89/100	28.0	0.0
Total	31.39	8.66	8/0	79/100	71/100	0.0	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - PHYS HLTH & PAIN	16	0.94	0.91	0.50
NEURO - NEUROGENIC SYMPTOMS	6	0.94	0.96	0.72
PAIN - PAIN/DISABILITY	11	0.91	0.91	0.49
Total	33	0.72	0.43	0.07

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix E: AAOS Lumbar Spine Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	NEURO	PAIN
PHP - PHYS HLTH & PAIN	(.94)		
NEURO - NEUROGENIC SYMPTOMS	-.7	(.94)	
PAIN - PAIN/DISABILITY	-.8	.74	(.91)
Total	-.4	.82	.81
Scale-Total Correlation Corrected for Overlap			
Total	-.8	.29	-.2

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal. Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	46

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1966
Subjects with Complete Data (No missing or out of range) -----	1306 (66 %)
Subjects with Computable scales (3) -----	1870 (95 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity) Significantly Greater (5a) -----	85	Yes	
Greater (5b) -----	95		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	DAILYACT	DAILY ACTIVITIES	10	Q33	SHOP	1	5
				Q44	GO OUT	1	5
				Q45	DRIVE	1	5
				Q50	PHYSREC	1	5
				Q51	LEISURE	1	5
				Q52	SEXACT	1	5
				Q53	YARDWORK	1	5
				Q54	HVYHOUSE	1	5
				Q55	USUALWRK	1	5
				Q63	DISABLE	1	5
	EMOTSTAT	EMOTIONAL STATUS	7	Q37	COMSLEEP	1	5
				Q57	PAINLIMB	1	5
				Q59	CONCENTR	1	5
				Q60	NEXTDAY	1	5
				Q61	IRRITABL	1	5
				Q62	TIRED	1	5
				Q64	INJARTHR	1	5
	ARM	ARM/HAND FUNCTION	8	Q32	OPNBOTTL	1	5
				Q35	FIST	1	5
				Q39	BUTTONS	1	5
				Q40	CUTNAILS	1	5
				Q41	DRESS	1	5
				Q46	CLNSELF	1	5
				Q47	TURNKNOB	1	5
				Q48	WRITE	1	5
	MOBILITY	MOBILITY	9	Q31	INCHAIR	1	5
				Q34	STAIRS	1	5
				Q36	INTUB	1	5
				Q38	BEND	1	5
				Q42	WALK	1	5
				Q43	MOVESIT	1	5
				Q49	PIVOT	1	5
				Q56	LIMP	1	5
				Q58	LEGLOCK	1	5
	BOTHER	BOTHER INDEX	12	Q65	HANDARM	1	5
				Q66	BACK	1	5
				Q67	WORKHOME	1	5
				Q68	BATHDRES	1	5
				Q69	SLEEP	1	5
				Q70	LEISURE	1	5
				Q71	FRIENDS	1	5
				Q72	THINK	1	5
				Q73	COPING	1	5
				Q74	USUALWRK	1	5
				Q75	DEPEND	1	5
				Q76	STIFFNES	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values				
					1	2	3	4	5

Total Sample (N=1966)

Scale = DAILYACT - DAILY ACTIVITIES

Q33	SHOP	1-5	92	4.7	1513	191	108	43	19
Q44	GO OUT	1-5	107	5.4	1639	124	48	30	18
Q45	DRIVE	1-5	124	6.3	1631	112	28	10	61
Q50	PHYSREC	1-5	111	5.6	1152	398	130	103	72
Q51	LEISURE	1-5	107	5.4	1409	279	105	50	16
Q52	SEXACT	1-5	225	11.4	1281	212	73	56	119
Q53	YARDWORK	1-5	104	5.3	1480	238	80	49	15
Q54	HVYHOUSE	1-5	112	5.7	1087	386	166	131	84
Q55	USUALWRK	1-5	117	6.0	1303	289	103	57	97
Q63	DISABLE	1-5	100	5.1	1273	316	141	90	46
	Missing		1199	6.1%					
	Out-of-range		0	0.0%					

Scale = EMOTSTAT - EMOTIONAL STATUS

Q37	COMSLEEP	1-5	106	5.4	1077	451	209	113	10
Q57	PAINLIMB	1-5	104	5.3	1050	444	256	95	17
Q59	CONCENTR	1-5	124	6.3	1242	421	136	34	9
Q60	NEXTDAY	1-5	96	4.9	772	602	289	142	65
Q61	IRRITABL	1-5	109	5.5	800	665	323	55	14
Q62	TIRED	1-5	108	5.5	411	700	441	241	65
Q64	INJARTHR	1-5	98	5.0	1141	363	183	118	63
	Missing		745	5.4%					
	Out-of-range		0	0.0%					

Scale = ARM - ARM/HAND FUNCTION

Q32	OPNBOTTL	1-5	84	4.3	1307	338	142	87	8
Q35	FIST	1-5	97	4.9	1511	228	78	41	11
Q39	BUTTONS	1-5	100	5.1	1514	221	92	33	6
Q40	CUTNAIILS	1-5	92	4.7	1647	137	49	29	12
Q41	DRESS	1-5	95	4.8	1679	134	43	12	3
Q46	CLNSELF	1-5	84	4.3	1711	120	35	15	1
Q47	TURNKNOB	1-5	99	5.0	1630	172	47	16	2
Q48	WRITE	1-5	106	5.4	1569	208	53	25	5
	Missing		757	4.8%					
	Out-of-range		0	0.0%					

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values				
					1	2	3	4	5
Scale = MOBILITY - MOBILITY									
Q31	INCHAIR	1-5	79	4.0	1140	459	174	104	10
Q34	STAIRS	1-5	102	5.2	1225	355	142	116	26
Q36	INTUB	1-5	94	4.8	1428	248	109	72	15
Q38	BEND	1-5	114	5.8	949	478	194	174	57
Q42	WALK	1-5	104	5.3	1402	275	119	55	11
Q43	MOVESIT	1-5	94	4.8	1045	574	172	78	3
Q49	PIVOT	1-5	129	6.6	1436	254	79	49	19
Q56	LIMP	1-5	91	4.6	1222	366	157	71	59
Q58	LEGLOCK	1-5	121	6.2	1319	323	176	21	6
	Missing		928	5.2%					
	Out-of-range		0	0.0%					
Scale = BOTHER - BOTHER INDEX									
Q65	HANDARM	1-5	88	4.5	1067	490	179	99	43
Q66	BACK	1-5	91	4.6	1058	463	185	105	64
Q67	WORKHOME	1-5	94	4.8	1175	415	169	72	41
Q68	BATHDRES	1-5	92	4.7	1567	184	68	36	19
Q69	SLEEP	1-5	97	4.9	1066	473	191	80	59
Q70	LEISURE	1-5	95	4.8	1267	372	126	74	32
Q71	FRIENDS	1-5	93	4.7	1459	279	80	40	15
Q72	THINK	1-5	100	5.1	1252	429	113	48	24
Q73	COPING	1-5	100	5.1	1307	352	116	60	31
Q74	USUALWRK	1-5	105	5.3	1267	372	122	47	53
Q75	DEPEND	1-5	108	5.5	1464	171	100	79	44
Q76	STIFFNES	1-5	114	5.8	853	548	222	138	91
	Missing		1177	5.0%					
	Out-of-range		0	0.0%					
Grand Totals					58797	15629	6351	3293	1560
	Missing		4806	5.3%					
	Out-of-range		0	0.0%					

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values				
					1	2	3	4	5
Total Sample (N=1870)									
Scale = DAILYACT - DAILY ACTIVITIES									
Q33	SHOP	1.34	0.78	21	1501	193	111	46	19
Q44	GO OUT	1.21	0.66	27	1636	134	51	31	18
Q45	DRIVE	1.25	0.81	46	1637	125	35	12	61
Q50	PHYSREC	1.67	1.07	37	1165	399	134	101	71
Q51	LEISURE	1.39	0.79	30	1410	281	110	51	18
Q52	SEXACT	1.59	1.14	148	1336	254	102	61	117
Q53	YARDWORK	1.33	0.75	24	1483	238	84	50	15
Q54	HVYHOUSE	1.78	1.15	33	1099	386	168	133	84
Q55	USUALWRK	1.57	1.08	40	1315	290	111	57	97
Q63	DISABLE	1.57	0.99	16	1274	316	142	91	47
Scale = EMOTSTAT - EMOTIONAL STATUS									
Q37	COMSLEEP	1.67	0.93	28	1074	463	210	113	10
Q57	PAINLIMB	1.71	0.95	24	1046	452	259	96	17
Q59	CONCENTR	1.46	0.76	43	1243	438	145	35	9
Q60	NEXTDAY	2.00	1.09	17	763	611	289	142	65
Q61	IRRITABL	1.83	0.87	28	797	678	326	55	14
Q62	TIRED	2.38	1.07	27	416	707	441	241	65
Q64	INJARTHR	1.72	1.09	16	1133	371	185	118	63
Scale = ARM - ARM/HAND FUNCTION									
Q32	OPNBOTTL	1.49	0.85	12	1298	337	142	85	8
Q35	FIST	1.30	0.70	21	1510	229	80	40	11
Q39	BUTTONS	1.28	0.66	27	1515	226	91	32	6
Q40	CUTNAILS	1.20	0.62	13	1640	140	48	30	12
Q41	DRESS	1.14	0.48	18	1677	135	43	12	3
Q46	CLNSELF	1.13	0.45	6	1696	123	35	15	1
Q47	TURNKNOB	1.17	0.51	16	1630	174	47	17	2
Q48	WRITE	1.22	0.58	26	1573	213	54	25	5
Scale = MOBILITY - MOBILITY									
Q31	INCHAIR	1.62	0.90	9	1123	460	174	103	10
Q34	STAIRS	1.59	0.97	25	1219	363	144	119	25
Q36	INTUB	1.40	0.83	18	1422	251	111	71	15
Q38	BEND	1.87	1.12	37	953	488	197	175	57
Q42	WALK	1.39	0.79	24	1403	277	124	55	11
Q43	MOVESIT	1.62	0.83	15	1041	575	173	78	3
Q49	PIVOT	1.37	0.79	51	1436	272	87	56	19
Q56	LIMP	1.61	1.01	15	1214	366	158	72	60
Q58	LEGLOCK	1.42	0.74	42	1327	334	178	25	6

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values				
					1	2	3	4	5
Scale = BOTHER - BOTHER INDEX									
Q65	HANDARM	1.70	1.00	14	1059	491	179	98	43
Q66	BACK	1.75	1.06	13	1053	462	187	104	64
Q67	WORKHOME	1.61	0.96	19	1170	416	171	72	41
Q68	BATHDRES	1.27	0.71	16	1552	194	70	35	19
Q69	SLEEP	1.72	1.02	21	1064	474	192	81	59
Q70	LEISURE	1.53	0.91	13	1260	375	128	75	32
Q71	FRIENDS	1.34	0.74	16	1450	282	81	42	15
Q72	THINK	1.49	0.83	18	1247	436	113	50	24
Q73	COPING	1.48	0.87	20	1306	356	118	59	31
Q74	USUALWRK	1.52	0.93	25	1269	379	122	47	53
Q75	DEPEND	1.43	0.94	28	1464	182	101	79	44
Q76	STIFFNES	1.95	1.14	33	861	556	224	139	90
				=====	=====	=====	=====	=====	=====
Grand Totals				1216	58760	15902	6475	3324	1559

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					Total
				DAILYA	EMOTST	ARM	MOBILI	BOTHER	
(Standard Error = .02)									
Scale = DAILYACT - DAILY ACTIVITIES									
Q33	SHOP	1.34	0.78	0.83*	0.61	0.71	0.76	0.72	0.80*
Q44	GO OUT	1.21	0.66	0.79*	0.50	0.69	0.69	0.63	0.72*
Q45	DRIVE	1.25	0.81	0.64*	0.42	0.56	0.53	0.49	0.58*
Q50	PHYSREC	1.67	1.07	0.82*	0.65	0.63	0.81	0.74	0.82*
Q51	LEISURE	1.39	0.79	0.82*	0.65	0.73	0.74	0.75	0.81*
Q52	SEXACT	1.59	1.14	0.66*	0.50	0.54	0.60	0.56	0.63*
Q53	YARDWORK	1.33	0.75	0.83*	0.62	0.66	0.74	0.73	0.80*
Q54	HVYHOUSE	1.78	1.15	0.84*	0.70	0.66	0.80	0.79	0.84*
Q55	USUALWRK	1.57	1.08	0.87*	0.67	0.68	0.76	0.78	0.84*
Q63	DISABLE	1.57	0.99	0.77*	0.74	0.58	0.74	0.80	0.82*
Scale = EMOTSTAT - EMOTIONAL STATUS									
Q37	COMSLEEP	1.67	0.93	0.58	0.67*	0.50	0.61	0.71	0.69*
Q57	PAINLIMB	1.71	0.95	0.61	0.63*	0.47	0.65	0.69b	0.69*
Q59	CONCENTR	1.46	0.76	0.48	0.58*	0.42	0.45	0.58	0.56*
Q60	NEXTDAY	2.00	1.09	0.65	0.75*	0.53	0.67	0.73	0.74*
Q61	IRRITABL	1.83	0.87	0.36	0.58*	0.28	0.36	0.48	0.45*
Q62	TIRED	2.38	1.07	0.53	0.70*	0.43	0.53	0.62	0.62*
Q64	INJARTHR	1.72	1.09	0.67	0.71*	0.51	0.65	0.79b	0.75*
Scale = ARM - ARM/HAND FUNCTION									
Q32	OPNBOTTL	1.49	0.85	0.59	0.51	0.70*	0.60	0.56	0.64*
Q35	FIST	1.30	0.70	0.54	0.47	0.68*	0.55	0.54	0.60*
Q39	BUTTONS	1.28	0.66	0.67	0.52	0.83*	0.64	0.60	0.69*
Q40	CUTNAILS	1.20	0.62	0.64	0.41	0.78*	0.58	0.51	0.62*
Q41	DRESS	1.14	0.48	0.70	0.48	0.72*	0.65	0.61	0.69*
Q46	CLNSELF	1.13	0.45	0.61	0.44	0.64*	0.56	0.54	0.61*
Q47	TURNKNOB	1.17	0.51	0.63	0.48	0.80*	0.59	0.57	0.66*
Q48	WRITE	1.22	0.58	0.62	0.47	0.73*	0.54	0.56	0.62*
Scale = MOBILITY - MOBILITY									
Q31	INCHAIR	1.62	0.90	0.73	0.64	0.64	0.83*	0.72	0.79*
Q34	STAIRS	1.59	0.97	0.80	0.64	0.66	0.85*	0.73	0.81*
Q36	INTUB	1.40	0.83	0.77	0.58	0.71	0.79*	0.68	0.78*
Q38	BEND	1.87	1.12	0.72	0.67	0.60	0.82*	0.71	0.78*
Q42	WALK	1.39	0.79	0.81	0.61	0.64	0.81*	0.71	0.80*
Q43	MOVESIT	1.62	0.83	0.72	0.69	0.62	0.80*	0.72	0.78*
Q49	PIVOT	1.37	0.79	0.77	0.59	0.69	0.76*	0.70	0.78*
Q56	LIMP	1.61	1.01	0.59	0.56	0.46	0.69*	0.61	0.65*
Q58	LEGLOCK	1.42	0.74	0.52	0.55	0.41	0.63*	0.56	0.59*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).

Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.

b: Less than desirable item discriminant validity: item correlation with competing scale is significantly

higher than its correlation with its own scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					Total	
				DAILYA	EMOTST	ARM	MOBILI	BOTHER		
Scale = BOTHER - BOTHER INDEX										
Q65	HANDARM	1.70	1.00	0.70	0.71	0.63	0.73	0.78*	0.79*	
Q66	BACK	1.75	1.06	0.58	0.69	0.45	0.60	0.71*	0.68*	
Q67	WORKHOME	1.61	0.96	0.82	0.76	0.65	0.78	0.86*	0.87*	
Q68	BATHDRES	1.27	0.71	0.75	0.58	0.72	0.71	0.72*	0.77*	
Q69	SLEEP	1.72	1.02	0.57	0.76	0.48	0.57	0.72*	0.69*	
Q70	LEISURE	1.53	0.91	0.78	0.72	0.61	0.75	0.85*	0.83*	
Q71	FRIENDS	1.34	0.74	0.53	0.61	0.44	0.51	0.66*	0.62*	
Q72	THINK	1.49	0.83	0.53	0.64	0.46	0.48	0.61*	0.60*	
Q73	COPING	1.48	0.87	0.70	0.73	0.55	0.67	0.82*	0.78*	
Q74	USUALWRK	1.52	0.93	0.79	0.75	0.64	0.74	0.87*	0.85*	
Q75	DEPEND	1.43	0.94	0.76	0.64	0.59	0.69	0.76*	0.77*	
Q76	STIFFNES	1.95	1.14	0.69	0.79	0.57	0.75	0.83*	0.81*	

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	DAILYA	EMOTST	ARM	MOBILI	BOTHER	Total
Scale = DAILYACT - DAILY ACTIVITIES									
Q33	SHOP	1.34	0.78	**	2	2	2	2	1
Q44	GO OUT	1.21	0.66	**	2	2	2	2	2
Q45	DRIVE	1.25	0.81	**	2	2	2	2	2
Q50	PHYSREC	1.67	1.07	**	2	2	1	2	1
Q51	LEISURE	1.39	0.79	**	2	2	2	2	1
Q52	SEXACT	1.59	1.14	**	2	2	2	2	1
Q53	YARDWORK	1.33	0.75	**	2	2	2	2	1
Q54	HVYHOUSE	1.78	1.15	**	2	2	1	2	-1
Q55	USUALWRK	1.57	1.08	**	2	2	2	2	1
Q63	DISABLE	1.57	0.99	**	1	2	1	-1	-1

Scale = EMOTSTAT - EMOTIONAL STATUS										
Q37	COMSLEEP	1.67	0.93		2	**	2	2	-1	-1
Q57	PAINLIMB	1.71	0.95	1	**	2	-1	-2	-2	
Q59	CONCENTR	1.46	0.76	2	**	2	2	-1	1	
Q60	NEXTDAY	2.00	1.09	2	**	2	2	1	1	
Q61	IRRITABL	1.83	0.87	2	**	2	2	2	2	
Q62	TIRED	2.38	1.07	2	**	2	2	2	2	
Q64	INJARTHR	1.72	1.09	1	**	2	2	-2	-2	

Scale = ARM - ARM/HAND FUNCTION									
Q32	OPNBOTTL	1.49	0.85	2	2	**	2	2	2
Q35	FIST	1.30	0.70	2	2	**	2	2	2
Q39	BUTTONS	1.28	0.66	2	2	**	2	2	2
Q40	CUTNAILS	1.20	0.62	2	2	**	2	2	2
Q41	DRESS	1.14	0.48	1	2	**	2	2	1
Q46	CLNSELF	1.13	0.45	1	2	**	2	2	1
Q47	TURNKNOB	1.17	0.51	2	2	**	2	2	2
Q48	WRITE	1.22	0.58	2	2	**	2	2	2

Scale = MOBILITY - MOBILITY									
Q31	INCHAIR	1.62	0.90	2	2	2	**	2	1
Q34	STAIRS	1.59	0.97	2	2	2	**	2	1
Q36	INTUB	1.40	0.83	1	2	2	**	2	1
Q38	BEND	1.87	1.12	2	2	2	**	2	1
Q42	WALK	1.39	0.79	1	2	2	**	2	1
Q43	MOVESIT	1.62	0.83	2	2	2	**	2	1
Q49	PIVOT	1.37	0.79	-1	2	2	**	2	-1
Q56	LIMP	1.61	1.01	2	2	2	**	2	1
Q58	LEGLOCK	1.42	0.74	2	2	2	**	2	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	DAILYA	EMOTST	ARM	MOBILI	BOTHER	Total
Scale = BOTHER - BOTHER INDEX									
Q65	HANDARM	1.70	1.00	2	2	2	2	**	-1
Q66	BACK	1.75	1.06	2	1	2	2	**	1
Q67	WORKHOME	1.61	0.96	2	2	2	2	**	-1
Q68	BATHDRES	1.27	0.71	-1	2	1	1	**	-2
Q69	SLEEP	1.72	1.02	2	-1	2	2	**	1
Q70	LEISURE	1.53	0.91	2	2	2	2	**	1
Q71	FRIENDS	1.34	0.74	2	1	2	2	**	1
Q72	THINK	1.49	0.83	2	-1	2	2	**	1
Q73	COPING	1.48	0.87	2	2	2	2	**	1
Q74	USUALWRK	1.52	0.93	2	2	2	2	**	1
Q75	DEPEND	1.43	0.94	1	2	2	2	**	-1
Q76	STIFFNES	1.95	1.14	2	1	2	2	**	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
DAILYACT - DAILY ACTIVITIES	0	0.0	1	2.5	4	10.0	35	87.5	39	97.5
EMOTSTAT - EMOTIONAL STATUS	2	7.1	3	10.7	3	10.7	20	71.4	23	82.1
ARM - ARM/HAND FUNCTION	0	0.0	0	0.0	2	6.3	30	93.8	32	100.0
MOBILITY - MOBILITY	0	0.0	1	2.8	2	5.6	33	91.7	35	97.2
BOTHER - BOTHER INDEX	0	0.0	3	6.3	6	12.5	39	81.3	45	93.8
Total	2	1.1	8	4.3	17	9.2	157	85.3	174	94.6

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
DAILYACT - DAILY ACTIVITIES	14.71	7.68	10/10	50/50	40/40	44.3	0.2
EMOTSTAT - EMOTIONAL STATUS	12.78	5.15	7/7	32/35	25/28	16.0	0.0
ARM - ARM/HAND FUNCTION	9.94	3.92	8/8	36/40	28/32	60.0	0.0
MOBILITY - MOBILITY	13.90	6.60	9/9	43/45	34/36	36.0	0.0
BOTHER - BOTHER INDEX	18.78	9.01	12/12	60/60	48/48	30.0	0.1
Total	70.10	29.58	46/46	210/230	164/184	12.9	0.0

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
DAILYACT - DAILY ACTIVITIES	11.78	19.19	0/0	100/100	100/100	44.3	0.2
EMOTSTAT - EMOTIONAL STATUS	20.63	18.40	0/0	89/100	89/100	16.0	0.0
ARM - ARM/HAND FUNCTION	6.05	12.24	0/0	88/100	88/100	60.0	0.0
MOBILITY - MOBILITY	13.60	18.33	0/0	94/100	94/100	36.0	0.0
BOTHER - BOTHER INDEX	14.13	18.76	0/0	100/100	100/100	30.0	0.1
Total	13.10	16.07	0/0	89/100	89/100	12.9	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
DAILYACT - DAILY ACTIVITIES	10	0.94	0.94	0.63
EMOTSTAT - EMOTIONAL STATUS	7	0.88	0.91	0.50
ARM - ARM/HAND FUNCTION	8	0.91	0.93	0.57
MOBILITY - MOBILITY	9	0.94	0.95	0.63
BOTHER - BOTHER INDEX	12	0.95	0.94	0.61
Total	46	0.98	0.91	0.52

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix F: AAOS Musculoskeletal (SMFA) Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	DAILYA	EMOTST	ARM MOBILI	BOTHER	
DAILYACT - DAILY ACTIVITIES	(.94)				
EMOTSTAT - EMOTIONAL STATUS	.74	(.88)			
ARM - ARM/HAND FUNCTION	.77	.59	(.91)		
MOBILITY - MOBILITY	.86	.75	.73	(.94)	
BOTHER - BOTHER INDEX	.85	.87	.70	.83	(.95)
Total	.94	.88	.81	.93	.95
Scale-Total Correlation Corrected for Overlap					
Total	.89	.82	.76	.88	.90

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal. Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	39

Total, Missing and Computable Data

Total Subjects in Original Data File -----	3559
Subjects with Complete Data (No missing or out of range) -----	2770 (78 %)
Subjects with Computable scales (3) -----	3471 (98 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	92	Yes	
Scaling Success (Item discriminant validity) Significantly Greater (5a) -----	95	Yes	
Greater (5b) -----	97		
Reliable Scales (6) -----	100	Yes	

- The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
- The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
- Only subjects for whom all scales are computable are included in Analysis Data.
- Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
- Scaling Success (Item discriminant validity) :
 - Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
- Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	UPEXPF	UP EXTREM PHYS FXN	8	Q23	LIFTBOOK	1	4
				Q24	POURMILK	1	4
				Q25	OPENJAR	1	4
				Q26	USEFORK	1	4
				Q27	COMBHAIR	1	4
				Q28	BUTTON	1	4
				Q30	WRITE	1	4
				Q54	DOORKNOB	1	4
	TRANSFER	TRANSFERS/BASIC MOBI	11	Q29	SOCKS	1	4
				Q43	CLIMBONE	1	4
				Q46	WALKONE	1	4
				Q47	ONBUS	1	4
				Q50	WASHHAND	1	4
				Q51	SITCHAIR	1	4
				Q52	TOILET	1	4
				Q53	IN BED	1	4
				Q55	BENDPICK	1	4
				Q56	HELPSIT	1	5
				Q57	ASSTDEV	1	5
	SPORTPF	SPORTS & PHYS FXN	12	Q40	RUNSHORT	1	4
				Q41	BICYCLE	1	4
				Q42	CLIMB3	1	4
				Q44	WALKMILE	1	4
				Q45	WALK3	1	4
				Q48	HELPWALK	1	4
				Q49	ASSTDEV	1	4
				Q58	OUTDRACT	1	4
				Q66	PICKUPGM	1	4
				Q74	COMPSPRT	1	4
				Q82	FRIENDS	1	4
				Q88	GYM	1	4
	PAIN	PAIN/COMFORT	3	Q97	AMTPAIN	1	6
				Q98	PAININTF	1	5
R				Q39	PAININTF	1	4
	HAPPY	HAPPINESS	5	Q32	HLOOKS	1	5
				Q33	HBODY	1	5
				Q34	HCLOTHES	1	5
				Q35	HFRIENDS	1	5
				Q36	HHEALTH	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6
Total Sample (N=3559)										
Scale = UPEXPF - UP EXTREM PHYS FXN										
Q23	LIFTBOOK	1-4	35	1.0	3205	288	23	7	1	0
Q24	POURMILK	1-4	53	1.5	3398	90	11	6	1	0
Q25	OPENJAR	1-4	52	1.5	3311	170	17	8	1	0
Q26	USEFORK	1-4	53	1.5	3482	16	4	4	0	0
Q27	COMBHAIR	1-4	44	1.2	3449	55	3	8	0	0
Q28	BUTTON	1-4	49	1.4	3468	32	3	6	1	0
Q30	WRITE	1-4	67	1.9	3422	51	13	5	1	0
Q54	DOORKNOB	1-4	100	2.8	3441	13	2	3	0	0
	Missing		453	1.6%						
	Out-of-range		5	0.0%						

Scale = TRANSFER - TRANSFERS/BASIC MOBI

Q29	SOCKS	1-4	56	1.6	3460	30	6	6	1	0
Q43	CLIMBONE	1-4	65	1.8	3334	138	16	6	0	0
Q46	WALKONE	1-4	72	2.0	3381	85	9	11	1	0
Q47	ONBUS	1-4	119	3.3	3368	49	10	11	2	0
Q50	WASHHAND	1-4	57	1.6	3471	24	1	5	1	0
Q51	SITCHAIR	1-4	81	2.3	3465	8	2	3	0	0
Q52	TOILET	1-4	75	2.1	3463	16	1	3	1	0
Q53	IN BED	1-4	96	2.7	3404	47	9	3	0	0
Q55	BENDPICK	1-4	139	3.9	3296	102	11	10	1	0
Q56	HELPSIT	1-5	64	1.8	3453	37	1	0	4	0
Q57	ASSTDEV	1-5	70	2.0	3449	26	3	2	9	0
	Missing		894	2.3%						
	Out-of-range		7	0.0%						

Scale = SPORTPF - SPORTS & PHYS FXN

Q40	RUNSHORT	1-4	56	1.6	2924	477	66	36	0	0
Q41	BICYCLE	1-4	81	2.3	3188	201	26	58	5	0
Q42	CLIMB3	1-4	71	2.0	2908	503	57	18	2	0
Q44	WALKMILE	1-4	76	2.1	2727	624	100	24	8	0
Q45	WALK3	1-4	83	2.3	3234	195	28	16	3	0
Q48	HELPWALK	1-4	63	1.8	3412	68	3	6	7	0
Q49	ASSTDEV	1-4	56	1.6	3434	45	3	5	16	0
Q58	OUTTRACT	1-4	62	1.7	3193	232	24	48	0	0
Q66	PICKUPGM	1-4	61	1.7	3106	284	32	76	0	0
Q74	COMPSPRT	1-4	47	1.3	2752	477	97	186	0	0
Q82	FRIENDS	1-4	48	1.3	2232	994	285	0	0	0
Q88	GYM	1-4	63	1.8	2470	193	75	758	0	0
	Missing		767	1.8%						
	Out-of-range		41	0.1%						

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1-6	93	2.6	2125	897	283	133	24	4
Q98	PAININTF	1-5	56	1.6	2776	595	96	32	4	0
Q39	PAININTF	1-4	90	2.5	88	387	565	2429	0	0
	Missing		239	2.2%						
	Out-of-range		0	0.0%						
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1-5	45	1.3	1560	1434	287	206	26	1
Q33	HBODY	1-5	58	1.6	1511	1292	359	284	53	2
Q34	H CLOTHES	1-5	91	2.6	1660	1397	169	205	35	2
Q35	HFRIENDS	1-5	77	2.2	1762	1160	245	256	58	1
Q36	HHEALTH	1-5	113	3.2	2032	1079	164	156	14	1
	Missing		384	2.2%						
	Out-of-range		7	0.0%						
Grand Totals					113814	3109		280		
	Missing		2737	2.0%		13811		5039		11
	Out-of-range		60	0.0%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=3471)										
Scale = UPEXPF - UP EXTREM PHYS FXN										
Q23	LIFTBOOK	1.10	0.34	16	3160	282	22	7	0	0
Q24	POURMILK	1.04	0.23	25	3367	88	10	6	0	0
Q25	OPENJAR	1.06	0.29	28	3282	164	17	8	0	0
Q26	USEFORK	1.01	0.14	28	3449	14	4	4	0	0
Q27	COMBHAIR	1.02	0.20	19	3407	53	3	8	0	0
Q28	BUTTON	1.02	0.16	22	3431	32	2	6	0	0
Q30	WRITE	1.03	0.20	39	3404	49	13	5	0	0
Q54	DOORKNOB	1.01	0.12	53	3455	11	2	3	0	0
Scale = TRANSFER - TRANSFERS/BASIC MOBI										
Q29	SOCKS	1.02	0.17	30	3430	29	6	6	0	0
Q43	CLIMBONE	1.05	0.27	29	3310	139	16	6	0	0
Q46	WALKONE	1.04	0.25	34	3367	84	9	11	0	0
Q47	ONBUS	1.03	0.23	84	3402	49	9	11	0	0
Q50	WASHHAND	1.01	0.14	15	3440	25	1	5	0	0
Q51	SITCHAIR	1.01	0.11	38	3456	10	2	3	0	0
Q52	TOILET	1.01	0.12	29	3450	17	1	3	0	0
Q53	IN BED	1.02	0.18	47	3410	49	9	3	0	0
Q55	BENDPICK	1.04	0.26	89	3349	101	11	10	0	0
Q56	HELPSIT	1.01	0.16	24	3431	35	1	1	3	0
Q57	ASSTDEV	1.02	0.23	30	3432	26	3	2	8	0
Scale = SPORTPF - SPORTS & PHYS FXN										
Q40	RUNSHORT	1.21	0.51	27	2891	477	67	36	0	0
Q41	BICYCLE	1.13	0.47	59	3168	218	28	57	0	0
Q42	CLIMB3	1.19	0.47	43	2891	506	56	18	0	0
Q44	WALKMILE	1.26	0.54	45	2725	623	99	24	0	0
Q45	WALK3	1.09	0.35	49	3227	199	29	16	0	0
Q48	HELPWALK	1.03	0.21	32	3387	71	4	9	0	0
Q49	ASSTDEV	1.03	0.22	35	3402	49	10	10	0	0
Q58	OUTTRACT	1.12	0.45	25	3165	235	24	47	0	0
Q66	PICKUPGM	1.17	0.54	23	3081	282	32	76	0	0
Q74	COMPSPRT	1.35	0.77	20	2721	471	96	183	0	0
Q82	FRIENDS	1.44	0.64	22	2209	983	279	0	0	0
Q88	GYM	1.74	1.23	33	2455	198	75	743	0	0
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1.57	0.87	50	2132	890	288	130	26	5
Q98	PAININTF	1.26	0.57	16	2747	590	97	32	5	0
Q39	PAININTF	1.46	0.79	54	2440	560	383	88	0	0

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item	Mean	SD	Imputed	Response Values						Frequency
Name	Label		Responses	1	2	3	4	5	6	
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1.78	0.88	13	1541	1418	282	204	26	0
Q33	HBODY	1.88	0.99	22	1494	1285	356	282	54	0
Q34	HCLOTHES	1.72	0.88	49	1655	1404	172	205	35	0
Q35	HFRIENDS	1.77	0.98	39	1748	1155	252	258	58	0
Q36	HHEALTH	1.57	0.82	69	2036	1086	177	158	14	0
Grand Totals				====	====	====	====	====	====	====
				1404	115547		2947		229	
						13957		2684		5

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
(Standard Error = .02)									
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.10	0.34	0.51*	0.40	0.40	0.26	0.20	0.45*
Q24	POURMILK	1.04	0.23	0.70*	0.47	0.36	0.19	0.11	0.41*
Q25	OPENJAR	1.06	0.29	0.55*	0.33	0.26	0.12	0.10	0.31*
Q26	USEFORK	1.01	0.14	0.70*	0.52	0.27	0.09	0.06	0.34*
Q27	COMBHAIR	1.02	0.20	0.65*	0.44	0.26	0.10	0.06	0.32*
Q28	BUTTON	1.02	0.16	0.71*	0.51	0.29	0.08	0.06	0.35*
Q30	WRITE	1.03	0.20	0.61*	0.41	0.31	0.13	0.12	0.36*
Q54	DOORKNOB	1.01	0.12	0.65*	0.62	0.28	0.09	0.05	0.36*
Scale = TRANSFER - TRANSFERS/BASIC MOBI									
Q29	SOCKS	1.02	0.17	0.67b	0.62*	0.38	0.18	0.12	0.45*
Q43	CLIMBONE	1.05	0.27	0.40	0.66*	0.58	0.35	0.21	0.59*
Q46	WALKONE	1.04	0.25	0.36	0.71*	0.54	0.29	0.18	0.54*
Q47	ONBUS	1.03	0.23	0.36	0.71*	0.46	0.26	0.14	0.48*
Q50	WASHHAND	1.01	0.14	0.55	0.74*	0.42	0.17	0.11	0.47*
Q51	SITCHAIR	1.01	0.11	0.52	0.73*	0.33	0.16	0.10	0.42*
Q52	TOILET	1.01	0.12	0.50	0.82*	0.39	0.18	0.11	0.46*
Q53	IN BED	1.02	0.18	0.39	0.63*	0.36	0.23	0.15	0.43*
Q55	BENDPICK	1.04	0.26	0.43	0.64*	0.49	0.33	0.22	0.54*
Q56	HELPSIT	1.01	0.16	0.54	0.74*	0.37	0.18	0.11	0.44*
Q57	ASSTDEV	1.02	0.23	0.39	0.61*	0.35	0.14	0.06	0.37*
Scale = SPORTPF - SPORTS & PHYS FXN									
Q40	RUNSHORT	1.21	0.51	0.33	0.49	0.68*	0.41	0.36	0.66*
Q41	BICYCLE	1.13	0.47	0.33	0.51	0.60*	0.34	0.26	0.57*
Q42	CLIMB3	1.19	0.47	0.34	0.52	0.64*	0.38	0.34	0.64*
Q44	WALKMILE	1.26	0.54	0.31	0.46	0.62*	0.36	0.34	0.61*
Q45	WALK3	1.09	0.35	0.37	0.66b	0.62*	0.33	0.25	0.61*
Q48	HELPWALK	1.03	0.21	0.47	0.61b	0.46*	0.23	0.16	0.49*
Q49	ASSTDEV	1.03	0.22	0.36	0.62b	0.37*a	0.21	0.10	0.41*
Q58	OUTDRACT	1.12	0.45	0.42	0.46	0.69*	0.31	0.31	0.63*
Q66	PICKUPGM	1.17	0.54	0.39	0.42	0.68*	0.32	0.32	0.62*
Q74	COMPSPRT	1.35	0.77	0.28	0.29	0.61*	0.29	0.33	0.55*
Q82	FRIENDS	1.44	0.64	0.16	0.15	0.33*a	0.19	0.30	0.36*
Q88	GYM	1.74	1.23	0.06	0.12	0.24*a	0.16	0.16	0.23*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.57	0.87	0.17	0.27	0.38	0.71*	0.30	0.48*
Q98	PAININTF	1.26	0.57	0.18	0.30	0.42	0.76*	0.29	0.52*
Q39	PAININTF	1.46	0.79	0.19	0.27	0.37	0.62*	0.26	0.45*
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.78	0.88	0.07	0.11	0.29	0.20	0.74*	0.46*
Q33	HBODY	1.88	0.99	0.10	0.15	0.37	0.25	0.73*	0.52*
Q34	H CLOTHES	1.72	0.88	0.09	0.11	0.22	0.18	0.64*	0.40*
Q35	HFRIENDS	1.77	0.98	0.17	0.19	0.38	0.23	0.61*	0.50*
Q36	HHEALTH	1.57	0.82	0.16	0.23	0.45	0.44	0.59*	0.59*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.10	0.34	**	2	2	2	2	2
Q24	POURMILK	1.04	0.23	**	2	2	2	2	2
Q25	OPENJAR	1.06	0.29	**	2	2	2	2	2
Q26	USEFORK	1.01	0.14	**	2	2	2	2	2
Q27	COMBHAIR	1.02	0.20	**	2	2	2	2	2
Q28	BUTTON	1.02	0.16	**	2	2	2	2	2
Q30	WRITE	1.03	0.20	**	2	2	2	2	2
Q54	DOORKNOB	1.01	0.12	**	1	2	2	2	2
Scale = TRANSFER - TRANSFERS/BASIC MOBI									
Q29	SOCKS	1.02	0.17	-2	**	2	2	2	2
Q43	CLIMBONE	1.05	0.27	2	**	2	2	2	2
Q46	WALKONE	1.04	0.25	2	**	2	2	2	2
Q47	ONBUS	1.03	0.23	2	**	2	2	2	2
Q50	WASHHAND	1.01	0.14	2	**	2	2	2	2
Q51	SITCHAIR	1.01	0.11	2	**	2	2	2	2
Q52	TOILET	1.01	0.12	2	**	2	2	2	2
Q53	IN BED	1.02	0.18	2	**	2	2	2	2
Q55	BENDPICK	1.04	0.26	2	**	2	2	2	2
Q56	HELPSIT	1.01	0.16	2	**	2	2	2	2
Q57	ASSTDEV	1.02	0.23	2	**	2	2	2	2
Scale = SPORTPF - SPORTS & PHYS FXN									
Q40	RUNSHORT	1.21	0.51	2	2	**	2	2	1
Q41	BICYCLE	1.13	0.47	2	2	**	2	2	1
Q42	CLIMB3	1.19	0.47	2	2	**	2	2	1
Q44	WALKMILE	1.26	0.54	2	2	**	2	2	1
Q45	WALK3	1.09	0.35	2	-2	**	2	2	1
Q48	HELPWALK	1.03	0.21	-1	-2	**	2	2	-1
Q49	ASSTDEV	1.03	0.22	1	-2	**	2	2	-2
Q58	OUTTRACT	1.12	0.45	2	2	**	2	2	2
Q66	PICKUPGM	1.17	0.54	2	2	**	2	2	2
Q74	COMPSPRT	1.35	0.77	2	2	**	2	2	2
Q82	FRIENDS	1.44	0.64	2	2	**	2	1	-1
Q88	GYM	1.74	1.23	2	2	**	2	2	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.57	0.87	2	2	2	**	2	2
Q98	PAININTF	1.26	0.57	2	2	2	**	2	2
Q39	PAININTF	1.46	0.79	2	2	2	**	2	2
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.78	0.88	2	2	2	2	**	2
Q33	HBODY	1.88	0.99	2	2	2	2	**	2
Q34	HCLOTHES	1.72	0.88	2	2	2	2	**	2
Q35	HFRIENDS	1.77	0.98	2	2	2	2	**	2
Q36	HHEALTH	1.57	0.82	2	2	2	2	**	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
UPEXPF - UP EXTREM PHYS FXN	0	0.0	0	0.0	1	3.1	31	96.9	32	100.0
TRANSFER - TRANSFERS/BASIC MOBI	1	2.3	0	0.0	0	0.0	43	97.7	43	97.7
SPORTPF - SPORTS & PHYS FXN	3	6.3	1	2.1	2	4.2	42	87.5	44	91.7
PAIN - PAIN/COMFORT	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
HAPPY - HAPPINESS	0	0.0	0	0.0	0	0.0	20	100.0	20	100.0
Total	4	2.6	1	0.6	3	1.9	148	94.9	151	96.8

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
UPEXPF - UP EXTREM PHYS FXN	8.28	1.22	8/8	32/32	24/24	85.8	0.1
TRANSFER - TRANSFERS/BASIC MOBI	11.27	1.59	11/11	46/46	35/35	91.0	0.1
SPORTPF - SPORTS & PHYS FXN	14.76	4.06	12/12	46/48	34/36	37.8	0.0
PAIN - PAIN/COMFORT	4.29	1.93	3/3	15/15	12/12	54.9	0.1
HAPPY - HAPPINESS	8.71	3.61	5/5	25/25	20/20	26.7	0.0
Total	47.31	9.06	39/39	149/166	110/127	11.6	0.0

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
UPEXPF - UP EXTREM PHYS FXN	1.18	5.08	0/0	100/100	100/100	85.8	0.1
TRANSFER - TRANSFERS/BASIC MOBI	0.76	4.53	0/0	100/100	100/100	91.0	0.1
SPORTPF - SPORTS & PHYS FXN	7.67	11.29	0/0	94/100	94/100	37.8	0.0
PAIN - PAIN/COMFORT	10.75	16.11	0/0	100/100	100/100	54.9	0.1
HAPPY - HAPPINESS	18.56	18.05	0/0	100/100	100/100	26.7	0.0
Total	6.55	7.13	0/0	87/100	87/100	11.6	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : (Observed scale score - lowest possible scale score) / (highest possible scale score - lowest possible scale score) * 100.
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
UPEXPF - UP EXTREM PHYS FXN	8	0.84	0.87	0.40
TRANSFER - TRANSFERS/BASIC MOBI	11	0.91	0.90	0.47
SPORTPF - SPORTS & PHYS FXN	12	0.81	0.78	0.26
PAIN - PAIN/COMFORT	3	0.82	0.94	0.60
HAPPY - HAPPINESS	5	0.85	0.92	0.53
Total	39	0.89	0.67	0.17

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix G: AAOS Pediatric Adolescent Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY
UPEXPF - UP EXTREM PHYS FXN	(.84)				
TRANSFER - TRANSFERS/BASIC MOBI	.60	(.91)			
SPORTPF - SPORTS & PHYS FXN	.43	.59	(.81)		
PAIN - PAIN/COMFORT	.20	.32	.44	(.82)	
HAPPY - HAPPINESS	.15	.20	.43	.32	(.85)
Total	.54	.67	.88	.63	.72
Scale-Total Correlation Corrected for Overlap					
Total	.43	.55	.66	.47	.41

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	39

Total, Missing and Computable Data

Total Subjects in Original Data File -----	3559
Subjects with Complete Data (No missing or out of range) -----	2770 (78 %)
Subjects with Computable scales (3) -----	3471 (98 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	92	Yes	
Scaling Success (Item discriminant validity) Significantly Greater (5a) -----	95	Yes	
Greater (5b) -----	97		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	UPEXPF	UP EXTREM PHYS FXN	8	Q23	LIFTBOOK	1	4
				Q24	POURMILK	1	4
				Q25	OPENJAR	1	4
				Q26	USEFORK	1	4
				Q27	COMBHAIR	1	4
				Q28	BUTTON	1	4
				Q30	WRITE	1	4
				Q54	DOORKNOB	1	4
	TRANSFER	TRANSFERS/BASIC MOBI	11	Q29	SOCKS	1	4
				Q43	CLIMBONE	1	4
				Q46	WALKONE	1	4
				Q47	ONBUS	1	4
				Q50	WASHHAND	1	4
				Q51	SITCHAIR	1	4
				Q52	TOILET	1	4
				Q53	IN BED	1	4
				Q55	BENDPICK	1	4
				Q56	HELPSIT	1	5
				Q57	ASSTDEV	1	5
	SPORTPF	SPORTS & PHYS FXN	12	Q40	RUNSHORT	1	4
				Q41	BICYCLE	1	4
				Q42	CLIMB3	1	4
				Q44	WALKMILE	1	4
				Q45	WALK3	1	4
				Q48	HELPWALK	1	4
				Q49	ASSTDEV	1	4
				Q58	OUTDRACT	1	4
				Q66	PICKUPGM	1	4
				Q74	COMPSPRT	1	4
				Q82	FRIENDS	1	4
				Q88	GYM	1	4
	PAIN	PAIN/COMFORT	3	Q97	AMTPAIN	1	6
				Q98	PAININTF	1	5
				Q39	PAININTF	1	4
R	HAPPY	HAPPINESS	5	Q32	HLOOKS	1	5
				Q33	HBODY	1	5
				Q34	HCLOTHES	1	5
				Q35	HFRIENDS	1	5
				Q36	HHEALTH	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix H: AAOs Pediatric Parent/Adolescent Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6
Total Sample (N=3559)										
Scale = UPEXPF - UP EXTREM PHYS FXN										
Q23	LIFTBOOK	1-4	35	1.0	3205	288	23	7	1	0
Q24	POURMILK	1-4	53	1.5	3398	90	11	6	1	0
Q25	OPENJAR	1-4	52	1.5	3311	170	17	8	1	0
Q26	USEFORK	1-4	53	1.5	3482	16	4	4	0	0
Q27	COMBHAIR	1-4	44	1.2	3449	55	3	8	0	0
Q28	BUTTON	1-4	49	1.4	3468	32	3	6	1	0
Q30	WRITE	1-4	67	1.9	3422	51	13	5	1	0
Q54	DOORKNOB	1-4	100	2.8	3441	13	2	3	0	0
	Missing		453	1.6%						
	Out-of-range		5	0.0%						

Scale = TRANSFER - TRANSFERS/BASIC MOBI										
Q29	SOCKS	1-4	56	1.6	3460	30	6	6	1	0
Q43	CLIMBONE	1-4	65	1.8	3334	138	16	6	0	0
Q46	WALKONE	1-4	72	2.0	3381	85	9	11	1	0
Q47	ONBUS	1-4	119	3.3	3368	49	10	11	2	0
Q50	WASHHAND	1-4	57	1.6	3471	24	1	5	1	0
Q51	SITCHAIR	1-4	81	2.3	3465	8	2	3	0	0
Q52	TOILET	1-4	75	2.1	3463	16	1	3	1	0
Q53	IN BED	1-4	96	2.7	3404	47	9	3	0	0
Q55	BENDPICK	1-4	139	3.9	3296	102	11	10	1	0
Q56	HELPSIT	1-5	64	1.8	3453	37	1	0	4	0
Q57	ASSTDEV	1-5	70	2.0	3449	26	3	2	9	0
	Missing		894	2.3%						
	Out-of-range		7	0.0%						

Scale = SPORTPF - SPORTS & PHYS FXN										
Q40	RUNSHORT	1-4	56	1.6	2924	477	66	36	0	0
Q41	BICYCLE	1-4	81	2.3	3188	201	26	58	5	0
Q42	CLIMB3	1-4	71	2.0	2908	503	57	18	2	0
Q44	WALKMILE	1-4	76	2.1	2727	624	100	24	8	0
Q45	WALK3	1-4	83	2.3	3234	195	28	16	3	0
Q48	HELPWALK	1-4	63	1.8	3412	68	3	6	7	0
Q49	ASSTDEV	1-4	56	1.6	3434	45	3	5	16	0
Q58	OUTDRACT	1-4	62	1.7	3193	232	24	48	0	0
Q66	PICKUPGM	1-4	61	1.7	3106	284	32	76	0	0
Q74	COMPSPRT	1-4	47	1.3	2752	477	97	186	0	0
Q82	FRIENDS	1-4	48	1.3	2232	994	285	0	0	0
Q88	GYM	1-4	63	1.8	2470	193	75	758	0	0
	Missing		767	1.8%						
	Out-of-range		41	0.1%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values Frequency					
					1	2	3	4	5	6
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1-6	93	2.6	2125	897	283	133	24	4
Q98	PAININTF	1-5	56	1.6	2776	595	96	32	4	0
Q39	PAININTF	1-4	90	2.5	88	387	565	2429	0	0
	Missing		239	2.2%						
	Out-of-range		0	0.0%						
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1-5	45	1.3	1560	1434	287	206	26	1
Q33	HBODY	1-5	58	1.6	1511	1292	359	284	53	2
Q34	HCLOTHES	1-5	91	2.6	1660	1397	169	205	35	2
Q35	HFRIENDS	1-5	77	2.2	1762	1160	245	256	58	1
Q36	HHEALTH	1-5	113	3.2	2032	1079	164	156	14	1
	Missing		384	2.2%						
	Out-of-range		7	0.0%						
Grand Totals					113814	3109		280		
	Missing		2737	2.0%		13811		5039		11
	Out-of-range		60	0.0%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix H: AAOs Pediatric Parent/Adolescent Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=3471)										
Scale = UPEXPF - UP EXTREM PHYS FXN										
Q23	LIFTBOOK	1.10	0.34	16	3160	282	22	7	0	0
Q24	POURMILK	1.04	0.23	25	3367	88	10	6	0	0
Q25	OPENJAR	1.06	0.29	28	3282	164	17	8	0	0
Q26	USEFORK	1.01	0.14	28	3449	14	4	4	0	0
Q27	COMBHAIR	1.02	0.20	19	3407	53	3	8	0	0
Q28	BUTTON	1.02	0.16	22	3431	32	2	6	0	0
Q30	WRITE	1.03	0.20	39	3404	49	13	5	0	0
Q54	DOORKNOB	1.01	0.12	53	3455	11	2	3	0	0
Scale = TRANSFER - TRANSFERS/BASIC MOBI										
Q29	SOCKS	1.02	0.17	30	3430	29	6	6	0	0
Q43	CLIMBONE	1.05	0.27	29	3310	139	16	6	0	0
Q46	WALKONE	1.04	0.25	34	3367	84	9	11	0	0
Q47	ONBUS	1.03	0.23	84	3402	49	9	11	0	0
Q50	WASHHAND	1.01	0.14	15	3440	25	1	5	0	0
Q51	SITCHAIR	1.01	0.11	38	3456	10	2	3	0	0
Q52	TOILET	1.01	0.12	29	3450	17	1	3	0	0
Q53	IN BED	1.02	0.18	47	3410	49	9	3	0	0
Q55	BENDPICK	1.04	0.26	89	3349	101	11	10	0	0
Q56	HELPSIT	1.01	0.16	24	3431	35	1	1	3	0
Q57	ASSTDEV	1.02	0.23	30	3432	26	3	2	8	0
Scale = SPORTPF - SPORTS & PHYS FXN										
Q40	RUNSHORT	1.21	0.51	27	2891	477	67	36	0	0
Q41	BICYCLE	1.13	0.47	59	3168	218	28	57	0	0
Q42	CLIMB3	1.19	0.47	43	2891	506	56	18	0	0
Q44	WALKMILE	1.26	0.54	45	2725	623	99	24	0	0
Q45	WALK3	1.09	0.35	49	3227	199	29	16	0	0
Q48	HELPWALK	1.03	0.21	32	3387	71	4	9	0	0
Q49	ASSTDEV	1.03	0.22	35	3402	49	10	10	0	0
Q58	OUTTRACT	1.12	0.45	25	3165	235	24	47	0	0
Q66	PICKUPGM	1.17	0.54	23	3081	282	32	76	0	0
Q74	COMPSPRT	1.35	0.77	20	2721	471	96	183	0	0
Q82	FRIENDS	1.44	0.64	22	2209	983	279	0	0	0
Q88	GYM	1.74	1.23	33	2455	198	75	743	0	0
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1.57	0.87	50	2132	890	288	130	26	5
Q98	PAININTF	1.26	0.57	16	2747	590	97	32	5	0
Q39	PAININTF	1.46	0.79	54	2440	560	383	88	0	0

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values					Frequency
					1	2	3	4	5	
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1.78	0.88	13	1541	1418	282	204	26	0
Q33	HBODY	1.88	0.99	22	1494	1285	356	282	54	0
Q34	HCLOTHES	1.72	0.88	49	1655	1404	172	205	35	0
Q35	HFRIENDS	1.77	0.98	39	1748	1155	252	258	58	0
Q36	HHEALTH	1.57	0.82	69	2036	1086	177	158	14	0
				=====	=====	=====	=====	=====	=====	=====
Grand Totals				1404	115547	2947	2684	229		5

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
(Standard Error = .02)									
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.10	0.34	0.51*	0.40	0.40	0.26	0.20	0.45*
Q24	POURMILK	1.04	0.23	0.70*	0.47	0.36	0.19	0.11	0.41*
Q25	OPENJAR	1.06	0.29	0.55*	0.33	0.26	0.12	0.10	0.31*
Q26	USEFORK	1.01	0.14	0.70*	0.52	0.27	0.09	0.06	0.34*
Q27	COMBHAIR	1.02	0.20	0.65*	0.44	0.26	0.10	0.06	0.32*
Q28	BUTTON	1.02	0.16	0.71*	0.51	0.29	0.08	0.06	0.35*
Q30	WRITE	1.03	0.20	0.61*	0.41	0.31	0.13	0.12	0.36*
Q54	DOORKNOB	1.01	0.12	0.65*	0.62	0.28	0.09	0.05	0.36*
Scale = TRANSFER - TRANSFERS/BASIC MOBI									
Q29	SOCKS	1.02	0.17	0.67b	0.62*	0.38	0.18	0.12	0.45*
Q43	CLIMBONE	1.05	0.27	0.40	0.66*	0.58	0.35	0.21	0.59*
Q46	WALKONE	1.04	0.25	0.36	0.71*	0.54	0.29	0.18	0.54*
Q47	ONBUS	1.03	0.23	0.36	0.71*	0.46	0.26	0.14	0.48*
Q50	WASHHAND	1.01	0.14	0.55	0.74*	0.42	0.17	0.11	0.47*
Q51	SITCHAIR	1.01	0.11	0.52	0.73*	0.33	0.16	0.10	0.42*
Q52	TOILET	1.01	0.12	0.50	0.82*	0.39	0.18	0.11	0.46*
Q53	IN BED	1.02	0.18	0.39	0.63*	0.36	0.23	0.15	0.43*
Q55	BENDPICK	1.04	0.26	0.43	0.64*	0.49	0.33	0.22	0.54*
Q56	HELPSIT	1.01	0.16	0.54	0.74*	0.37	0.18	0.11	0.44*
Q57	ASSTDEV	1.02	0.23	0.39	0.61*	0.35	0.14	0.06	0.37*
Scale = SPORTPF - SPORTS & PHYS FXN									
Q40	RUNSHORT	1.21	0.51	0.33	0.49	0.68*	0.41	0.36	0.66*
Q41	BICYCLE	1.13	0.47	0.33	0.51	0.60*	0.34	0.26	0.57*
Q42	CLIMB3	1.19	0.47	0.34	0.52	0.64*	0.38	0.34	0.64*
Q44	WALKMILE	1.26	0.54	0.31	0.46	0.62*	0.36	0.34	0.61*
Q45	WALK3	1.09	0.35	0.37	0.66b	0.62*	0.33	0.25	0.61*
Q48	HELPWALK	1.03	0.21	0.47	0.61b	0.46*	0.23	0.16	0.49*
Q49	ASSTDEV	1.03	0.22	0.36	0.62b	0.37*a	0.21	0.10	0.41*
Q58	OUTDRACT	1.12	0.45	0.42	0.46	0.69*	0.31	0.31	0.63*
Q66	PICKUPGM	1.17	0.54	0.39	0.42	0.68*	0.32	0.32	0.62*
Q74	COMPSPRT	1.35	0.77	0.28	0.29	0.61*	0.29	0.33	0.55*
Q82	FRIENDS	1.44	0.64	0.16	0.15	0.33*a	0.19	0.30	0.36*
Q88	GYM	1.74	1.23	0.06	0.12	0.24*a	0.16	0.16	0.23*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.57	0.87	0.17	0.27	0.38	0.71*	0.30	0.48*
Q98	PAININTF	1.26	0.57	0.18	0.30	0.42	0.76*	0.29	0.52*
Q39	PAININTF	1.46	0.79	0.19	0.27	0.37	0.62*	0.26	0.45*
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.78	0.88	0.07	0.11	0.29	0.20	0.74*	0.46*
Q33	HBODY	1.88	0.99	0.10	0.15	0.37	0.25	0.73*	0.52*
Q34	H CLOTHES	1.72	0.88	0.09	0.11	0.22	0.18	0.64*	0.40*
Q35	HFRIENDS	1.77	0.98	0.17	0.19	0.38	0.23	0.61*	0.50*
Q36	HHEALTH	1.57	0.82	0.16	0.23	0.45	0.44	0.59*	0.59*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.10	0.34	**	2	2	2	2	2
Q24	POURMILK	1.04	0.23	**	2	2	2	2	2
Q25	OPENJAR	1.06	0.29	**	2	2	2	2	2
Q26	USEFORK	1.01	0.14	**	2	2	2	2	2
Q27	COMBHAIR	1.02	0.20	**	2	2	2	2	2
Q28	BUTTON	1.02	0.16	**	2	2	2	2	2
Q30	WRITE	1.03	0.20	**	2	2	2	2	2
Q54	DOORKNOB	1.01	0.12	**	1	2	2	2	2

Scale = TRANSFER - TRANSFERS/BASIC MOBI

Q29	SOCKS	1.02	0.17	-2	**	2	2	2	2
Q43	CLIMBONE	1.05	0.27	2	**	2	2	2	2
Q46	WALKONE	1.04	0.25	2	**	2	2	2	2
Q47	ONBUS	1.03	0.23	2	**	2	2	2	2
Q50	WASHHAND	1.01	0.14	2	**	2	2	2	2
Q51	SITCHAIR	1.01	0.11	2	**	2	2	2	2
Q52	TOILET	1.01	0.12	2	**	2	2	2	2
Q53	IN BED	1.02	0.18	2	**	2	2	2	2
Q55	BENDPICK	1.04	0.26	2	**	2	2	2	2
Q56	HELPSIT	1.01	0.16	2	**	2	2	2	2
Q57	ASSTDEV	1.02	0.23	2	**	2	2	2	2

Scale = SPORTPF - SPORTS & PHYS FXN

Q40	RUNSHORT	1.21	0.51	2	2	**	2	2	1
Q41	BICYCLE	1.13	0.47	2	2	**	2	2	1
Q42	CLIMB3	1.19	0.47	2	2	**	2	2	1
Q44	WALKMILE	1.26	0.54	2	2	**	2	2	1
Q45	WALK3	1.09	0.35	2	-2	**	2	2	1
Q48	HELPWALK	1.03	0.21	-1	-2	**	2	2	-1
Q49	ASSTDEV	1.03	0.22	1	-2	**	2	2	-2
Q58	OUTTRACT	1.12	0.45	2	2	**	2	2	2
Q66	PICKUPGM	1.17	0.54	2	2	**	2	2	2
Q74	COMPSPRT	1.35	0.77	2	2	**	2	2	2
Q82	FRIENDS	1.44	0.64	2	2	**	2	1	-1
Q88	GYM	1.74	1.23	2	2	**	2	2	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.

1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.

-1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.

-2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.57	0.87	2	2	2	**	2	2
Q98	PAININTF	1.26	0.57	2	2	2	**	2	2
Q39	PAININTF	1.46	0.79	2	2	2	**	2	2
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.78	0.88	2	2	2	2	**	2
Q33	HBODY	1.88	0.99	2	2	2	2	**	2
Q34	HCLOTHES	1.72	0.88	2	2	2	2	**	2
Q35	HFRIENDS	1.77	0.98	2	2	2	2	**	2
Q36	HHEALTH	1.57	0.82	2	2	2	2	**	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
UPEXPF - UP EXTREM PHYS FXN	0	0.0	0	0.0	1	3.1	31	96.9	32	100.0
TRANSFER - TRANSFERS/BASIC MOBI	1	2.3	0	0.0	0	0.0	43	97.7	43	97.7
SPORTPF - SPORTS & PHYS FXN	3	6.3	1	2.1	2	4.2	42	87.5	44	91.7
PAIN - PAIN/COMFORT	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
HAPPY - HAPPINESS	0	0.0	0	0.0	0	0.0	20	100.0	20	100.0
Total	4	2.6	1	0.6	3	1.9	148	94.9	151	96.8

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
UPEXPF - UP EXTREM PHYS FXN	8.28	1.22	8/8	32/32	24/24	85.8	0.1
TRANSFER - TRANSFERS/BASIC MOBI	11.27	1.59	11/11	46/46	35/35	91.0	0.1
SPORTPF - SPORTS & PHYS FXN	14.76	4.06	12/12	46/48	34/36	37.8	0.0
PAIN - PAIN/COMFORT	4.29	1.93	3/3	15/15	12/12	54.9	0.1
HAPPY - HAPPINESS	8.71	3.61	5/5	25/25	20/20	26.7	0.0
Total	47.31	9.06	39/39	149/166	110/127	11.6	0.0

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)						
	Mean	SD	Observed/Possible Lowest	Highest	Values Range	% at Floor	% at Ceiling
UPEXPF - UP EXTREM PHYS FXN	1.18	5.08	0/0	100/100	100/100	85.8	0.1
TRANSFER - TRANSFERS/BASIC MOBI	0.76	4.53	0/0	100/100	100/100	91.0	0.1
SPORTPF - SPORTS & PHYS FXN	7.67	11.29	0/0	94/100	94/100	37.8	0.0
PAIN - PAIN/COMFORT	10.75	16.11	0/0	100/100	100/100	54.9	0.1
HAPPY - HAPPINESS	18.56	18.05	0/0	100/100	100/100	26.7	0.0
Total	6.55	7.13	0/0	87/100	87/100	11.6	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix H: AAOS Pediatric Parent/Adolescent Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
UPEXPF - UP EXTREM PHYS FXN	8	0.84	0.87	0.40
TRANSFER - TRANSFERS/BASIC MOBI	11	0.91	0.90	0.47
SPORTPF - SPORTS & PHYS FXN	12	0.81	0.78	0.26
PAIN - PAIN/COMFORT	3	0.82	0.94	0.60
HAPPY - HAPPINESS	5	0.85	0.92	0.53
Total	39	0.89	0.67	0.17

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

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Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY
UPEXPF - UP EXTREM PHYS FXN	(.84)				
TRANSFER - TRANSFERS/BASIC MOBI	.60	(.91)			
SPORTPF - SPORTS & PHYS FXN	.43	.59	(.81)		
PAIN - PAIN/COMFORT	.20	.32	.44	(.82)	
HAPPY - HAPPINESS	.15	.20	.43	.32	(.85)
Total	.54	.67	.88	.63	.72
Scale-Total Correlation Corrected for Overlap					
Total	.43	.55	.66	.47	.41

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	39

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1775
Subjects with Complete Data (No missing or out of range) -----	1000 (56 %)
Subjects with Computable scales (3) -----	1592 (90 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	90	No	Q29 Q49 Q82 Q88
Scaling Success (Item discriminant validity) Significantly Greater (5a) -----	94	Yes	
Greater (5b) -----	96		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	UPEXPF	UP EXTREM PHYS FXN	8	Q23	LIFTBOOK	1	4
				Q24	POURMILK	1	4
				Q25	OPENJAR	1	4
				Q26	USEFORK	1	4
				Q27	COMBHAIR	1	4
				Q28	BUTTON	1	4
				Q30	WRITE	1	4
				Q54	DOORKNOB	1	4
	TRANSFER	TRANSFERS/BASIC MOBI	11	Q29	SOCKS	1	4
				Q43	CLIMBONE	1	4
				Q46	WALKONE	1	4
				Q47	ONBUS	1	4
				Q50	WASHHAND	1	4
				Q51	SITCHAIR	1	4
				Q52	TOILET	1	4
				Q53	IN BED	1	4
				Q55	BENDPICK	1	4
				Q56	HELPSIT	1	5
				Q57	ASSTDEV	1	5
	SPORTPF	SPORTS & PHYS FXN	12	Q40	RUNSHORT	1	4
				Q41	BICYCLE	1	4
				Q42	CLIMB3	1	4
				Q44	WALKMILE	1	4
				Q45	WALK3	1	4
				Q48	HELPWALK	1	4
				Q49	ASSTDEV	1	4
				Q58	OUTDRACT	1	4
				Q66	PICKUPGM	1	4
				Q74	COMPSPRT	1	4
				Q82	FRIENDS	1	4
				Q88	GYM	1	4
	PAIN	PAIN/COMFORT	3	Q97	AMTPAIN	1	6
				Q98	PAININTF	1	5
				Q39	PAININTF	1	4
R	HAPPY	HAPPINESS	5	Q32	HLOOKS	1	5
				Q33	HBODY	1	5
				Q34	HCLOTHES	1	5
				Q35	HFRIENDS	1	5
				Q36	HHEALTH	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					
					1	2	3	4	5	6

Total Sample (N=1775)

Scale = UPEXPF - UP EXTREM PHYS FXN

Q23	LIFTBOOK	1-4	22	1.2	1178	410	40	9	116	0
Q24	POURMILK	1-4	30	1.7	989	376	64	43	273	0
Q25	OPENJAR	1-4	30	1.7	1123	340	82	33	167	0
Q26	USEFORK	1-4	19	1.1	1692	59	1	3	1	0
Q27	COMBHAIR	1-4	21	1.2	1432	250	25	13	34	0
Q28	BUTTON	1-4	30	1.7	1276	289	63	43	74	0
Q30	WRITE	1-4	16	0.9	1486	159	39	14	61	0
Q54	DOORKNOB	1-4	34	1.9	1625	94	7	5	10	0
Missing			202	1.4%						
Out-of-range			736	5.2%						

Scale = TRANSFER - TRANSFERS/BASIC MOBI

Q29	SOCKS	1-4	15	0.8	1498	191	25	17	29	0
Q43	CLIMBONE	1-4	34	1.9	1645	68	9	4	15	0
Q46	WALKONE	1-4	32	1.8	1641	52	12	5	33	0
Q47	ONBUS	1-4	71	4.0	1350	73	4	14	263	0
Q50	WASHHAND	1-4	19	1.1	1680	41	4	4	27	0
Q51	SITCHAIR	1-4	22	1.2	1733	13	3	2	2	0
Q52	TOILET	1-4	23	1.3	1675	57	5	3	12	0
Q53	IN BED	1-4	35	2.0	1716	14	2	3	5	0
Q55	BENDPICK	1-4	36	2.0	1706	26	2	3	2	0
Q56	HELPSIT	1-5	27	1.5	1688	54	1	1	4	0
Q57	ASSTDEV	1-5	32	1.8	1734	5	0	3	1	0
Missing			346	1.8%						
Out-of-range			388	2.0%						

Scale = SPORTPF - SPORTS & PHYS FXN

Q40	RUNSHORT	1-4	15	0.8	1609	109	23	4	15	0
Q41	BICYCLE	1-4	22	1.2	1492	131	27	40	63	0
Q42	CLIMB3	1-4	62	3.5	1278	335	28	7	65	0
Q44	WALKMILE	1-4	70	3.9	818	469	105	25	288	0
Q45	WALK3	1-4	45	2.5	1389	209	36	7	89	0
Q48	HELPWALK	1-4	27	1.5	1389	332	15	5	7	0
Q49	ASSTDEV	1-4	21	1.2	1743	4	0	4	3	0
Q58	OUTTRACT	1-4	30	1.7	1578	98	14	55	0	0
Q66	PICKUPGM	1-4	38	2.1	1418	170	24	125	0	0
Q74	COMPSPRT	1-4	27	1.5	1145	221	35	347	0	0
Q82	FRIENDS	1-4	17	1.0	1033	548	177	0	0	0
Q88	GYM	1-4	22	1.2	1349	101	45	258	0	0
Missing			396	1.9%						
Out-of-range			530	2.5%						

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values Frequency					
					1	2	3	4	5	6
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1-6	27	1.5	1243	388	72	39	5	1
Q98	PAININTF	1-5	18	1.0	1517	200	29	8	3	0
Q39	PAININTF	1-4	25	1.4	31	118	238	1363	0	0
	Missing		70	1.3%						
	Out-of-range		0	0.0%						
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1-5	16	0.9	1194	297	63	30	3	172
Q33	HBODY	1-5	19	1.1	1149	269	86	44	7	201
Q34	H CLOTHES	1-5	30	1.7	1091	457	40	55	4	98
Q35	HFRIENDS	1-5	19	1.1	1067	398	101	71	14	105
Q36	HHEALTH	1-5	25	1.4	1221	248	60	59	8	154
	Missing		109	1.2%						
	Out-of-range		730	8.2%						
Grand Totals					53621	7673	1606	2768	1703	731
	Missing		1123	1.6%						
	Out-of-range		2384	3.4%						

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=1592)										
Scale = UPEXPF - UP EXTREM PHYS FXN										
Q23	LIFTBOOK	1.30	0.52	83	1177	374	33	8	0	0
Q24	POURMILK	1.40	0.66	180	1085	411	61	35	0	0
Q25	OPENJAR	1.36	0.64	106	1149	342	75	26	0	0
Q26	USEFORK	1.03	0.20	10	1545	45	0	2	0	0
Q27	COMBHAIR	1.18	0.45	18	1350	212	21	9	0	0
Q28	BUTTON	1.28	0.60	38	1251	268	47	26	0	0
Q30	WRITE	1.15	0.44	31	1411	140	32	9	0	0
Q54	DOORKNOB	1.06	0.27	14	1513	71	4	4	0	0
Scale = TRANSFER - TRANSFERS/BASIC MOBI										
Q29	SOCKS	1.12	0.39	13	1429	142	13	8	0	0
Q43	CLIMBONE	1.05	0.26	22	1530	51	8	3	0	0
Q46	WALKONE	1.04	0.25	32	1538	41	11	2	0	0
Q47	ONBUS	1.07	0.31	221	1517	63	3	9	0	0
Q50	WASHHAND	1.03	0.21	17	1554	33	2	3	0	0
Q51	SITCHAIR	1.01	0.13	6	1581	7	3	1	0	0
Q52	TOILET	1.03	0.18	11	1558	31	1	2	0	0
Q53	IN BED	1.01	0.15	15	1576	12	2	2	0	0
Q55	BENDPICK	1.02	0.17	16	1566	22	2	2	0	0
Q56	HELPSIT	1.04	0.25	10	1547	41	0	1	3	0
Q57	ASSTDEV	1.01	0.16	13	1583	6	0	2	1	0
Scale = SPORTPF - SPORTS & PHYS FXN										
Q40	RUNSHORT	1.10	0.36	12	1461	104	24	3	0	0
Q41	BICYCLE	1.18	0.54	35	1404	130	26	32	0	0
Q42	CLIMB3	1.25	0.48	66	1241	319	27	5	0	0
Q44	WALKMILE	1.50	0.66	240	942	528	103	19	0	0
Q45	WALK3	1.19	0.45	75	1335	221	32	4	0	0
Q48	HELPWALK	1.19	0.43	17	1319	258	9	6	0	0
Q49	ASSTDEV	1.01	0.18	10	1581	6	0	5	0	0
Q58	OUTTRACT	1.13	0.48	13	1460	91	12	29	0	0
Q66	PICKUPGM	1.24	0.66	23	1351	156	25	60	0	0
Q74	COMPSPRT	1.62	1.08	16	1105	219	31	237	0	0
Q82	FRIENDS	1.49	0.65	9	962	488	142	0	0	0
Q88	GYM	1.43	0.97	12	1292	94	29	177	0	0
Scale = PAIN - PAIN/COMFORT										
Q97	AMTPAIN	1.39	0.71	12	1134	345	71	37	4	1
Q98	PAININTF	1.17	0.47	5	1369	186	27	7	3	0
Q39	PAININTF	1.33	0.68	16	1228	225	111	28	0	0

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Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Scale = HAPPY - HAPPINESS										
Q32	HLOOKS	1.33	0.66	36	1194	304	62	29	3	0
Q33	HBODY	1.39	0.75	63	1161	297	85	42	7	0
Q34	H CLOTHES	1.43	0.71	17	1058	445	36	49	4	0
Q35	HFRIENDS	1.52	0.85	13	1034	384	93	67	14	0
Q36	HHEALTH	1.37	0.76	37	1209	256	62	57	8	0
				=====	=====	=====	=====	=====	=====	=====
Grand Totals				1583	52300	7368	1325	1047	47	1

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Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
(Standard Error = .03)									
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.30	0.52	0.52*	0.37	0.47	0.16	0.17	0.50*
Q24	POURMILK	1.40	0.66	0.63*	0.36	0.44	0.08	0.11	0.47*
Q25	OPENJAR	1.36	0.64	0.50*	0.29	0.32	0.08	0.07	0.36*
Q26	USEFORK	1.03	0.20	0.44*	0.57b	0.37	0.04	0.12	0.44*
Q27	COMBHAIR	1.18	0.45	0.54*	0.41	0.38	0.07	0.12	0.44*
Q28	BUTTON	1.28	0.60	0.61*	0.42	0.48	0.09	0.09	0.50*
Q30	WRITE	1.15	0.44	0.53*	0.44	0.46	0.12	0.12	0.49*
Q54	DOORKNOB	1.06	0.27	0.44*	0.50b	0.38	0.11	0.10	0.44*
Scale = TRANSFER - TRANSFERS/BASIC MOBI									
Q29	SOCKS	1.12	0.39	0.58b	0.37*a	0.44b	0.11	0.08	0.48*
Q43	CLIMBONE	1.05	0.26	0.30	0.57*	0.50	0.33	0.28	0.55*
Q46	WALKONE	1.04	0.25	0.32	0.62*	0.47	0.29	0.20	0.52*
Q47	ONBUS	1.07	0.31	0.35	0.51*	0.39	0.14	0.10	0.42*
Q50	WASHHAND	1.03	0.21	0.35	0.54*	0.30	0.13	0.14	0.39*
Q51	SITCHAIR	1.01	0.13	0.34	0.66*	0.29	0.18	0.15	0.42*
Q52	TOILET	1.03	0.18	0.45	0.63*	0.38	0.11	0.11	0.46*
Q53	IN BED	1.01	0.15	0.33	0.66*	0.27	0.18	0.13	0.40*
Q55	BENDPICK	1.02	0.17	0.32	0.68*	0.41	0.28	0.22	0.51*
Q56	HELPSIT	1.04	0.25	0.44	0.66*	0.40	0.20	0.18	0.51*
Q57	ASSTDEV	1.01	0.16	0.34	0.65*	0.35	0.19	0.19	0.46*
Scale = SPORTPF - SPORTS & PHYS FXN									
Q40	RUNSHORT	1.10	0.36	0.25	0.50	0.46*	0.33	0.35	0.54*
Q41	BICYCLE	1.18	0.54	0.42	0.41	0.49*	0.17	0.20	0.51*
Q42	CLIMB3	1.25	0.48	0.34	0.43	0.52*	0.25	0.27	0.54*
Q44	WALKMILE	1.50	0.66	0.40	0.34	0.52*	0.24	0.24	0.52*
Q45	WALK3	1.19	0.45	0.40	0.50	0.57*	0.27	0.23	0.58*
Q48	HELPWALK	1.19	0.43	0.49	0.46	0.50*	0.15	0.13	0.51*
Q49	ASSTDEV	1.01	0.18	0.32	0.58b	0.33*a	0.17	0.16	0.42*
Q58	OUTDRACT	1.13	0.48	0.40	0.45	0.56*	0.20	0.21	0.55*
Q66	PICKUPGM	1.24	0.66	0.43	0.40	0.63*	0.14	0.22	0.56*
Q74	COMPSPRT	1.62	1.08	0.46	0.30	0.59*	0.14	0.15	0.51*
Q82	FRIENDS	1.49	0.65	0.20	0.18	0.33*a	0.15	0.20	0.32*
Q88	GYM	1.43	0.97	0.33	0.26	0.39*a	0.07	0.01	0.33*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations					
				UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.39	0.71	0.13	0.26	0.25	0.70*	0.32	0.38*
Q98	PAININTF	1.17	0.47	0.14	0.26	0.27	0.68*	0.28	0.39*
Q39	PAININTF	1.33	0.68	0.10	0.22	0.21	0.58*	0.25	0.32*
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.33	0.66	0.04	0.10	0.13	0.16	0.68*	0.29*
Q33	HBODY	1.39	0.75	0.04	0.13	0.17	0.20	0.65*	0.31*
Q34	HCLOTHES	1.43	0.71	0.09	0.17	0.15	0.17	0.53*	0.30*
Q35	HFRIENDS	1.52	0.85	0.23	0.25	0.33	0.27	0.57*	0.47*
Q36	HHEALTH	1.37	0.76	0.17	0.22	0.30	0.42	0.53*	0.45*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

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Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = UPEXPF - UP EXTREM PHYS FXN									
Q23	LIFTBOOK	1.30	0.52	**	2	2	2	2	1
Q24	POURMILK	1.40	0.66	**	2	2	2	2	2
Q25	OPENJAR	1.36	0.64	**	2	2	2	2	2
Q26	USEFORK	1.03	0.20	**	-2	2	2	2	-1
Q27	COMBHAIR	1.18	0.45	**	2	2	2	2	2
Q28	BUTTON	1.28	0.60	**	2	2	2	2	2
Q30	WRITE	1.15	0.44	**	2	2	2	2	1
Q54	DOORKNOB	1.06	0.27	**	-2	2	2	2	1

Scale = TRANSFER - TRANSFERS/BASIC MOBI

Q29	SOCKS	1.12	0.39	-2	**	-2	2	2	-2
Q43	CLIMBONE	1.05	0.26	2	**	2	2	2	1
Q46	WALKONE	1.04	0.25	2	**	2	2	2	2
Q47	ONBUS	1.07	0.31	2	**	2	2	2	2
Q50	WASHHAND	1.03	0.21	2	**	2	2	2	2
Q51	SITCHAIR	1.01	0.13	2	**	2	2	2	2
Q52	TOILET	1.03	0.18	2	**	2	2	2	2
Q53	IN BED	1.01	0.15	2	**	2	2	2	2
Q55	BENDPICK	1.02	0.17	2	**	2	2	2	2
Q56	HELPSIT	1.04	0.25	2	**	2	2	2	2
Q57	ASSTDEV	1.01	0.16	2	**	2	2	2	2

Scale = SPORTPF - SPORTS & PHYS FXN

Q40	RUNSHORT	1.10	0.36	2	-1	**	2	2	-2
Q41	BICYCLE	1.18	0.54	2	2	**	2	2	-1
Q42	CLIMB3	1.25	0.48	2	2	**	2	2	-1
Q44	WALKMILE	1.50	0.66	2	2	**	2	2	-1
Q45	WALK3	1.19	0.45	2	2	**	2	2	-1
Q48	HELPWALK	1.19	0.43	1	1	**	2	2	-1
Q49	ASSTDEV	1.01	0.18	1	-2	**	2	2	-2
Q58	OUTTRACT	1.13	0.48	2	2	**	2	2	1
Q66	PICKUPGM	1.24	0.66	2	2	**	2	2	2
Q74	COMPSPRT	1.62	1.08	2	2	**	2	2	2
Q82	FRIENDS	1.49	0.65	2	2	**	2	2	1
Q88	GYM	1.43	0.97	2	2	**	2	2	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

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Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY	Total
Scale = PAIN - PAIN/COMFORT									
Q97	AMTPAIN	1.39	0.71	2	2	2	**	2	2
Q98	PAININTF	1.17	0.47	2	2	2	**	2	2
Q39	PAININTF	1.33	0.68	2	2	2	**	2	2
Scale = HAPPY - HAPPINESS									
Q32	HLOOKS	1.33	0.66	2	2	2	2	**	2
Q33	HBODY	1.39	0.75	2	2	2	2	**	2
Q34	HCLOTHES	1.43	0.71	2	2	2	2	**	2
Q35	HFRIENDS	1.52	0.85	2	2	2	2	**	2
Q36	HHEALTH	1.37	0.76	2	2	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
UPEXPF - UP EXTREM PHYS FXN	2	6.3	0	0.0	0	0.0	30	93.8	30	93.8
TRANSFER - TRANSFERS/BASIC MOBI	2	4.5	0	0.0	0	0.0	42	95.5	42	95.5
SPORTPF - SPORTS & PHYS FXN	1	2.1	1	2.1	3	6.3	43	89.6	46	95.8
PAIN - PAIN/COMFORT	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
HAPPY - HAPPINESS	0	0.0	0	0.0	0	0.0	20	100.0	20	100.0
Total	5	3.2	1	0.6	3	1.9	147	94.2	150	96.2

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
UPEXPF - UP EXTREM PHYS FXN	9.75	2.56	8/8	32/32	24/24	45.1	0.1
TRANSFER - TRANSFERS/BASIC MOBI	11.43	1.64	11/11	46/46	35/35	80.6	0.1
SPORTPF - SPORTS & PHYS FXN	15.32	4.26	12/12	47/48	35/36	28.2	0.0
PAIN - PAIN/COMFORT	3.89	1.60	3/3	14/15	11/12	64.9	0.0
HAPPY - HAPPINESS	7.03	2.80	5/5	23/25	18/20	44.2	0.0
Total	47.43	9.25	39/39	150/166	111/127	9.3	0.0

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
UPEXPF - UP EXTREM PHYS FXN	7.30	10.68	0/0	100/100	100/100	45.1	0.1
TRANSFER - TRANSFERS/BASIC MOBI	1.22	4.70	0/0	100/100	100/100	80.6	0.1
SPORTPF - SPORTS & PHYS FXN	9.22	11.84	0/0	97/100	97/100	28.2	0.0
PAIN - PAIN/COMFORT	7.45	13.29	0/0	92/100	92/100	64.9	0.0
HAPPY - HAPPINESS	10.17	14.00	0/0	90/100	90/100	44.2	0.0
Total	6.64	7.28	0/0	87/100	87/100	9.3	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
UPEXPF - UP EXTREM PHYS FXN	8	0.80	0.83	0.33
TRANSFER - TRANSFERS/BASIC MOBI	11	0.85	0.84	0.35
SPORTPF - SPORTS & PHYS FXN	12	0.81	0.78	0.26
PAIN - PAIN/COMFORT	3	0.79	0.93	0.56
HAPPY - HAPPINESS	5	0.80	0.89	0.45
Total	39	0.89	0.68	0.17

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix I: AAOS Pediatric Parent/Child Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	UPEXPF	TRANSF	SPORTP	PAIN	HAPPY
UPEXPF - UP EXTREM PHYS FXN	(.80)				
TRANSFER - TRANSFERS/BASIC MOBI	.58	(.85)			
SPORTPF - SPORTS & PHYS FXN	.62	.59	(.81)		
PAIN - PAIN/COMFORT	.14	.29	.28	(.79)	
HAPPY - HAPPINESS	.16	.23	.30	.33	(.80)
Total	.74	.73	.88	.49	.58
Scale-Total Correlation Corrected for Overlap					
Total	.56	.63	.65	.35	.33

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	39

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1872
Subjects with Complete Data	
(No missing or out of range) -----	87 (5 %)
Subjects with Computable scales (3) -----	563 (30 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	93	Yes	
Greater (5b) -----	99		
Reliable Scales (6) -----	100	Yes	

- The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
- The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
- Only subjects for whom all scales are computable are included in Analysis Data.
- Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
- Scaling Success (Item discriminant validity) :
 - Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
- Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	PHP	PHYS HLTH & PAIN	16	Q20A	Vigorous	1	3
				Q20B	Moderate	1	3
				Q20C	Lifting	1	3
				Q20D	Climbsev	1	3
				Q20E	Climbone	1	3
				Q20F	Bending	1	3
				Q20G	Walkmile	1	3
				Q20H	Walksev	1	3
				Q20I	Walkone	1	3
				Q20J	Bathing	1	3
				Q21A	Pcutoff	1	2
				Q21B	Plessdon	1	2
				Q21C	Plimited	1	2
				Q21D	Pdiffcft	1	2
				Q24	Bodypain	1	6
R							Q25
R	LL_CORE	LOWER LIMB CORE	7	Q37	STIFF	1	5
				Q38	SWOLLEN	1	5
				Q39	FLAT	1	6
				Q40	STAIRS	1	6
				Q41	LIE_BED	1	6
				Q50	GETARND	1	7
				Q51	SOCKSOFF	1	6
	GIVEWAY	KNEE GIVE WAY ON ACT	4	Q42	GWJUMP	1	4
				Q43	GWSKI	1	4
				Q44	GWJOG	1	4
				Q45	GWWALK	1	4
	PALIM	PRE-INJURY LIM	4	Q52	PIJUMP	1	5
				Q53	PISKI	1	5
				Q54	PIJOG	1	5
				Q55	PIWALK	1	5
	CALIM	CURRENT ACT LIM	4	Q56	CAJUMP	1	5
				Q57	CASKI	1	5
				Q58	CAJOG	1	5
				Q59	CAWALK	1	5
	PAIN	PAIN ON ACTIVITY	4	Q62	PNJUMP	1	5
				Q63	PNSKI	1	5
				Q64	PNJOG	1	5
				Q65	PNWALK	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Total Sample (N=1872)											
Scale = PHP - PHYS HLTH & PAIN											
Q20A	Vigorous	1-3	42	2.2	553	631	646	0	0	0	0
Q20B	Moderate	1-3	39	2.1	175	367	1291	0	0	0	0
Q20C	Lifting	1-3	50	2.7	107	321	1394	0	0	0	0
Q20D	Climbsev	1-3	61	3.3	256	465	1090	0	0	0	0
Q20E	Climbone	1-3	52	2.8	124	267	1429	0	0	0	0
Q20F	Bending	1-3	53	2.8	213	498	1108	0	0	0	0
Q20G	Walkmile	1-3	55	2.9	315	388	1114	0	0	0	0
Q20H	Walksev	1-3	52	2.8	183	233	1404	0	0	0	0
Q20I	Walkone	1-3	59	3.2	108	211	1494	0	0	0	0
Q20J	Bathing	1-3	38	2.0	39	128	1667	0	0	0	0
Q21A	Pcutdown	1-2	1415	75.6	77	380	0	0	0	0	0
Q21B	Plessdon	1-2	1417	75.7	146	309	0	0	0	0	0
Q21C	Plimited	1-2	1417	75.7	113	342	0	0	0	0	0
Q21D	Pdiffclt	1-2	1417	75.7	119	336	0	0	0	0	0
Q24	Bodypain	1-6	30	1.6	464	539	327	359	119	34	0
Q25	Painintf	1-5	27	1.4	994	458	219	136	38	0	0
	Missing		6224	20.8%							
	Out-of-range		0	0.0%							

Scale = LL_CORE - LOWER LIMB CORE

Q37	STIFF	1-5	39	2.1	1223	359	179	57	15	0	0
Q38	SWOLLEN	1-5	40	2.1	1569	159	69	29	6	0	0
Q39	FLAT	1-6	80	4.3	1465	196	91	17	7	2	14
Q40	STAIRS	1-6	86	4.6	1179	340	159	57	22	8	21
Q41	LIE_BED	1-6	82	4.4	1484	169	98	22	11	0	6
Q50	GETARND	1-7	103	5.5	1572	104	58	16	7	8	4
Q51	SOCKSOFF	1-6	56	3.0	1456	230	87	23	10	10	0
	Missing		486	3.7%							
	Out-of-range		41	0.3%							

Scale = GIVEWAY - KNEE GIVE WAY ON ACT

Q42	GWJUMP	1-4	150	8.0	1255	65	5	48	349	0	0
Q43	GWSKI	1-4	141	7.5	1288	73	5	38	327	0	0
Q44	GWJOG	1-4	130	6.9	1389	72	9	36	236	0	0
Q45	GWWALK	1-4	97	5.2	1567	119	14	12	63	0	0
	Missing		518	6.9%							
	Out-of-range		975	13.0%							

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values						
					1	2	3	4	5	6	7
Scale = PALIM - PRE-INJURY LIM											
Q52	PIJUMP	1-5	1143	61.1	558	33	15	16	15	92	0
Q53	PISKI	1-5	1149	61.4	563	29	16	16	13	86	0
Q54	PIJOG	1-5	1145	61.2	584	35	21	15	12	60	0
Q55	PIWALK	1-5	1128	60.3	649	47	15	16	4	13	0
	Missing		4565	61.0%							
	Out-of-range		251	3.4%							
Scale = CALIM - CURRENT ACT LIM											
Q56	CAJUMP	1-5	1153	61.6	312	146	34	33	63	131	0
Q57	CASKI	1-5	1155	61.7	341	132	37	27	56	124	0
Q58	CAJOG	1-5	1149	61.4	398	136	29	34	39	87	0
Q59	CAWALK	1-5	1133	60.5	549	107	33	25	9	16	0
	Missing		4590	61.3%							
	Out-of-range		358	4.8%							
Scale = PAIN - PAIN ON ACTIVITY											
Q62	PNJUMP	1-5	1181	63.1	312	105	35	7	55	177	0
Q63	PNSKI	1-5	1167	62.3	334	112	37	14	45	163	0
Q64	PNJOG	1-5	1157	61.8	384	127	53	6	39	106	0
Q65	PNWALK	1-5	1134	60.6	499	142	59	10	10	18	0
	Missing		4639	62.0%							
	Out-of-range		464	6.2%							
Grand Totals					24916	8910	14341	1069	1570	1135	45
	Missing		21022	28.8%							
	Out-of-range		2089	2.9%							

Scale Percent Missing = Number missing / Total possible
 Scale Percent Out-of-Range = Number outside allowed range / Total possible
 where Total Possible = Number of items in scale * Number of subjects

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Total Sample (N=563)											
Scale = PHP - PHYS HLTH & PAIN											
Q20A	Vigorous	2.20	0.76	11	116	217	230	0	0	0	0
Q20B	Moderate	2.75	0.53	5	26	88	449	0	0	0	0
Q20C	Lifting	2.80	0.46	5	15	82	466	0	0	0	0
Q20D	Climbsev	2.59	0.64	9	48	132	383	0	0	0	0
Q20E	Climbone	2.81	0.48	7	21	63	479	0	0	0	0
Q20F	Bending	2.56	0.63	6	44	159	360	0	0	0	0
Q20G	Walkmile	2.62	0.65	10	53	111	399	0	0	0	0
Q20H	Walksev	2.81	0.51	5	29	52	482	0	0	0	0
Q20I	Walkone	2.86	0.42	11	18	41	504	0	0	0	0
Q20J	Bathing	2.93	0.30	6	7	27	529	0	0	0	0
Q21A	Pcutdown	1.85	0.24	419	54	509	0	0	0	0	0
Q21B	Plessdon	1.81	0.28	420	74	489	0	0	0	0	0
Q21C	Plimited	1.83	0.26	421	66	497	0	0	0	0	0
Q21D	Pdiffclt	1.82	0.27	419	70	493	0	0	0	0	0
Q24	Bodypain	4.40	1.23	6	4	32	114	119	171	123	0
Q25	Painintf	4.31	0.91	4	5	26	67	156	309	0	0
Scale = LL_CORE - LOWER LIMB CORE											
Q37	STIFF	1.68	0.90	1	310	154	71	24	4	0	0
Q38	SWOLLEN	1.30	0.69	2	449	75	23	15	1	0	0
Q39	FLAT	1.35	0.72	10	424	93	35	7	4	0	0
Q40	STAIRS	1.70	0.98	7	310	164	55	21	9	4	0
Q41	LIE_BED	1.30	0.68	6	447	76	31	5	4	0	0
Q50	GETARND	1.16	0.58	15	507	38	11	3	1	3	0
Q51	SOCKSOFF	1.23	0.61	5	470	64	22	5	1	1	0
Scale = GIVEWAY - KNEE GIVE WAY ON ACT											
Q42	GWJUMP	1.28	0.76	75	478	45	6	34	0	0	0
Q43	GWSKI	1.24	0.68	50	481	50	7	25	0	0	0
Q44	GWJOG	1.23	0.68	6	489	41	9	24	0	0	0
Q45	GWWALK	1.13	0.44	5	506	46	5	6	0	0	0
Scale = PALIM - PRE-INJURY LIM											
Q52	PIJUMP	1.23	0.73	28	496	33	14	11	9	0	0
Q53	PISKI	1.23	0.73	24	499	30	14	11	9	0	0
Q54	PIJOG	1.22	0.72	6	502	28	13	11	9	0	0
Q55	PIWALK	1.13	0.50	5	517	28	9	8	1	0	0

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency						
					1	2	3	4	5	6	7
Scale = CALIM - CURRENT ACT LIM											
Q56	CAJUMP	1.81	1.18	47	315	146	34	30	38	0	0
Q57	CASKI	1.72	1.14	37	339	132	37	19	36	0	0
Q58	CAJOG	1.58	1.01	2	372	121	24	26	20	0	0
Q59	CAWALK	1.31	0.75	4	453	71	18	16	5	0	0
Scale = PAIN - PAIN ON ACTIVITY											
Q62	PNJUMP	1.73	1.17	87	337	130	43	10	43	0	0
Q63	PNSKI	1.69	1.11	55	341	132	39	19	32	0	0
Q64	PNJOG	1.59	1.02	4	368	115	46	8	26	0	0
Q65	PNWALK	1.35	0.74	2	429	90	32	5	7	0	0
				=====	=====	=====	=====	=====	=====	=====	=====
Grand Totals				2247	10489	4920	5060	618	739	131	0

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations						Total
				PHP	LL_COR	GIVEWA	PALIM	CALIM	PAIN	
(Standard Error = .04)										
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.20	0.76	0.63*	-0.43	-0.37	-0.19	-0.45	-0.43	-0.25*
Q20B	Moderate	2.75	0.53	0.78*	-0.51	-0.44	-0.28	-0.46	-0.45	-0.24*
Q20C	Lifting	2.80	0.46	0.74*	-0.55	-0.45	-0.28	-0.48	-0.45	-0.28*
Q20D	Climbsev	2.59	0.64	0.75*	-0.52	-0.45	-0.27	-0.52	-0.52	-0.31*
Q20E	Climbone	2.81	0.48	0.74*	-0.55	-0.50	-0.35	-0.51	-0.49	-0.34*
Q20F	Bending	2.56	0.63	0.73*	-0.58	-0.48	-0.27	-0.58	-0.54	-0.38*
Q20G	Walkmile	2.62	0.65	0.77*	-0.51	-0.45	-0.27	-0.49	-0.47	-0.27*
Q20H	Walksev	2.81	0.51	0.76*	-0.57	-0.52	-0.28	-0.52	-0.50	-0.33*
Q20I	Walkone	2.86	0.42	0.72*	-0.56	-0.54	-0.35	-0.49	-0.49	-0.35*
Q20J	Bathing	2.93	0.30	0.47*	-0.33	-0.32	-0.35	-0.26	-0.27	-0.20*
Q21A	Pcutdown	1.85	0.24	0.85*	-0.58	-0.50	-0.33	-0.55	-0.53	-0.30*
Q21B	Plessdon	1.81	0.28	0.77*	-0.53	-0.44	-0.27	-0.49	-0.51	-0.27*
Q21C	Plimited	1.83	0.26	0.83*	-0.60	-0.53	-0.30	-0.58	-0.55	-0.33*
Q21D	Pdiffclt	1.82	0.27	0.82*	-0.55	-0.48	-0.26	-0.52	-0.52	-0.27*
Q24	Bodypain	4.40	1.23	0.62*	-0.53	-0.36	-0.16	-0.43	-0.47	-0.31*
Q25	Painintf	4.31	0.91	0.76*	-0.61	-0.50	-0.21	-0.54	-0.55	-0.37*
Scale = LL_CORE - LOWER LIMB CORE										
Q37	STIFF	1.68	0.90	-0.50	0.74*	0.54	0.17	0.58	0.66	0.58*
Q38	SWOLLEN	1.30	0.69	-0.47	0.73*	0.56	0.18	0.56	0.61	0.58*
Q39	FLAT	1.35	0.72	-0.56	0.77*	0.60	0.30	0.62	0.70	0.64*
Q40	STAIRS	1.70	0.98	-0.65	0.81*	0.67	0.26	0.70	0.78	0.65*
Q41	LIE_BED	1.30	0.68	-0.53	0.68*	0.52	0.27	0.52	0.60	0.52*
Q50	GETARND	1.16	0.58	-0.50	0.54*	0.50	0.24	0.41	0.45	0.37*
Q51	SOCKSOFF	1.23	0.61	-0.54	0.51*	0.44	0.26	0.42	0.47	0.34*
Scale = GIVEWAY - KNEE GIVE WAY ON ACT										
Q42	GWJUMP	1.28	0.76	-0.51	0.63	0.85*	0.25	0.66	0.72	0.68*
Q43	GWSKI	1.24	0.68	-0.53	0.66	0.91*	0.25	0.69	0.72	0.70*
Q44	GWJOG	1.23	0.68	-0.57	0.69	0.89*	0.29	0.66	0.72	0.68*
Q45	GWWALK	1.13	0.44	-0.51	0.58	0.66*	0.32	0.51	0.56	0.53*
Scale = PALIM - PRE-INJURY LIM										
Q52	PIJUMP	1.23	0.73	-0.31	0.27	0.27	0.93*	0.28	0.28	0.36*
Q53	PISKI	1.23	0.73	-0.32	0.29	0.29	0.97*	0.29	0.28	0.38*
Q54	PIJOG	1.22	0.72	-0.31	0.27	0.28	0.93*	0.30	0.28	0.37*
Q55	PIWALK	1.13	0.50	-0.34	0.34	0.33	0.83*	0.30	0.29	0.39*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations						Total
				PHP	LL_COR	GIVEWA	PALIM	CALIM	PAIN	
Scale = CALIM - CURRENT ACT LIM										
Q56	CAJUMP	1.81	1.18	-0.56	0.63	0.63	0.23	0.89*	0.78	0.67*
Q57	CASKI	1.72	1.14	-0.59	0.66	0.65	0.26	0.93*	0.79	0.70*
Q58	CAJOG	1.58	1.01	-0.61	0.69	0.71	0.33	0.90*	0.82	0.74*
Q59	CAWALK	1.31	0.75	-0.63	0.69	0.63	0.34	0.72*	0.67	0.61*
Scale = PAIN - PAIN ON ACTIVITY										
Q62	PNJUMP	1.73	1.17	-0.56	0.71	0.70	0.23	0.80	0.89*	0.74*
Q63	PNSKI	1.69	1.11	-0.58	0.74	0.72	0.27	0.82	0.93*	0.77*
Q64	PNJOG	1.59	1.02	-0.62	0.77	0.73	0.31	0.80	0.90*	0.77*
Q65	PNWALK	1.35	0.74	-0.61	0.77	0.69	0.29	0.68	0.76*	0.67*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	PHP	LL_COR	GIVEWA	PALIM	CALIM	PAIN	Total
Scale = PHP - PHYS HLTH & PAIN										
Q20A	Vigorous	2.20	0.76	**	2	2	2	2	2	2
Q20B	Moderate	2.75	0.53	**	2	2	2	2	2	2
Q20C	Lifting	2.80	0.46	**	2	2	2	2	2	2
Q20D	Climbsev	2.59	0.64	**	2	2	2	2	2	2
Q20E	Climbone	2.81	0.48	**	2	2	2	2	2	2
Q20F	Bending	2.56	0.63	**	2	2	2	2	2	2
Q20G	Walkmile	2.62	0.65	**	2	2	2	2	2	2
Q20H	Walksev	2.81	0.51	**	2	2	2	2	2	2
Q20I	Walkone	2.86	0.42	**	2	2	2	2	2	2
Q20J	Bathing	2.93	0.30	**	2	2	2	2	2	2
Q21A	Pcutdown	1.85	0.24	**	2	2	2	2	2	2
Q21B	Plessdon	1.81	0.28	**	2	2	2	2	2	2
Q21C	Plimited	1.83	0.26	**	2	2	2	2	2	2
Q21D	Pdiffclt	1.82	0.27	**	2	2	2	2	2	2
Q24	Bodypain	4.40	1.23	**	2	2	2	2	2	2
Q25	Painintf	4.31	0.91	**	2	2	2	2	2	2
Scale = LL_CORE - LOWER LIMB CORE										
Q37	STIFF	1.68	0.90	2	**	2	2	2	2	2
Q38	SWOLLEN	1.30	0.69	2	**	2	2	2	2	2
Q39	FLAT	1.35	0.72	2	**	2	2	2	1	2
Q40	STAIRS	1.70	0.98	2	**	2	2	2	1	2
Q41	LIE_BED	1.30	0.68	2	**	2	2	2	1	2
Q50	GETARND	1.16	0.58	2	**	1	2	2	2	2
Q51	SOCKSOFF	1.23	0.61	2	**	1	2	2	1	2
Scale = GIVEWAY - KNEE GIVE WAY ON ACT										
Q42	GWJUMP	1.28	0.76	2	2	**	2	2	2	2
Q43	GWSKI	1.24	0.68	2	2	**	2	2	2	2
Q44	GWJOG	1.23	0.68	2	2	**	2	2	2	2
Q45	GWWALK	1.13	0.44	2	1	**	2	2	2	2
Scale = PALIM - PRE-INJURY LIM										
Q52	PIJUMP	1.23	0.73	2	2	2	**	2	2	2
Q53	PISKI	1.23	0.73	2	2	2	**	2	2	2
Q54	PIJOG	1.22	0.72	2	2	2	**	2	2	2
Q55	PIWALK	1.13	0.50	2	2	2	**	2	2	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Item Label	Mean	SD	PHP	LL_COR	GIVEWA	PALIM	CALIM	PAIN	Total
Scale = CALIM - CURRENT ACT LIM										
Q56	CAJUMP	1.81	1.18	2	2	2	2	**	2	2
Q57	CASKI	1.72	1.14	2	2	2	2	**	2	2
Q58	CAJOG	1.58	1.01	2	2	2	2	**	1	2
Q59	CAWALK	1.31	0.75	2	1	1	2	**	1	2
Scale = PAIN - PAIN ON ACTIVITY										
Q62	PNJUMP	1.73	1.17	2	2	2	2	2	**	2
Q63	PNSKI	1.69	1.11	2	2	2	2	2	**	2
Q64	PNJOG	1.59	1.02	2	2	2	2	2	**	2
Q65	PNWALK	1.35	0.74	2	-1	1	2	1	**	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - PHYS HLTH & PAIN	0	0.0	0	0.0	0	0.0	80	100.0	80	100.0
LL_CORE - LOWER LIMB CORE	0	0.0	0	0.0	6	17.1	29	82.9	35	100.0
GIVEWAY - KNEE GIVE WAY ON ACT	0	0.0	0	0.0	1	5.0	19	95.0	20	100.0
PALIM - PRE-INJURY LIM	0	0.0	0	0.0	0	0.0	20	100.0	20	100.0
CALIM - CURRENT ACT LIM	0	0.0	0	0.0	4	20.0	16	80.0	20	100.0
PAIN - PAIN ON ACTIVITY	0	0.0	1	5.0	2	10.0	17	85.0	19	95.0
Total	0	0.0	1	0.5	13	6.7	181	92.8	194	99.5

Levels of Scaling Success Presented in the Table

2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.

1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.

-1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.

-2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores						% at Floor	% at Ceiling
	Mean	SD	Observed/ Possible Lowest	Highest	Values Range			
PHP - PHYS HLTH & PAIN	42.94	6.59	17/16	49/49	32/33	0.0	13.9	
LL_CORE - LOWER LIMB CORE	9.73	4.03	7/7	31/41	24/34	41.9	0.0	
GIVEWAY - KNEE GIVE WAY ON ACT	4.89	2.34	4/4	16/16	12/12	80.1	0.9	
PALIM - PRE-INJURY LIM	4.80	2.56	4/4	20/20	16/16	86.7	0.2	
CALIM - CURRENT ACT LIM	6.41	3.77	4/4	20/20	16/16	52.8	0.9	
PAIN - PAIN ON ACTIVITY	6.37	3.75	4/4	20/20	16/16	53.5	1.1	
Total	75.14	10.06	51/39	121/166	70/127	0.0	0.0	

Transformed Scores (0-100)

Scale	Transformed Scores (0-100)						% at Floor	% at Ceiling
	Mean	SD	Observed/ Possible Lowest	Highest	Values Range			
PHP - PHYS HLTH & PAIN	81.64	19.96	3/0	100/100	97/100	0.0	13.9	
LL_CORE - LOWER LIMB CORE	8.02	11.85	0/0	71/100	71/100	41.9	0.0	
GIVEWAY - KNEE GIVE WAY ON ACT	7.40	19.48	0/0	100/100	100/100	80.1	0.9	
PALIM - PRE-INJURY LIM	5.01	15.98	0/0	100/100	100/100	86.7	0.2	
CALIM - CURRENT ACT LIM	15.08	23.58	0/0	100/100	100/100	52.8	0.9	
PAIN - PAIN ON ACTIVITY	14.81	23.44	0/0	100/100	100/100	53.5	1.1	
Total	28.46	7.92	9/0	65/100	56/100	0.0	0.0	

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - PHYS HLTH & PAIN	16	0.93	0.89	0.44
LL_CORE - LOWER LIMB CORE	7	0.88	0.92	0.52
GIVEWAY - KNEE GIVE WAY ON ACT	4	0.92	0.96	0.73
PALIM - PRE-INJURY LIM	4	0.96	0.98	0.85
CALIM - CURRENT ACT LIM	4	0.93	0.97	0.77
PAIN - PAIN ON ACTIVITY	4	0.94	0.97	0.79
Total	39	0.81	0.52	0.10

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix J: AAOS Sports Knee Multi-trait analysis

Table 12

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	LL_COR	GIVEWA	PALIM	CALIM	PAIN
PHP - PHYS HLTH & PAIN	(.93)					
LL_CORE - LOWER LIMB CORE	-.7	(.88)				
GIVEWAY - KNEE GIVE WAY ON ACT	-.6	.71	(.92)			
PALIM - PRE-INJURY LIM	-.3	.30	.30	(.96)		
CALIM - CURRENT ACT LIM	-.6	.72	.71	.31	(.93)	
PAIN - PAIN ON ACTIVITY	-.6	.80	.76	.29	.84	(.94)
Total	-.3	.76	.76	.45	.80	.85
Scale-Total Correlation Corrected for Overlap						
Total	-.7	.48	.63	.22	.58	.66

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal. Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 1

Overall Summary

Summary of Run Options

Standard Error Option (1) -----	2.00
Missing data option used (2) -----	HalfScale
Number of Items -----	54

Total, Missing and Computable Data

Total Subjects in Original Data File -----	1828
Subjects with Complete Data	
(No missing or out of range) -----	213 (12 %)
Subjects with Computable scales (3) -----	1142 (62 %)

Data Quality Indicators

	%	Satisfactory	Item/Scale Failures
Item Internal Consistency (4) -----	100	Yes	
Scaling Success (Item discriminant validity)			
Significantly Greater (5a) -----	97	Yes	
Greater (5b) -----	100		
Reliable Scales (6) -----	100	Yes	

1. The number of standard errors selected to determine the statistical significance of differences between item-scale correlations in Table 7.
2. The proportion of items in a scale for which there must be data in order to compute the scale score. Scale scores are computable if:
 - Complete option: response provided for each item in each scale.
 - Halfscale option: response provided for at least 50% of the items in each scale.
3. Only subjects for whom all scales are computable are included in Analysis Data.
4. Item Internal Consistency:
 - Percentage of item-scale correlations that are greater than or equal to 0.40 (corrected).
 - "Yes" in the satisfactory column indicates that 90 % or greater meet this standard.
5. Scaling Success (Item discriminant validity) :
 - a. Percentage of item-scale correlations at least 2 standard errors greater than the correlations of the item to other scales. "Yes" indicates that at least 80 % of item-to-scale correlations in the total data set AND within each individual scale meet this standard.
 - b. Percentage of item-scale correlations greater than the correlations of the item to other scales, but not necessarily by 2 standard errors.
6. Reliable Scales:
 - Percentage of scales with Cronbach's Alpha coefficient greater than or equal to 0.70.
 - "Yes" indicates that all scales meet this standard.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value	
	PHP	Phys Hlth & Pain	16	Q20A	Vigorous	1	3	
				Q20B	Moderate	1	3	
				Q20C	Lifting	1	3	
				Q20D	Climbsev	1	3	
				Q20E	Climbone	1	3	
				Q20F	Bending	1	3	
				Q20G	Walkmile	1	3	
				Q20H	Walksev	1	3	
				Q20I	Walkone	1	3	
				Q20J	Bathing	1	3	
				Q21A	Pcutdown	1	2	
				Q21B	Plessdon	1	2	
				Q21C	Plimited	1	2	
				Q21D	Pdiffclt	1	2	
				Q24	Bodypain	1	6	R
				Q25	Painintf	1	5	R
	FXNSYMP	FUNCTION/SYMPTOMS	30	Q37	OPENJAR	1	5	
				Q38	WRITE	1	5	
				Q39	TURKEY	1	5	
				Q40	MAKEMEAL	1	5	
				Q41	PUSHDOOR	1	5	
				Q42	PUTSHELF	1	5	
				Q43	HVYCHORE	1	5	
				Q44	YARDWORK	1	5	
				Q45	MAKEBED	1	5	
				Q46	CARRYBAG	1	5	
				Q47	HVYOBJ	1	5	
				Q48	LTBULB	1	5	
				Q49	WASHHAIR	1	5	
				Q50	WASHBACK	1	5	
				Q51	SWEATER	1	5	
				Q52	USEKNIFE	1	5	
				Q53	PLAYCARD	1	5	
				Q54	GOLF	1	5	
				Q55	FRISBEE	1	5	
				Q56	MNGTRANS	1	5	
	Q57	SEXACT	1	5				
	Q58	ARMINTF	1	5				
	Q59	ARMLIM	1	5				
	Q60	ARMSYMP	1	5				
	Q61	SYMPTACT	1	5				
	Q62	TINGLING	1	5				
	Q63	WEAK	1	5				
	Q64	STIFF	1	5				
	Q65	DIFSLEEP	1	5				
	Q66	CAPABLE	1	5				
	SPORTS	SPORTS/MUSIC	4	Q67	TECHNIQ	1	5	
				Q68	DIFFPAIN	1	5	
				Q69	DIFFWELL	1	5	
				Q70	DIFFTIME	1	5	

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 2

Assignment of Items to Scales and Item Recoding

Coding(1)	Scale Name	Scale Desc.	No. of Items	Item Name	Item Label	Minimum Value	Maximum Value
	WORK	WORK	4	Q71	DIFFTECH	1	5
				Q72	DIFFPAIN	1	5
				Q73	DIFFWELL	1	5
				Q74	DIFFTIME	1	5

1. Coding of 'R' indicates item scores reversed; default is 'preserved'.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing		Response Values					
			Freq	%	1	2	3	4	5	6
Total Sample (N=1828)										
Scale = PHP - Phys Hlth & Pain										
Q20A	Vigorous	1-3	52	2.8	508	616	652	0	0	0
Q20B	Moderate	1-3	50	2.7	155	361	1262	0	0	0
Q20C	Lifting	1-3	46	2.5	92	316	1374	0	0	0
Q20D	Climbsev	1-3	71	3.9	249	410	1098	0	0	0
Q20E	Climbone	1-3	85	4.6	121	257	1365	0	0	0
Q20F	Bending	1-3	68	3.7	208	448	1104	0	0	0
Q20G	Walkmile	1-3	57	3.1	302	351	1118	0	0	0
Q20H	Walksev	1-3	66	3.6	160	247	1355	0	0	0
Q20I	Walkone	1-3	63	3.4	93	193	1479	0	0	0
Q20J	Bathing	1-3	45	2.5	35	106	1642	0	0	0
Q21A	Pcutdown	1-2	1381	75.5	69	378	0	0	0	0
Q21B	Plessdon	1-2	1387	75.9	143	298	0	0	0	0
Q21C	Plimited	1-2	1382	75.6	104	342	0	0	0	0
Q21D	Pdiffclt	1-2	1383	75.7	113	332	0	0	0	0
Q24	Bodypain	1-6	34	1.9	428	523	342	376	108	17
Q25	Painintf	1-5	34	1.9	964	468	216	123	23	0
	Missing		6204	21.2%						
	Out-of-range		0	0.0%						

Scale = FXNSYMP - FUNCTION/SYMPTOMS

Q37	OPENJAR	1-5	36	2.0	992	464	227	79	30	0
Q38	WRITE	1-5	41	2.2	1562	133	68	18	6	0
Q39	TURNKEY	1-5	52	2.8	1627	96	41	9	3	0
Q40	MAKEMEAL	1-5	65	3.6	1570	119	51	14	9	0
Q41	PUSHDOOR	1-5	57	3.1	1339	308	86	28	10	0
Q42	PUTSHELF	1-5	49	2.7	1352	253	103	51	20	0
Q43	HVYCHORE	1-5	55	3.0	1125	312	179	87	70	0
Q44	YARDWORK	1-5	69	3.8	1086	328	181	97	67	0
Q45	MAKEBED	1-5	60	3.3	1490	165	71	27	15	0
Q46	CARRYBAG	1-5	52	2.8	1444	209	75	33	15	0
Q47	HVYOBJ	1-5	48	2.6	1164	338	149	77	52	0
Q48	LTBULB	1-5	57	3.1	1354	220	94	54	49	0
Q49	WASHHAIR	1-5	62	3.4	1517	136	71	31	11	0
Q50	WASHBACK	1-5	61	3.3	1363	225	87	55	37	0
Q51	SWEATER	1-5	63	3.4	1533	131	76	23	2	0
Q52	USEKNIFE	1-5	37	2.0	1641	98	37	10	5	0
Q53	PLAYCARD	1-5	46	2.5	1630	98	33	13	8	0
Q54	GOLF	1-5	61	3.3	1123	339	149	75	81	0
Q55	FRISBEE	1-5	66	3.6	1164	301	131	78	88	0
Q56	MNGTRANS	1-5	45	2.5	1568	122	55	21	17	0
Q57	SEXACT	1-5	156	8.5	1312	137	85	40	98	0
Q58	ARMINTF	1-5	41	2.2	1511	181	51	37	7	0

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Table 3

Item Descriptive Statistics - Raw Data

Item Name	Label	Allowed Range	Missing Freq	Missing %	Response Values					Frequency
					1	2	3	4	5	
Q59	ARMLIM	1-5	57	3.1	1420	226	83	35	7	0
Q60	ARMSYMPT	1-5	56	3.1	1058	423	225	58	8	0
Q61	SYMPTACT	1-5	73	4.0	1047	388	223	85	12	0
Q62	TINGLING	1-5	72	3.9	1290	265	138	51	12	0
Q63	WEAK	1-5	78	4.3	1230	279	164	59	18	0
Q64	STIFF	1-5	67	3.7	1191	340	156	58	16	0
Q65	DIFSLEEP	1-5	55	3.0	1374	268	99	26	6	0
Q66	CAPABLE	1-5	66	3.6	1161	227	218	125	31	0
	Missing		1803	3.3%						
	Out-of-range		0	0.0%						

Scale = SPORTS - SPORTS/MUSIC

Q67	TECHNIQ	1-5	658	36.0	949	116	44	18	43	0
Q68	DIFFPAIN	1-5	677	37.0	930	120	39	26	36	0
Q69	DIFFWELL	1-5	672	36.8	897	140	43	28	48	0
Q70	DIFFTIME	1-5	684	37.4	912	113	49	21	49	0
	Missing		2691	36.8%						
	Out-of-range		0	0.0%						

Scale = WORK - WORK

Q71	DIFFTech	1-5	156	8.5	1322	235	71	23	21	0
Q72	DIFFPAIN	1-5	159	8.7	1288	261	73	30	17	0
Q73	DIFFWELL	1-5	163	8.9	1263	240	87	51	24	0
Q74	DIFFTIME	1-5	160	8.8	1302	211	92	43	20	0
	Missing		638	8.7%						
	Out-of-range		0	0.0%						

Grand Totals					52845	14211	16911	2193	1199	17
	Missing		11336	11.5%						
	Out-of-range		0	0.0%						

Scale Percent Missing = Number missing / Total possible

Scale Percent Out-of-Range = Number outside allowed range / Total possible

where Total Possible = Number of items in scale * Number of subjects

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Total Sample (N=1142)										
Scale = PHP - Phys Hlth & Pain										
Q20A	Vigorous	2.20	0.77	20	250	415	477	0	0	0
Q20B	Moderate	2.72	0.57	14	69	185	888	0	0	0
Q20C	Lifting	2.80	0.48	13	40	149	953	0	0	0
Q20D	Climbsev	2.59	0.67	20	121	231	790	0	0	0
Q20E	Climbone	2.78	0.52	27	61	127	954	0	0	0
Q20F	Bending	2.61	0.65	22	103	236	803	0	0	0
Q20G	Walkmile	2.58	0.70	16	144	196	802	0	0	0
Q20H	Walksev	2.74	0.58	22	86	119	937	0	0	0
Q20I	Walkone	2.83	0.48	14	51	96	995	0	0	0
Q20J	Bathing	2.92	0.32	14	16	60	1066	0	0	0
Q21A	Pcutdown	1.84	0.25	863	122	1020	0	0	0	0
Q21B	Plessdon	1.81	0.29	868	156	986	0	0	0	0
Q21C	Plimited	1.82	0.28	863	145	997	0	0	0	0
Q21D	Pdiffclt	1.82	0.28	864	144	998	0	0	0	0
Q24	Bodypain	4.56	1.23	6	10	48	208	205	365	306
Q25	Painintf	4.33	0.95	7	16	58	122	286	660	0
Scale = FXNSYMP - FUNCTION/SYMP TOMS										
Q37	OPENJAR	1.58	0.86	7	703	275	122	30	12	0
Q38	WRITE	1.15	0.49	10	1026	73	33	9	1	0
Q39	TURNKEY	1.10	0.39	12	1064	49	25	4	0	0
Q40	MAKEMEAL	1.15	0.53	25	1037	63	26	11	5	0
Q41	PUSHDOOR	1.29	0.66	12	907	172	38	19	6	0
Q42	PUTSHELF	1.31	0.73	7	922	137	45	29	9	0
Q43	HVYCHORE	1.54	0.98	9	792	192	86	37	35	0
Q44	YARDWORK	1.55	0.97	14	778	200	90	45	29	0
Q45	MAKEBED	1.21	0.64	15	993	92	30	18	9	0
Q46	CARRYBAG	1.21	0.61	11	979	111	30	14	8	0
Q47	HVYOBJ	1.47	0.91	14	830	173	78	37	24	0
Q48	LTBULB	1.33	0.81	16	933	112	49	29	19	0
Q49	WASHHAIR	1.17	0.57	16	1026	61	37	14	4	0
Q50	WASHBACK	1.34	0.81	17	913	134	48	27	20	0
Q51	SWEATER	1.16	0.52	20	1025	68	35	14	0	0
Q52	USEKNIFE	1.10	0.41	7	1066	48	23	2	3	0
Q53	PLAYCARD	1.10	0.42	8	1067	49	16	8	2	0
Q54	GOLF	1.51	0.94	18	799	198	80	35	30	0
Q55	FRISBEE	1.49	0.97	13	826	177	66	38	35	0
Q56	MNGTRANS	1.16	0.57	6	1028	68	26	12	8	0
Q57	SEXACT	1.39	0.95	54	923	101	56	16	46	0
Q58	ARMINTF	1.19	0.59	12	995	102	21	19	5	0
Q59	ARMLIM	1.25	0.63	17	948	134	36	20	4	0
Q60	ARMSYMP	1.51	0.80	13	749	245	113	33	2	0
Q61	SYMPTACT	1.54	0.85	17	740	235	123	40	4	0
Q62	TINGLING	1.37	0.76	16	864	173	71	25	9	0

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 4

Item Descriptive Statistics - Analysis Data

Item Name	Label	Mean	SD	Imputed Responses	Response Values Frequency					
					1	2	3	4	5	6
Q63	WEAK	1.39	0.80	22	868	152	81	32	9	0
Q64	STIFF	1.42	0.79	21	825	204	77	26	10	0
Q65	DIFSLEEP	1.28	0.64	8	914	158	53	13	4	0
Q66	CAPABLE	1.56	1.00	12	808	128	120	69	17	0
Scale = SPORTS - SPORTS/MUSIC										
Q67	TECHNIQ	1.37	0.92	7	925	113	45	17	42	0
Q68	DIFFPAIN	1.37	0.90	14	920	120	40	26	36	0
Q69	DIFFWELL	1.43	0.98	13	886	138	43	29	46	0
Q70	DIFFTIME	1.41	0.97	16	910	112	50	22	48	0
Scale = WORK - WORK										
Q71	DIFFTECH	1.27	0.69	7	940	138	35	16	13	0
Q72	DIFFPAIN	1.29	0.70	11	923	152	37	18	12	0
Q73	DIFFWELL	1.34	0.80	15	912	140	43	30	17	0
Q74	DIFFTIME	1.31	0.77	13	929	127	44	27	15	0
Grand Totals				=====	=====	=====	=====	=====	=====	=====
				4198	36227	11045	11066	1401	1623	306

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item Name	Label	Mean	SD	Pearson Item-Scale Correlations				
				PHP	FXNSYM	SPORTS	WORK	Total

(Standard Error = .03)

Scale = PHP - Phys Hlth & Pain

Q20A	Vigorous	2.20	0.77	0.68*	-0.51	-0.34	-0.37	-0.35*
Q20B	Moderate	2.72	0.57	0.80*	-0.65	-0.47	-0.52	-0.49*
Q20C	Lifting	2.80	0.48	0.76*	-0.69	-0.46	-0.55	-0.54*
Q20D	Climbsev	2.59	0.67	0.79*	-0.56	-0.38	-0.42	-0.38*
Q20E	Climbone	2.78	0.52	0.79*	-0.59	-0.42	-0.48	-0.42*
Q20F	Bending	2.61	0.65	0.78*	-0.58	-0.42	-0.47	-0.42*
Q20G	Walkmile	2.58	0.70	0.80*	-0.57	-0.40	-0.44	-0.39*
Q20H	Walksev	2.74	0.58	0.82*	-0.59	-0.42	-0.45	-0.41*
Q20I	Walkone	2.83	0.48	0.76*	-0.57	-0.39	-0.45	-0.40*
Q20J	Bathing	2.92	0.32	0.56*	-0.57	-0.42	-0.50	-0.49*
Q21A	Pcutdown	1.84	0.25	0.85*	-0.67	-0.49	-0.56	-0.49*
Q21B	Plessdon	1.81	0.29	0.82*	-0.62	-0.44	-0.50	-0.43*
Q21C	Plimited	1.82	0.28	0.84*	-0.63	-0.46	-0.51	-0.44*
Q21D	Pdiffclt	1.82	0.28	0.83*	-0.64	-0.46	-0.52	-0.46*
Q24	Bodypain	4.56	1.23	0.62*	-0.59	-0.45	-0.52	-0.50*
Q25	Painintf	4.33	0.95	0.74*	-0.68	-0.52	-0.64	-0.58*

Scale = FXNSYMP - FUNCTION/SYMTOMS

Q37	OPENJAR	1.58	0.86	-0.50	0.64*	0.46	0.51	0.59*
Q38	WRITE	1.15	0.49	-0.45	0.65*	0.52	0.56	0.64*
Q39	TURNKEY	1.10	0.39	-0.45	0.70*	0.51	0.58	0.69*
Q40	MAKEMEAL	1.15	0.53	-0.53	0.68*	0.47	0.59	0.63*
Q41	PUSHDOOR	1.29	0.66	-0.59	0.76*	0.58	0.66	0.72*
Q42	PUTSHELF	1.31	0.73	-0.58	0.78*	0.58	0.63	0.73*
Q43	HVYCHORE	1.54	0.98	-0.72	0.79*	0.56	0.62	0.67*
Q44	YARDWORK	1.55	0.97	-0.75	0.77*	0.56	0.60	0.63*
Q45	MAKEBED	1.21	0.64	-0.62	0.79*	0.58	0.67	0.73*
Q46	CARRYBAG	1.21	0.61	-0.62	0.80*	0.57	0.67	0.74*
Q47	HVYOBJ	1.47	0.91	-0.72	0.78*	0.55	0.62	0.66*
Q48	LTBULB	1.33	0.81	-0.65	0.80*	0.53	0.61	0.70*
Q49	WASHHAIR	1.17	0.57	-0.54	0.77*	0.57	0.65	0.74*
Q50	WASHBACK	1.34	0.81	-0.59	0.72*	0.53	0.59	0.66*
Q51	SWEATER	1.16	0.52	-0.53	0.76*	0.56	0.63	0.73*
Q52	USEKNIFE	1.10	0.41	-0.44	0.70*	0.46	0.59	0.69*
Q53	PLAYCARD	1.10	0.42	-0.44	0.68*	0.49	0.59	0.67*
Q54	GOLF	1.51	0.94	-0.64	0.79*	0.67	0.64	0.74*
Q55	FRISBEE	1.49	0.97	-0.66	0.82*	0.68	0.67	0.76*
Q56	MNGTRANS	1.16	0.57	-0.53	0.72*	0.55	0.62	0.69*
Q57	SEXACT	1.39	0.95	-0.53	0.54*	0.43	0.48	0.47*
Q58	ARMINTF	1.19	0.59	-0.55	0.75*	0.61	0.70	0.74*
Q59	ARMLIM	1.25	0.63	-0.57	0.79*	0.65	0.75	0.79*
Q60	ARMSYMP	1.51	0.80	-0.51	0.71*	0.57	0.63	0.69*
Q61	SYMPTACT	1.54	0.85	-0.52	0.73*	0.60	0.66	0.72*
Q62	TINGLING	1.37	0.76	-0.43	0.62*	0.44	0.57	0.60*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).

Starred correlations also hypothesized to be highest in same row.

a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.

b: Less than desirable item discriminant validity: item correlation with competing scale is significantly

higher than its correlation with its own scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 5

Item Descriptive Statistics and Pearson Item-Scale Correlations Corrected for Overlap

Item		Mean	SD	Pearson Item-Scale Correlations				
Name	Label			PHP	FXNSYM	SPORTS	WORK	Total
Q63	WEAK	1.39	0.80	-0.55	0.79*	0.59	0.70	0.77*
Q64	STIFF	1.42	0.79	-0.52	0.73*	0.61	0.69	0.73*
Q65	DIFSLEEP	1.28	0.64	-0.50	0.69*	0.57	0.63	0.68*
Q66	CAPABLE	1.56	1.00	-0.50	0.65*	0.54	0.64	0.64*
Scale = SPORTS - SPORTS/MUSIC								
Q67	TECHNIQ	1.37	0.92	-0.53	0.72	0.95*	0.68	0.77*
Q68	DIFFPAIN	1.37	0.90	-0.51	0.73	0.95*	0.71	0.79*
Q69	DIFFWELL	1.43	0.98	-0.53	0.70	0.95*	0.70	0.75*
Q70	DIFFTIME	1.41	0.97	-0.55	0.72	0.95*	0.72	0.77*
Scale = WORK - WORK								
Q71	DIFFTECH	1.27	0.69	-0.57	0.78	0.70	0.91*	0.81*
Q72	DIFFPAIN	1.29	0.70	-0.58	0.79	0.68	0.91*	0.81*
Q73	DIFFWELL	1.34	0.80	-0.60	0.79	0.70	0.91*	0.80*
Q74	DIFFTIME	1.31	0.77	-0.62	0.78	0.67	0.92*	0.78*

*: Item-scale correlation corrected for overlap (relevant item removed from its scale for correlation).
 Starred correlations also hypothesized to be highest in same row.
 a: Less than desirable item internal consistency: item-scale correlation is less than 0.4.
 b: Less than desirable item discriminant validity: item correlation with competing scale is significantly higher than its correlation with its own scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	PHP	FXNSYM	SPORTS	WORK	Total
Scale = PHP - Phys Hlth & Pain								
Q20A	Vigorous	2.20	0.77	**	2	2	2	2
Q20B	Moderate	2.72	0.57	**	2	2	2	2
Q20C	Lifting	2.80	0.48	**	2	2	2	2
Q20D	Climbsev	2.59	0.67	**	2	2	2	2
Q20E	Climbone	2.78	0.52	**	2	2	2	2
Q20F	Bending	2.61	0.65	**	2	2	2	2
Q20G	Walkmile	2.58	0.70	**	2	2	2	2
Q20H	Walksev	2.74	0.58	**	2	2	2	2
Q20I	Walkone	2.83	0.48	**	2	2	2	2
Q20J	Bathing	2.92	0.32	**	2	2	2	2
Q21A	Pcutdown	1.84	0.25	**	2	2	2	2
Q21B	Plessdon	1.81	0.29	**	2	2	2	2
Q21C	Plimited	1.82	0.28	**	2	2	2	2
Q21D	Pdiffclt	1.82	0.28	**	2	2	2	2
Q24	Bodypain	4.56	1.23	**	2	2	2	2
Q25	Painintf	4.33	0.95	**	2	2	2	2
Scale = FXNSYMP - FUNCTION/SYMPOMS								
Q37	OPENJAR	1.58	0.86	2	**	2	2	1
Q38	WRITE	1.15	0.49	2	**	2	2	1
Q39	TURNKEY	1.10	0.39	2	**	2	2	1
Q40	MAKEMEAL	1.15	0.53	2	**	2	2	1
Q41	PUSHDOOR	1.29	0.66	2	**	2	2	1
Q42	PUTSHELF	1.31	0.73	2	**	2	2	1
Q43	HVYCHORE	1.54	0.98	2	**	2	2	2
Q44	YARDWORK	1.55	0.97	2	**	2	2	2
Q45	MAKEBED	1.21	0.64	2	**	2	2	1
Q46	CARRYBAG	1.21	0.61	2	**	2	2	2
Q47	HVYOBJ	1.47	0.91	2	**	2	2	2
Q48	LTBULB	1.33	0.81	2	**	2	2	2
Q49	WASHHAIR	1.17	0.57	2	**	2	2	1
Q50	WASHBACK	1.34	0.81	2	**	2	2	2
Q51	SWEATER	1.16	0.52	2	**	2	2	1
Q52	USEKNIFE	1.10	0.41	2	**	2	2	1
Q53	PLAYCARD	1.10	0.42	2	**	2	2	1
Q54	GOLF	1.51	0.94	2	**	2	2	1
Q55	FRISBEE	1.49	0.97	2	**	2	2	1
Q56	MNGTRANS	1.16	0.57	2	**	2	2	1
Q57	SEXACT	1.39	0.95	2	**	2	2	2
Q58	ARMINTF	1.19	0.59	2	**	2	1	1
Q59	ARMLIM	1.25	0.63	2	**	2	1	1
Q60	ARMSYMP	1.51	0.80	2	**	2	2	1
Q61	SYMPTACT	1.54	0.85	2	**	2	2	1
Q62	TINGLING	1.37	0.76	2	**	2	1	1
Q63	WEAK	1.39	0.80	2	**	2	2	1
Q64	STIFF	1.42	0.79	2	**	2	1	1

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 6

Item-Level Discriminant Validity Tests

Item Name	Label	Mean	SD	PHP	FXNSYM	SPORTS	WORK	Total
Q65	DIFSLEEP	1.28	0.64	2	**	2	2	1
Q66	CAPABLE	1.56	1.00	2	**	2	1	1

Scale = SPORTS - SPORTS/MUSIC

Q67	TECHNIQ	1.37	0.92	2	2	**	2	2
Q68	DIFFPAIN	1.37	0.90	2	2	**	2	2
Q69	DIFFWELL	1.43	0.98	2	2	**	2	2
Q70	DIFFTIME	1.41	0.97	2	2	**	2	2

Scale = WORK - WORK

Q71	DIFFTECH	1.27	0.69	2	2	2	**	2
Q72	DIFFPAIN	1.29	0.70	2	2	2	**	2
Q73	DIFFWELL	1.34	0.80	2	2	2	**	2
Q74	DIFFTIME	1.31	0.77	2	2	2	**	2

Cut-off point for significance is 2 Standard Errors

Levels of Scaling Success Presented in the Table

- 2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.
- 1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.
- 1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.
- 2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 7

Frequency and Percentage of Item-Scale Correlations at Each Level of Scaling Success

Scale	-2		-1		1		2		1 + 2	
	N	%	N	%	N	%	N	%	N	%
PHP - Phys Hlth & Pain	0	0.0	0	0.0	0	0.0	48	100.0	48	100.0
FXNSYMP - FUNCTION/SYMPTOMS	0	0.0	0	0.0	5	5.6	85	94.4	90	100.0
SPORTS - SPORTS/MUSIC	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
WORK - WORK	0	0.0	0	0.0	0	0.0	12	100.0	12	100.0
Total	0	0.0	0	0.0	5	3.1	157	96.9	162	100.0

Levels of Scaling Success Presented in the Table

2 - Item-scale correlation is significantly higher for hypothesized scale than for competing scale.

1 - Item-scale correlation is higher for hypothesized scale than competing scale, but not significantly.

-1 - Item-scale correlation is lower for hypothesized scale than competing scale, but not significantly.

-2 - Item-scale correlation is significantly lower for hypothesized scale than for competing scale.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 8

Descriptive Statistics for Scales

Scale	Raw Scores					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
PHP - Phys Hlth & Pain	42.94	7.15	16/16	49/49	33/33	0.2	16.6
FXNSYMP - FUNCTION/SYMPTOMS	39.83	16.28	30/30	133/150	103/120	28.6	0.0
SPORTS - SPORTS/MUSIC	5.58	3.67	4/4	20/20	16/16	74.8	3.0
WORK - WORK	5.21	2.81	4/4	20/20	16/16	75.0	0.7
Total	93.56	16.93	64/54	204/239	140/185	0.0	0.0

Scale	Transformed Scores (0-100)					% at Floor	% at Ceiling
	Mean	SD	Observed/Possible Lowest	Highest	Values Range		
PHP - Phys Hlth & Pain	81.62	21.67	0/0	100/100	100/100	0.2	16.6
FXNSYMP - FUNCTION/SYMPTOMS	8.19	13.57	0/0	86/100	86/100	28.6	0.0
SPORTS - SPORTS/MUSIC	9.90	22.93	0/0	100/100	100/100	74.8	3.0
WORK - WORK	7.53	17.57	0/0	100/100	100/100	75.0	0.7
Total	21.38	9.15	5/0	81/100	76/100	0.0	0.0

Raw Score : Sum of item scores for the scale.
 Transformed Score : $(\text{Observed scale score} - \text{lowest possible scale score}) / (\text{highest possible scale score} - \text{lowest possible scale score}) * 100.$
 % At Floor : Percentage of respondents at the lowest possible scale score.
 % At Ceiling : Percentage of respondents at the highest possible scale score.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 9

Scale Reliability and Homogeneity Estimates

Scale	k	Rtt	R10	Rii
PHP - Phys Hlth & Pain	16	0.94	0.90	0.49
FXNSYMP - FUNCTION/SYMPTOMS	30	0.97	0.91	0.52
SPORTS - SPORTS/MUSIC	4	0.98	0.99	0.92
WORK - WORK	4	0.96	0.98	0.87
Total	54	0.92	0.67	0.17

k : Number of items.
 Rtt : Cronbach's Alpha.
 R10 : Alpha estimated for a 10-item scale.
 Rii : Average inter-item correlation.

Appendix K: AAOS Upper Limb Multi-trait analysis

Table 10

Reliability Coefficients and Inter-Scale Correlations

Scale	PHP	FXNSYM	SPORTS	WORK
PHP - Phys Hlth & Pain	(.94)			
FXNSYMP - FUNCTION/SYMPTOMS	-.8	(.97)		
SPORTS - SPORTS/MUSIC	-.5	.74	(.98)	
WORK - WORK	-.6	.83	.72	(.96)
Total	-.5	.94	.82	.86
Scale-Total Correlation Corrected for Overlap				
Total	-.7	-.1	.72	.80

Scale internal consistency reliability coefficients (Cronbach's Alpha) are presented in the diagonal.

Coefficients of '-' indicate that internal consistency reliability for that scale could not be calculated because it is a single-item scale.