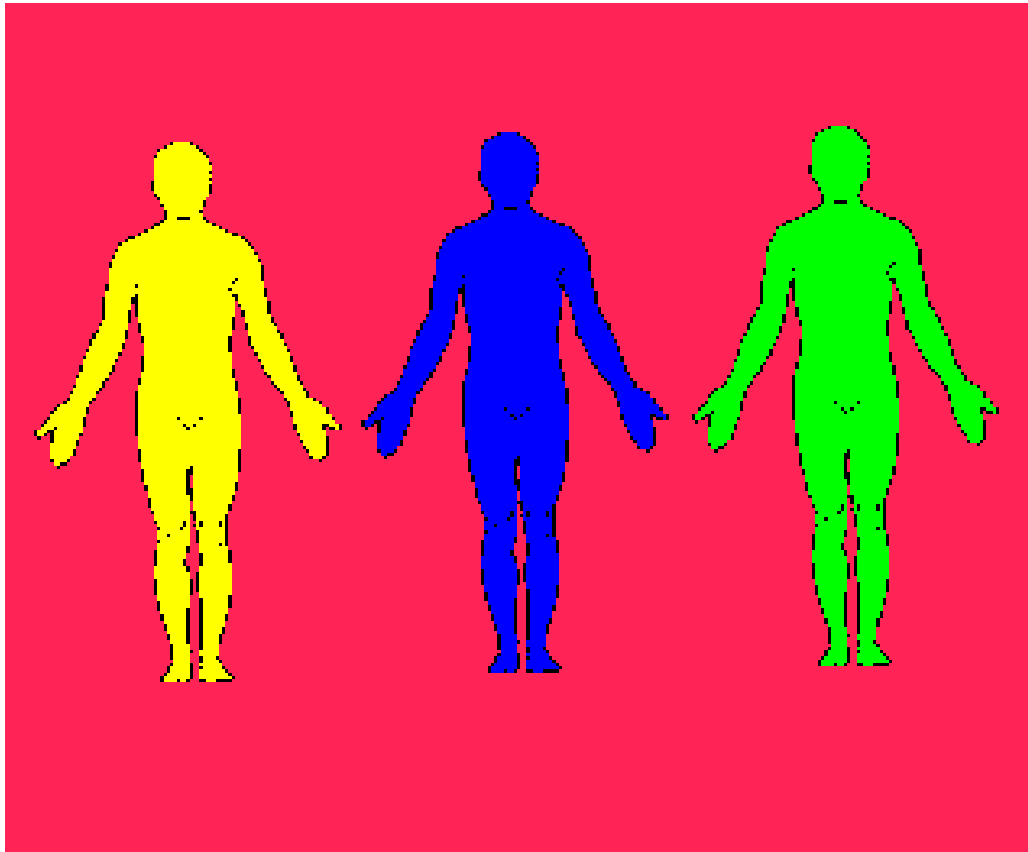




American Academy of Orthopaedic Surgeons



The American Academy of Orthopaedic Surgeons Outcomes Instruments:

Normative Values from the General Population, Norms Base Scoring and Original Standard Raw Scores

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CHAPTER ONE: THE NORMATIVE DATA STUDY

Introduction

Using a panel mail methodology, self-report data were collected from the general non-institutionalized U.S. population for 11 musculoskeletal measures designed by researchers from the American Academy of Orthopaedic Surgeons. These data are to serve as comparative normative scores in clinical and research settings. The overall response rate of 67.5% for all the surveys met study expectations. For each of the 11 measures, the overall confidence interval of $\pm 3\%$ set *a priori* was exceeded. Using a Multitrait/Multi-item Analysis Program, all of the sub-scales within each of 11 measures exhibited high internal reliability as well as discriminant and convergent validity. Items within each of the sub-scales contributed roughly equal proportions of information to the total scale scores.

The American Academy of Orthopaedic Surgeons (AAOS) Outcomes Studies Committee, in collaboration with the Council of Musculoskeletal Specialty Societies (COMSS) and the Council of Spine Societies (COSS), has developed and pre-tested eleven functional outcomes assessment measurement instruments. These AAOS measurement instruments are directed at patient populations comprised of individuals diagnosed with a specific musculoskeletal disorder or disorders. The instruments were designed to collect patient-based data for use in clinical practices to assess the effectiveness of treatment regimens and in musculoskeletal research settings to study the clinical outcomes of treatment.

Reflecting the desire of medical practitioners for more rigorous verification of the effects of various interventions and treatments, normative data comparisons have been incorporated into a variety of treatment outcome studies. Comparing pre- and post- treatment clinical data to normative data from the general population serving as a reference group allows medical practitioners to assess whether treated individuals meet established criteria for a specific disorder. In considering the clinical significance of treatment-outcome studies, Kendall et al. forward two basic questions: (1) is the pre – post treatment change large enough to be considered significant and (2) can treated individuals be

distinguished from “normal individuals”^{*} serving as a reference group? Clinical measures address the first question, while normative comparisons address the other. Specifically, the method of normative comparison addresses the issue of whether or not patients treated for specific maladies or conditions have returned to critical normative ranges of functioning on important outcome measures.

The collection of normative data is thus a necessary step in the standardization process for the AAOS outcome measures. The study was conducted to collect such normative data from the general non-institutionalized United States population. These data will serve as a national orthopedic normative outcome database for the series of eleven musculoskeletal functional outcomes assessment instruments developed through AAOS.

Methods and Materials

The eleven AAOS instruments are designed to assess the degree to which a patient’s condition(s) affects his or her physical and emotional functioning, self-image, and symptom status. These measures are self-reporting and cover five general areas of musculoskeletal care: lower extremity, upper extremity, pediatrics, spine and general musculoskeletal care. For risk assessment purposes, each of the instruments includes a three-response option comorbidity checklist of 14 conditions or disorders. In addition, 7 of the eleven instruments include the Short-Form-36 (SF-36TM) Health Status questionnaire. The study collected normative data for the lower limb, sports knee, foot and ankle, hip and knee, upper extremity (DASH), cervical spine, lumbar spine, and general musculoskeletal function (SMFA) measures. For this study, in addition to the 8 adult surveys, three different pediatric surveys were administered. These consisted of a pediatric-child survey (completed by parents with children ages 2-10), and two adolescent surveys (one to be filled out by adolescents ages 11-18 and one by the parent of that adolescent). Parents who were surveyed were instructed to respond by proxy about a specified child or adolescent. Adolescents who were surveyed were

* In this context, the operational definition of normal individuals is the random sample of individuals from the general, non-institutionalized U.S. population from whom scale scores are derived.

matched to parents receiving proxy surveys and instructed to respond for themselves. As an inducement to complete the survey, adolescents received \$5.00.

Sample Design:

The sampling methodology for this project was designed to garner data representative of the non-institutionalized, general United States population stratified by the following demographic markers: gender, comorbid conditions, ethnicity and specific age groups. To meet this requirement, a panel methodology was selected. The panel, in this instance, is a group of households recruited by National Family Opinion to be representative of individuals and the families in which they reside for the general, non-institutionalized United States population. This approach to sampling, using a single-wave mail questionnaire, was deemed appropriate for a number of reasons.

First, an assumption was made that the information provided by respondents would be valid and reliable. Each of the musculoskeletal measures required replying individuals to provide information about their physical, emotional, and social functioning capabilities as well as symptom status. There were no items included intended to elicit sensitive or highly personal information such as self-disclosure about alcohol or drug misuse, feelings or beliefs about other people, or attitudes about controversial social issues. Requiring respondents to reveal this type of information can trigger a “social desirability effect”, i.e., the tendency for individuals to respond to personal questions with answers they believe are socially acceptable. Previous research has found that including items that ask subjects to disclose information they would not typically discuss in casual conversation not only reduces response rates dramatically, but also calls into question the validity of the responses provided. Given that no such items are present in the AAOS measures, an assumption was made that responses to questions included in these measures would be both candid and truthful.

Second, the size and scope of the study required a cost-efficient and expeditious methodology. Compared to random samples generated through census tract data or other methods which typically produce low response rates in the 20%-25% range using a multiple-wave mailing strategy, panel studies yield response rates of 60% or higher with a single-wave mailing⁶.

Additionally, with the exception of comorbid conditions, the demographic markers required for post-stratification (age, gender, etc.) were known for the panel before selection. This information, along with the high response rate associated with panel studies, facilitated sampling and permitted careful targeting of respondents to increase the likelihood that the margin of error set *a priori* for each measure (± 3 points on a 100-point metric) would be met, as well as assuring acceptable sample representation within strata.

Finally, by monitoring response rates within strata, decisions regarding additional sampling could be made and executed promptly. This shortened the time required to complete the data collection phase of the study. Data were collected over a six-week period in the spring of 1999.

As stated previously, the sample frame consisted of a panel of respondents recruited and maintained by National Family Opinion Research (NFO). NFO's panel is a reliable panel of over 475,000 households representative of the non-institutionalized United States population. Respondents are matched to the US Census data on geographical region, market size, age, income (SES), and household size. The panel is managed to maintain additional demographic information such as the gender of household members. Panel households are not only balanced demographically in the four Census Regions and nine Census Divisions, but also in correct proportion by state within each Division. Households are identified by frequently used geographic classifications to provide complete sampling and identification flexibility.

Data Analyses:

The first phase of data manipulation involved running frequencies on all data points. This was done in order to identify the percentages of missing or out-of-range values. All out-of-range values were assigned to a missing value category. Scoring algorithms and validity tests on all scaled items required item completion criteria to be met before scoring could be completed. Each of the AAOS instruments contains items that are scored individually. However, the majority of the questionnaire items are aggregated into conceptually distinct scales designed to measure patient physical and mental functioning and symptom status. With the exception of the comorbidities scale (described

below) and single-item measures, each scale is composed of the summated mean scores from related items.

Summative scale scores were calculated only for individuals who answered at least half of the items comprising a scale (half plus one for scales with an odd number of items). With the exception of the Hip and Knee “function and limitation scale”, the Foot and Ankle “global foot and ankle” scale, and the DASH module, items that were not completed by respondents within scales were computed into the mean score for that scale. For the DASH instrument, if 10% or more of the items for any scale were missing, that individual’s scale scores were treated as missing values. If less than 10% of the items were missing, the rest of the items are scored and averaged and that mean score is imputed to the missing items rounded to the nearest integer and the scale score is then calculated. Each scale was calibrated to a 100-point metric scored from 0 to 100. The DASH and SMFA were scored so that 0 represents least disability or best health and 100 the most disability or worst health. All other scales were scored so that 0 represents the worst health and 100 the best health. Calibrating scores to this metric allows for direct comparison to SF-36™ scores and is generally easier to interpret for diverse audiences²². Tables 1 through 11 present the scoring for each of the eleven measures, including sample sizes, mean scores and standard deviations.

Comorbidity Checklist Scoring:

The comorbidity check list²⁰ component of the surveys required respondents to answer three “yes” or “no” responses for each comorbid condition listed, 1) “Do you have the problem?”, 2) “Do you receive treatment for it?”, and, 3) “Does it limit your activity?” Each of these responses is then used to compute a general comorbidity index and three sub-scales composed of scores from related items. The comorbidity index is calculated as the sum of “yes” responses (x) across all response options divided by the total number of possible “yes” responses, or comorbidity index = $x/42 \times 100$. Comorbidity scores are presented in tables 12 and 13 below.

Reliability and Validity Analyses:

For this study, multitrait-scaling techniques were used to assess the reliability and validity of the eleven AAOS measures. The Multitrait Analysis Program (MAP) is a straightforward methodology for scale analysis. In multitrait scaling, scale items are evaluated in terms of four scaling criteria: (1) convergent validity expressed in terms of internal consistency, (2) item discriminant validity, (3) tests for equal item-total correlations and, (4) equal variance test of scale items.

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. 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. For cases where more than half of the scale items was missing, the non-missing items were assigned to a missing value category and thus excluded from the analysis. This mean replacement approach was used solely for reliability and validity testing.

Multitrait scaling analyses were then performed on the eleven survey instruments based upon three conceptual models in order to assess scale 1) item internal consistency validity, 2) item discriminant validity and, 3) internal consistency reliability of the AAOS measures.

Results

Response Rates:

All of the survey instruments met the required confidence interval criterion of $\pm 3\%$ established *a priori*. The response rate overall for the eleven measures exceeded the 65% rate expected (Table 1). The response rates for adult stand-alone surveys were similarly higher than the 65% response rate expected. The parent-adolescent and adolescent survey outgo was larger than the stand-alone surveys; their mailings reflected the matching of surveys for these two groups.

Table 1 Survey Outgo & Returns, Response Rates and Confidence Levels

AAOS Questionnaire	Survey Outgo	Survey Returns	Response Rate	Confidence Interval
Lumbar Spine	2920	1979	67.8%	$\pm 2.20\%$
General Musculoskeletal (SMFA)	2917	2124	72.8%	$\pm 2.13\%$
Sports Knee	2920	2015	69.0%	$\pm 2.18\%$
Upper Limb	2920	1965	67.3%	$\pm 2.21\%$
Cervical Spine	2920	1987	68.0%	$\pm 2.20\%$
Foot & Ankle	2920	1994	68.3%	$\pm 2.20\%$
Hip & Knee	2920	2057	70.4%	$\pm 2.16\%$
Lower Limb	2920	2059	70.5%	$\pm 2.16\%$
Parent-Child	2917	1791	61.4%	$\pm 2.32\%$
Parent/Adolescent	5834	3668	62.9%	$\pm 1.62\%$

All Surveys	32,162	21,639	67.5%	NA
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However, the anticipated 65% response rate was not obtained for parent-child (61.4%) and the parent-adolescent-matched surveys (62.9%). Examination of the response frequencies for these surveys to identify possible response bias effects due to differences in the characteristics of responders and non-responders did not reveal evidence of systematic biasing effects. The decision to not mail additional surveys to non-responders was based on a review of the literature on survey research methods, especially Dillman’s classic text on the subject in which he comments the 50% response rates have been “quite acceptable for mail surveys.”

Reliability and Validity Tests

Alpha Reliability and Item-to-Scale Pearson’s Product-Moment Correlation Coefficients:

It would be very difficult, at best, to report all of the statistics computed to test the reliability and validity of eleven separate, multiple-scale instruments in a traditional results section format. Presented below are summary descriptions and statistics for the analyses conducted. Table 7 displays the number of scales within each measure, the range of Cronbach’s alpha coefficients for each summated scale within each measure, and the range of Pearson’s product-moment item-to-scale correlation coefficients corrected for overlap.

Table 2 Multi Trait Analysis Summary Scores

AAOS Questionnaire	NUMBER OF SCALES	Range of Cronbach’s Alpha	Range of Inter-item Correlations *	Item Internal Consistency %**
Cervical Spine	3	.90 to .94	.45 to .71	100%
Foot & Ankle	3	.81 to .96	.46 to .56	98%
Hip & Knee	6	.89 to .93	.47 to .77	100%
Lower Limb	2	.89 to .94	.49 to .54	100%

Lumbar Spine	3	.91 to .94	.49 to .72	100%
SMFA (General Musculoskeletal)	5	.88 to .98	.50 to .63	100%
Adolescent	5	.81 to .91	.26 to .60	92%
Sports Knee	6	.81 to .96	.44 to .85	100%
Upper Limb (DASH)	4	.94 to .98	.49 to .87	100%
Parent/Adolescent	5	.81 to .89	.26 to .53	92%
Parent/Child	5	.78 to .89	.26 to .56	90%

* All item-to-scale significant correlations (corrected) $p < .05$ (using 2 standard errors for testing significance)

** Percentage of item-scale correlations greater than or equal to .40

All scales within each AAOS measure exhibit consistently high alpha reliability estimates, with Cronbach's alpha values all exceeding .80. In MAP-R scaling, item internal consistency percentages of 90% or greater are scored as satisfactory.

Item Discriminant Validity Tests:

In MAP scaling, discriminant validity assesses the extent to which item-to-scale correlations are higher for items to their own scales than other scales. Scaling success is achieved if at least 80% of the time item-to-scale correlations in the total data set and within each individual scale are greater than two standard errors (see Table 8).

Table 8 Multi Trait Analysis Summary Scores

AAOS Questionnaire	% of Item-Scale Correlations ≥ 2 Standard Errors
Cervical Spine	98%
Foot & Ankle	99%
Hip & Knee	99%
Lower Limb	100%

Lumbar Spine	98%
General Musculoskeletal(SMF A)	85%
Sports Knee	93%
Upper Limb (DASH)	97%
Adolescent	95%
Parent/Adolescent	95%
Parent/Child	95%

Scale Scoring¹

The scale scorings for each of the individual measures displayed subsequently in tables have been standardized using norm-based methods and displayed such that the mean for the overall scale scores derived from the general U.S. population is 50, and the standard deviation of those scores is 10 (as opposed to a standard z-score transformation with a mean of 0 and a standard deviation of 1). The process of computing norm-base scoring is straightforward and simple. Each score in the AAOS scales is transformed to a 0-100 metric (using the original standard scoring for each scale). Next, the mean and standard deviation of the 0-100 scale in the general population is computed. Subtracting the general population mean from the individual's score, then dividing by the standard deviation from the general population standardizes each person's individual score. That value is multiplied by 10 and 50 is added to the result. For example, if the AAOS raw scale score for person A is 84 on the 0-100 scale, with a population mean of 75 and a standard deviation of 20, the standard score for person A is then: $(84 - 75) / 20 = 0.45$. Therefore, the norm-based score for person A is: $(0.45 * 10) + 50 = 54.5$.

¹ Note: For instructions on how to obtain the raw score for a particular scale please refer to the proper appendix in this document.

This scoring, known as the “50-10” standardization, or norm-based scoring (NBS), makes it easier to compare scores with the mean for the general U.S. population, as well as account for deviations from that mean in that a change of one point on a 100-point metric is a change of one-tenth of a standard deviation. Using NBS, interpretation of results is greatly simplified.

The norm-based scores for the various measures are displayed in separate “chapters” in table form, with specific measures listed within the general area of musculoskeletal functioning with which they are associated. The first of the tables within each section contains the norm-based scores for the general population for each of the scales that comprise that specific measure. Additionally, the first table in each section also contains the mean score and standard deviation from the AAOS measures. These values are necessary to compute a patient’s (or a group of patients’) norm-based score value (see the example discussed above).

Chapter Two focuses on the upper extremity and includes the DASH data. Chapter Three presents the general musculoskeletal or SMFA results. Chapter Four holds both the lumbar and cervical spine outcomes. Chapter Five displays the NBS for the lower extremities and includes the hip and knee, foot and ankle, lower limb, and sports knee measures. Chapter Six exhibits the population norms for the three pediatric measures; pediatric child, pediatric adolescent and pediatric adolescent-parent measures. Finally, scores for the general comorbidity index and the three sub-scale scores from which it is derived are displayed in Chapter Seven for adults and pediatrics. The comorbidity scores represent the aggregated scores from all measures. Additionally, NBS by gender (male and female), age categories (19-34, 35-44, 45-54, 55-64, 65-74, and 75 and older), and ethnicity (white, black, Hispanic, Asian, native American, and other) are presented in additional tables for each of the measures.

CHAPTER TWO: DASH (Disabilities of the Arm, Shoulder, & Hand)

DASH (Disabilities of the Arm, Shoulder, & Hand)

The DASH measure was designed to gauge the effect on patients' functioning of a variety of musculoskeletal diseases or conditions in the upper extremity and can be used for the evaluation of any joint or condition of the upper extremity. The measure contains .NBS scaled measures indexing patients' scores from the original DASH instrument that measures the effects of the upper extremity condition on general functioning (functional symptoms), social functioning (sports/music), and functioning at work (work).

To compute a norm-based for an individual patient or group of patients, use the scoring algorithm described about in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 1.1 below.

DASH: Overall Normative and AAOS Raw Scores

Table 1.1: Upper Limb Normative Scores	Functional Symptoms	Sports / Music	Work
OVERALL			
Mean	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00
Percentiles: Min	43	46	45
25	44	46	45
50	46	46	45
75	52	47	49
Max	102	90	100
AAOS Raw Scores			
Mean	10.10	9.75	8.81
Std Dev	14.68	22.72	18.37

For example, if the patient's AAOS score on the functional symptoms scale is 8.3, then that individual's functional symptoms norm-based score is calculated as:

$$((8.3 - 10.10) / 14.68 * 10) + 50 = 48.77.$$

As discussed previously, for the DASH measure, lower scores are associated with better functioning or health. In this case, the individual score, with regards to functional symptoms, of 48.77 almost .3 of one standard deviation in a positive direction from the general population norm-based mean.

Normative Scores by Demographic Markers

Gender

Table 1.2: Upper Limb Normative Scores by Gender		Functional Symptoms	Sports/Music	Work
Gender				
Male				
Mean		48.17	49.74	49.51
Std Dev		8.24	9.12	9.85
Percentiles: Min		43	46	45
25		43	46	45
50		45	46	45
75		49	48	48
Max		98	90	100
Female				
Mean		51.26	50.22	50.34
Std Dev		10.88	10.70	10.09
Percentiles: Min		43	46	45
25		44	46	45
50		47	46	45
75		55	46	52
Max		102	90	100

Age

Table 1.3: Upper Limb Normative Scores by Age	Functional Symptoms	Sports/ Music	Work
Age Group			
19-34 Years			
Mean	47.13	47.96	47.92
Std Dev	7.69	6.82	7.81
Percentiles: Min	43	46	45
25	43	46	45
50	44	46	45
75	47	46	45
Max	102	90	100
35-44 Years			
Mean	47.85	49.07	49.33
Std Dev	7.95	8.43	8.92
Percentiles: Min	43	46	45
25	43	46	45
50	44	46	45
75	49	46	48
Max	98	90	100
45-54 Years			
Mean	49.38	49.55	49.40
Std Dev	9.91	9.62	9.65
Percentiles: Min	43	46	45
25	43	46	45
50	45	46	45
75	51	46	48
Max	100	90	100
55-64 Years			
Mean	50.98	50.70	51.21
Std Dev	10.13	10.74	11.82
Percentiles: Min	43	46	45
25	44	46	45
50	47	46	45
75	54	51	52
Max	94	90	100
65-74 Years			
Mean	52.69	51.63	50.84
Std Dev	10.48	10.97	9.97
Percentiles: Min	43	46	45
25	45	46	45
50	49	46	45
75	57	54	56
Max	98	90	96
75+ Years			
Mean	56.72	55.58	54.06
Std Dev	13.05	15.53	12.42
Percentiles: Min	43	46	45
25	47	46	45
50	53	46	48
75	62	57	59
Max	100	90	100

Ethnicity

Table 1.4: Upper Limb Normative Scores by Ethnicity		Functional Symptoms	Sports/Music	Work
Ethnicity				
White				
Mean		49.83	49.89	49.83
Std Dev		9.74	9.84	9.66
Percentiles:	Min	43	46	45
	25	44	46	45
	50	46	46	45
	75	52	46	48
	Max	102	90	100
Black				
Mean		52.20	51.38	52.46
Std Dev		11.09	11.64	12.14
Percentiles:	Min	43	46	45
	25	44	46	45
	50	48	46	45
	75	55	53	59
	Max	94	90	96
Hispanic				
Mean		49.46	50.13	48.74
Std Dev		11.61	11.59	12.37
Percentiles:	Min	43	46	45
	25	43	46	45
	50	45	46	45
	75	49	46	45
	Max	92	90	100
Asian				
Mean		45.58	49.27	45.70
Std Dev		2.79	7.00	1.23
Percentiles:	Min	43	46	45
	25	43	46	45
	50	44	46	45
	75	48	50	45
	Max	51	68	48
Native American				
Mean		55.69	54.46	54.63
Std Dev		15.07	13.97	14.10
Percentiles:	Min	43	46	45
	25	44	46	45
	50	50	46	45
	75	66	57	59
	Max	93	90	93
Other Ethnicity				
Mean		52.71	53.97	53.55
Std Dev		11.47	14.77	15.70
Percentiles:	Min	43	46	45
	25	44	46	45
	50	53	48	45
	75	56	58	57
	Max	86	90	93

Comorbidity

Table 1.5: Upper Limb Normative Scores by Comorbidity	Functional Symptoms	Sports / Music	Work
Comorbidity Condition			
Heart Disease			
Mean	56.37	56.26	54.37
Std Dev	12.40	14.51	12.49
Percentiles: Min	43	46	45
25	47	46	45
50	52	46	45
75	63	62	59
Max	100	90	100
High Blood Pressure			
Mean	53.72	52.07	52.81
Std Dev	11.85	11.98	11.98
Percentiles: Min	43	46	45
25	45	46	45
50	49	46	45
75	59	54	59
Max	102	90	100
Lung Disease			
Mean	58.73	57.42	57.26
Std Dev	13.50	14.73	14.77
Percentiles: Min	43	46	45
25	48	46	45
50	55	51	52
75	64	70	66
Max	98	90	100
Diabetes			
Mean	55.72	55.89	54.50
Std Dev	12.27	15.66	12.95
Percentiles: Min	43	46	45
25	47	46	45
50	51	46	48
75	63	62	59
Max	100	90	100
Ulcer/Stomach Disease			
Mean	49.75	50.31	49.94
Std Dev	9.89	10.55	10.19
Percentiles: Min	43	46	45
25	43	46	45
50	45	46	45
75	52	48	48
Max	102	90	100
Kidney Disease			
Mean	57.12	53.19	54.16
Std Dev	11.78	15.69	10.01
Percentiles: Min	43	46	45
25	47	46	45
50	57	46	54

75	64	52	59
Max	89	90	79
Liver Disease			
Mean	57.76	60.85	59.86
Std Dev	17.56	19.61	18.46
Percentiles: Min	43	46	45
25	44	46	45
50	49	50	45
75	76	88	74
Max	91	90	96
Anemia/Blood Disease			
Mean	57.22	55.67	56.74
Std Dev	14.63	15.59	15.93
Percentiles: Min	43	46	45
25	45	46	45
50	51	46	45
75	71	65	66
Max	99	90	100
Cancer			
Mean	54.70	54.86	52.81
Std Dev	12.16	14.77	12.62
Percentiles: Min	43	46	45
25	46	46	45
50	50	46	45
75	60	65	59
Max	100	90	100
Depression			
Mean	57.64	56.02	57.56
Std Dev	14.68	14.07	15.32
Percentiles: Min	43	46	45
25	46	46	45
50	51	51	52
75	66	57	66
Max	102	90	100
Osteoarthritis			
Mean	59.31	58.00	57.67
Std Dev	13.79	15.65	14.83
Percentiles: Min	43	46	45
25	49	46	45
50	55	51	52
75	66	68	62
Max	102	90	100
Back Pain			
Mean	53.94	52.85	53.51
Std Dev	11.91	12.18	12.57
Percentiles: Min	43	46	45
25	45	46	45
50	49	46	45
75	59	57	59
Max	102	90	100
Rheumatoid Arthritis			
Mean	62.23	59.76	60.32
Std Dev	14.85	16.30	15.31
Percentiles: Min	43	46	45
25	50	46	45

50	59	57	59
75	72	72	72
Max	102	90	100
Other Medical Problem			
Mean	53.93	53.16	53.35
Std Dev	12.84	12.86	12.97
Percentiles: Min	43	46	45
25	45	46	45
50	49	46	45
75	58	57	59
Max	102	90	100

CHAPER THREE: SFMA (Short Form Musculoskeletal Function Assessment)

SFMA (Short Form Musculoskeletal Function Assessment)

The SFMA measure is designed for use with the broad range of patients with musculoskeletal disorders of the extremities commonly seen in clinical practice. This measure contains six scales tapping patients level of function in daily activities, emotional functioning, functioning of the arm and hand, mobility, general functioning and the extent to which activities are bothersome.

To compute a norm-based score for an individual patient or group of patients, use the scoring algorithm described in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 2.1 below.

SFMA: Overall Normative and AAOS Scores

Table 2.1: SMFA Normative Scores		Daily Activities	Emotion	Arm/Hand	Mobility	Function Index	Bother
OVERALL							
Mean		50.00	50.00	50.00	50.00	50.00	50.00
Std Dev		10.00	10.00	10.00	10.00	10.00	10.00
Percentiles:	Min	44	39	45	43	42	43
	25	44	43	45	43	43	43
	50	45	49	45	46	46	46
	75	52	56	50	53	53	53
	Max	96	87	117	94	96	96
AAOS Raw Scores							
Mean		11.85	20.54	6.02	13.61	12.70	13.77
St Dev		19.20	18.38	12.26	18.31	15.59	18.59

For example, if the patient's AAOS score on the SFMA Functional Index scale is 7.6, then that individual's functional symptoms norm-based score is calculated as:

$$((7.6 - 12.70) / 15.59 * 10) + 50 = 46.73.$$

As discussed previously, for the SFMA measure, lower scores are associated with better functioning or health. In this case, the individual score, with regards to the Function Index, of 46.73 is slightly greater than .75 of a standard deviation in a positive direction from the general population norm-based mean.

Normative Scores by Demographic Markers

Gender

Table 2.2: SMFA Normative Scores by Gender		Daily Activities	Emotion	Arm/Hand	Mobility	Function Index	Bother
Gender							
Male							
Mean		48.58	48.55	48.05	48.28	48.26	48.37
Std Dev		8.56	9.23	7.74	8.47	8.47	8.90
Percentiles:	Min	44	39	45	43	42	43
	25	44	41	45	43	42	43
	50	44	46	45	44	45	45
	75	49	52	48	50	51	51
	Max	92	83	117	89	93	92
Female							
Mean		50.94	50.97	51.30	51.15	51.16	51.08
Std Dev		10.75	10.37	11.07	10.76	10.75	10.53
Percentiles:	Min	44	39	45	43	42	43
	25	44	43	45	43	43	43
	50	46	49	45	47	47	47
	75	53	56	52	56	55	55
	Max	96	87	114	94	96	96

Age

Table 2.3: SMFA Normative Scores by Age Group		Daily Activities	Emotion	Arm/Hand	Mobility	Function Index	Bother
Age Group							
19-34 Years							
Mean		45.71	46.44	46.36	45.25	45.40	45.96
Std Dev		5.31	8.33	4.73	5.54	5.67	6.15
Percentiles:	Min	44	39	45	43	42	43
25		44	39	45	43	42	43
50		44	45	45	43	43	43
75		45	50	45	46	46	47
Max		87	83	93	88	88	82
35-44 Years							
Mean		47.81	49.58	47.79	47.44	47.93	48.89
Std Dev		7.49	10.24	7.02	7.44	7.94	9.32
Percentiles:	Min	44	39	45	43	42	43
25		44	41	45	43	42	43
50		44	46	45	44	45	45
75		49	55	48	50	50	52
Max		90	85	97	79	87	92
45-54 Years							
Mean		50.06	51.28	49.87	50.40	50.43	51.03
Std Dev		10.51	11.01	9.83	10.75	10.76	11.46
Percentiles:	Min	44	39	45	43	42	43
25		44	43	45	43	43	43
50		45	49	45	46	46	47
75		51	56	50	54	53	54
Max		96	87	114	91	96	96
55-64 Years							
Mean		51.60	51.53	51.57	52.16	51.95	52.08
Std Dev		10.80	10.01	11.61	10.51	10.84	10.68
Percentiles:	Min	44	39	45	43	42	43
25		44	45	45	44	44	44
50		46	49	45	49	48	47
75		54	58	52	56	56	57
Max		95	83	117	85	93	91
65-74 Years							
Mean		53.23	51.38	53.31	53.79	53.31	52.34
Std Dev		10.87	9.43	11.82	10.70	10.48	10.71
Percentiles:	Min	44	39	45	43	42	43
25		45	45	45	44	45	45
50		49	50	48	52	50	50
75		58	57	56	61	59	57
Max		96	80	104	94	92	90
75+ Years							
Mean		56.11	51.05	55.38	55.67	55.19	52.43
Std Dev		12.63	9.19	13.40	12.10	11.88	9.75
Percentiles:	Min	44	39	45	43	42	43
25		46	43	45	46	46	45

50	52	49	50	52	51	50
75	64	56	61	63	62	57
Max	96	82	104	89	89	92

Ethnicity

Table 2.4: SMFA Normative Scores by Ethnicity		Daily Activities	Emotion	Arm/Hand	Mobility	Function Index	Bother
Ethnicity							
White							
Mean		50.08	50.07	50.04	50.02	50.05	50.04
Std Dev		10.07	9.95	10.06	10.00	10.01	9.85
Percentiles:	Min	44	39	45	43	42	43
25		44	43	45	43	43	43
50		45	49	45	46	46	46
75		52	56	50	53	53	54
Max		96	87	117	94	93	92
Black							
Mean		50.68	50.78	50.41	52.06	51.10	51.44
Std Dev		9.52	10.85	8.45	10.66	9.88	13.18
Percentiles:	Min	44	39	45	43	42	43
25		44	43	45	43	43	43
50		46	49	45	50	48	45
75		55	55	55	57	54	54
Max		79	82	88	84	78	96
Hispanic							
Mean		46.87	47.20	47.72	46.42	46.56	47.59
Std Dev		5.47	9.82	5.57	7.52	7.21	9.21
Percentiles:	Min	44	39	45	43	42	43
25		44	39	45	43	42	43
50		44	43	45	43	43	43
75		49	53	48	46	48	51
Max		62	72	65	74	66	76
Asian							
Mean		46.92	44.81	48.53	46.19	46.20	47.16
Std Dev		7.31	8.84	10.84	8.17	9.18	10.24
Percentiles:	Min	44	39	45	43	42	43
25		44	39	45	43	42	43
50		44	41	45	43	42	43
75		46	47	46	47	46	47
Max		70	72	86	73	76	79
Native American							
Mean		56.04	59.50	56.15	57.15	57.87	58.62
Std Dev		13.98	12.45	16.05	13.81	14.27	15.21
Percentiles:	Min	44	39	45	43	42	43
25		45	49	45	44	46	45
50		50	57	48	52	51	53
75		67	69	69	72	70	75
Max		91	87	96	85	91	92
Other Ethnicity							

Mean	50.65	52.28	53.62	49.87	51.36	51.49
Std Dev	15.05	13.96	18.01	12.99	15.49	16.45
Percentiles: Min	44	39	45	43	42	43
25	44	41	45	43	42	43
50	44	52	45	43	46	45
75	49	58	52	56	53	50
Max	95	87	106	85	96	96

CHAPTER FOUR: LUMBAR & CERVICAL SPINE

LUMBAR & CERVICAL SPINE

Scores for the two measures for the spine are presented below, the lumbar and cervical spine. Each of these measures contains two scales, one measuring neurological functioning and the other a pain measure.

Lumbar Spine Questionnaire

Lumbar Spine Overall Normative & AAOS Scores

To compute a norm-based lumbar spine score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 3.1 below.

Table 3.1: Lumbar Spine Normative Scores	Neuro	Pain
Lumbar Spine		
OVERALL		
Mean	50.00	50.00
Std Dev	10.00	10.00
Percentiles: Min	12	6
25	47	47
50	55	54
75	56	58
Max	56	58
AAOS Raw Scores		
Mean	85.70	86.74
Std Dev	22.40	17.17

For example, if the patient's AAOS score on the Lumbar Spine Pain scale is 75.2, then that individual's norm-based score is calculated as:

$((75.2 - 86.74) / 17.17 * 10) + 50 = 43.28$. In this instance, the patient's normalized score is almost 7/10 of one standard deviation from the overall general population mean.

Lumbar Spine Normative Scores by Demographic Markers

Gender

Table 3.2: Lumbar Spine Normative Scores by Gender	Neuro	Pain
Gender		
Male		
Mean	50.39	51.32
Std Dev	9.87	9.34
Percentiles: Min	12	7
25	49	49
50	56	55
75	56	58
Max	56	58
Female		
Mean	49.73	49.11
Std Dev	10.08	10.33
Percentiles: Min	12	6
25	47	45
50	55	53
75	56	57
Max	56	58

Age

Table 3.3: Lumbar Spine Normative Scores by Age Group	Neuro	Pain
Age Group		
19-34 Years		
Mean	52.45	52.65
Std Dev	7.11	6.78
Percentiles: Min	12	9
25	52	50
50	56	55
75	56	58
Max	56	58
35-44 Years		
Mean	51.63	51.35
Std Dev	8.45	9.08
Percentiles: Min	12	7
25	51	49
50	56	55
75	56	58
Max	56	58
45-54 Years		
Mean	49.92	50.20
Std Dev	10.05	9.97

Percentiles:	Min	12	8
	25	47	47
	50	55	55
	75	56	58
	Max	56	58
55-64 Years			
	Mean	49.15	48.72
	Std Dev	11.36	11.48
Percentiles:	Min	12	9
	25	47	45
	50	55	54
	75	56	58
	Max	56	58
65-74 Years			
	Mean	47.56	48.18
	Std Dev	11.47	10.65
Percentiles:	Min	12	6
	25	42	42
	50	53	52
	75	56	57
	Max	56	58
75+ Years			
	Mean	46.62	46.29
	Std Dev	11.50	11.66
Percentiles:	Min	12	11
	25	40	39
	50	51	50
	75	56	55
	Max	56	58

Ethnicity

Table 3.4: Lumbar Spine Normative Scores by Ethnicity	Neuro	Pain
Ethnicity		
White		
Mean	50.02	49.91
Std Dev	9.95	10.07
Percentiles: Min	12	6
25	47	47
50	55	54
75	56	58
Max	56	58
Black		
Mean	48.55	50.89
Std Dev	12.46	10.38
Percentiles: Min	12	10
25	46	48
50	55	55
75	56	58
Max	56	58
Hispanic		

Mean		50.06	51.00
Std Dev		11.62	10.38
Percentiles:	Min	12	12
	25	51	50
	50	56	55
	75	56	58
	Max	56	58
Asian			
Mean		52.91	52.82
Std Dev		4.54	7.66
Percentiles:	Min	42	27
	25	52	53
	50	53	55
	75	56	58
	Max	56	58
Native American			
Mean		43.01	43.61
Std Dev		14.32	13.84
Percentiles:	Min	12	10
	25	33	37
	50	48	47
	75	55	55
	Max	56	58
Other Ethnicity			
Mean		53.85	49.89
Std Dev		3.07	7.58
Percentiles:	Min	47	37
	25	52	43
	50	54	52
	75	56	57
	Max	56	58

Comorbidity Conditions

Table 3.5: Lumbar Spine Normative Scores by Comorbidity	Neuro	Pinn	
Comorbidity Conditions			
Heart Disease			
Mean	41.47	42.15	
Std Dev	13.59	12.94	
Percentiles:	Min	12	9
	25	30	33
	50	44	45
	75	54	52
	Ax	56	58
High Blood Pressure			
Mean	47.31	46.82	
Std Dev	11.82	11.54	
Percentiles:	Min	12	6
	25	42	42
	50	53	51

75	56	55
Max	56	58
Lung Disease		
Mean	43.49	42.91
Std Dev	12.60	13.88
Percentiles: Min	12	9
25	34	31
50	47	47
75	55	55
Max	56	58
Diabetes		
Mean	43.46	43.28
Std Dev	14.51	13.58
Percentiles: Min	12	6
25	33	34
50	49	48
75	56	54
Max	56	58
Ulcer/Stomach Disease		
Mean	41.77	41.30
Std Dev	14.09	14.29
Percentiles: Min	12	6
25	33	31
50	47	45
75	55	54
Max	56	58
Kidney Disease		
Mean	39.60	40.69
Std Dev	15.05	10.64
Percentiles: Min	13	20
25	26	35
50	43	41
75	55	49
Max	56	58
Liver Disease		
Mean	34.73	40.30
Std Dev	12.77	14.17
Percentiles: Min	12	7
25	25	35
50	35	41
75	45	52
Max	56	58
Anemia/Blood Disease		
Mean	45.77	43.61
Std Dev	12.17	12.32
Percentiles: Min	12	9
25	37	36
50	51	46
75	56	55
Max	56	58
Cancer		
Mean	46.41	43.90
Std Dev	11.05	12.51
Percentiles: Min	12	9

25	39	39
50	51	48
75	56	52
Max	56	58
Depression		
Mean	43.83	42.06
Std Dev	13.17	13.21
Percentiles: Min	12	6
25	35	34
50	47	45
75	56	52
Max	56	58
Osteoarthritis		
Mean	41.71	40.68
Std Dev	13.25	12.50
Percentiles: Min	12	6
25	33	32
50	46	43
75	53	51
Max	56	58
Back Pain		
Mean	45.91	43.66
Std Dev	12.08	11.35
Percentiles: Min	12	6
25	40	37
50	51	47
75	56	52
Max	56	58
Rheumatoid Arthritis		
Mean	41.08	40.42
Std Dev	14.35	13.84
Percentiles: Min	12	7
25	30	29
50	43	44
75	54	52
Max	56	58
Other Medical Problem		
Mean	46.79	46.48
Std Dev	12.28	11.95
Percentiles: Min	12	6
25	41	42
50	52	50
75	56	55
Max	56	58

Cervical Spin Questionnaire

Cervical Spine Overall Normative & AAOS Scores

To compute a norm-based cervical spine score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 4.1 below.

Table 4.1: Cervical Spine Normative Scores	Neuro	Pain
Cervical Spine		
OVERALL		
Mean	50.00	50.00
Std Dev	10.00	10.00
Percentiles: Min	2	0
25	49	47
50	56	54
75	56	57
Max	56	57
<i>AAOS Raw Scores</i>		
Mean	89.35	89.06
Std Dev	18.44	15.48

For example, if the patient's AAOS score on the Cervical Spine Pain scale is 80.1, then that individual's functional symptoms norm-based score is calculated as:

$((80.1 - 89.06) / 15.48 * 10) + 50 = 44.21$. In this instance, the patient's normalized score is almost 6/10 of one standard deviation from the overall general population mean.

Cervical Spine: Normative Scores by Demographic Markers

Gender

Table 4.2: Cervical Spine Normative Scores by Gender	Neuro	Pain
Gender		
Male		
Mean	50.91	51.40
Std Dev	8.90	9.08
Percentiles: Min	2	1
25	49	50
50	56	54
75	56	57
Max	56	57
Female		
Mean	49.38	49.05
Std Dev	10.64	10.48
Percentiles: Min	2	0
25	47	45
50	56	54
75	56	57

Max	56	57
-----	----	----

Age

Table 4.3: Cervical Spine Normative Scores by Age Group	Neuro	Pain
Age Group		
19-34 Years		
Mean	52.22	52.53
Std Dev	7.20	7.68
Percentiles: Min	14	11
25	52	53
50	56	56
75	56	57
Max	56	57
35-44 Years		
Mean	50.82	52.05
Std Dev	9.54	7.72
Percentiles: Min	2	1
25	50	51
50	56	54
75	56	57
Max	56	57
45-54 Years		
Mean	48.31	49.06
Std Dev	11.47	11.06
Percentiles: Min	2	2
25	45	47
50	54	54
75	56	57
Max	56	57
55-64 Years		
Mean	48.08	48.72
Std Dev	11.59	11.30
Percentiles: Min	5	0
25	45	45
50	56	54
75	56	57
Max	56	57
65-74 Years		
Mean	50.57	48.82
Std Dev	8.75	10.23
Percentiles: Min	7	8
25	49	45
50	56	53
75	56	57
Max	56	57
75+ Years		
Mean	49.62	46.18
Std Dev	10.13	11.53
Percentiles: Min	4	10

25	47	41
50	56	50
75	56	56
Max	56	57

Ethnicity

Table 4.3: Cervical Spine Normative Scores by Ethnicity	Neuro	Pain
Ethnicity		
White		
Mean	50.10	50.02
Std Dev	9.99	10.01
Percentiles: Min	2	0
25	49	47
50	56	54
75	56	57
Max	56	57
Black		
Mean	48.26	49.19
Std Dev	10.17	10.07
Percentiles: Min	7	20
25	44	45
50	52	54
75	56	57
Max	56	57
Hispanic		
Mean	47.43	49.33
Std Dev	13.12	11.95
Percentiles: Min	9	1
25	45	47
50	52	54
75	56	57
Max	56	57
Asian		
Mean	52.81	52.85
Std Dev	6.55	7.11
Percentiles: Min	29	28
25	52	53
50	56	54
75	56	57
Max	56	57
Native American		
Mean	41.85	45.04
Std Dev	12.92	12.47
Percentiles: Min	14	16
25	31	36
50	45	49
75	52	55
Max	56	57
Other Ethnicity		
Mean	51.18	50.66

Std Dev	8.18	8.63
Percentiles: Min	25	30
25	49	48
50	56	54
75	56	57
Max	56	57

Comorbidity Conditions

Table 4.4: Cervical Spine Normative Scores by Comorbidity	Neuro	Pain
Comorbidity Conditions		
Heart Disease		
Mean	44.75	42.70
Std Dev	13.60	14.07
Percentiles: Min	2	2
25	36	33
50	50	47
75	56	54
Max	56	57
High Blood Pressure		
Mean	47.36	46.79
Std Dev	11.87	12.09
Percentiles: Min	2	2
25	45	41
50	52	51
75	56	57
Max	56	57
Lung Disease		
Mean	44.38	39.37
Std Dev	13.89	14.47
Percentiles: Min	2	2
25	38	30
50	50	42
75	56	51
Max	56	57
Diabetes		
Mean	45.50	43.96
Std Dev	12.94	13.37
Percentiles: Min	2	2
25	38	35
50	50	48
75	56	56
Max	56	57
Ulcer/Stomach Disease		
Mean	43.21	41.34
Std Dev	14.29	14.18
Percentiles: Min	2	2
25	34	33
50	49	45
75	56	54

Max	56	57
Kidney Disease		
Mean	40.21	36.18
Std Dev	16.34	15.69
Percentiles: Min	5	3
25	33	20
50	46	39
75	55	50
Max	56	57
Liver Disease		
Mean	44.27	38.77
Std Dev	9.87	14.73
Percentiles: Min	29	16
25	36	26
50	45	40
75	54	51
Max	56	57
Anemia/Blood Disease		
Mean	46.09	44.89
Std Dev	11.42	12.75
Percentiles: Min	16	10
25	38	36
50	50	50
75	56	56
Max	56	57
Cancer		
Mean	49.43	46.64
Std Dev	9.34	11.28
Percentiles: Min	7	8
25	45	39
50	54	51
75	56	55
Max	56	57
Depression		
Mean	43.73	41.47
Std Dev	14.13	13.88
Percentiles: Min	2	1
25	34	33
50	49	45
75	56	54
Max	56	57
Osteoarthritis		
Mean	42.29	38.95
Std Dev	14.44	13.65
Percentiles: Min	2	0
25	34	30
50	47	42
75	56	50
Max	56	57
Back Pain		
Mean	45.41	43.32
Std Dev	12.95	12.21
Percentiles: Min	2	0
25	38	36

50	50	47
75	56	53
Max	56	57
Rheumatoid Arthritis		
Mean	40.68	39.94
Std Dev	13.77	14.86
Percentiles: Min	5	0
25	31	30
50	43	44
75	56	53
Max	56	57
Other Medical Problem		
Mean	47.01	45.42
Std Dev	12.55	12.26
Percentiles: Min	2	2
25	43	38
50	52	50
75	56	56
Max	56	57

CHAPTER FIVE: LOWER EXTREMITIES: (Foot & Ankle, Hip & Knee, Lower Limb and Sports Knee)

Foot and Ankle Questionnaire

The foot and ankle measure is comprised of two scales, a global measure of the function of the foot or ankle and a second scale measuring the comfort-discomfort of the foot or ankle.

Foot and Ankle Overall Normative and Aaos scores

To compute a norm-based Foot and Ankle score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The Aaos mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 5.1 below.

Table 5.1: Foot/Ankle Normative Scores	Global	Comfort
Normative Scores		
OVERALL		
Mean	50.00	50.00
Std Dev	10.00	10.00
Percentiles: Min	-12	25
25	49	42
50	55	52
75	56	59
Max	56	59
<i>Aaos Raw Scores</i>		
Mean	93.19	73.87
Std Dev	12.33	29.51

For example, if the patient's Aaos score on the Foot and Ankle Comfort scale is 60.4, then that individual's norm-based Comfort scale score is calculated as:

$((60.4 - 73.87) / 29.51 * 10) + 50 = 45.56$. In this instance, the patient's normalized score is almost .444 of one standard deviation from the overall general population mean.

Foot and Ankle: Normative Scores by Demographic Markers

Gender

Table 5.2: Foot/Ankle Normative Scores by Gender	Global	Comfort
Gender		
Male		
Mean	51.07	52.79
Std Dev	8.81	9.67
Percentiles: Min	-9	25
25	51	48
50	55	59
75	56	59
Max	56	59
Female		
Mean	49.31	48.37
Std Dev	10.65	9.83
Percentiles: Min	-12	25
25	48	42
50	54	50
75	56	59
Max	56	59

Age

Table 5.3: Foot/Ankle Normative Scores by Age Group	Global	Comfort
Age		
19-34 Years		
Mean	53.02	52.45
Std Dev	5.42	8.90
Percentiles: Min	22	25
25	53	48
50	56	59
75	56	59
Max	56	59
35-44 Years		
Mean	51.63	51.15
Std Dev	7.93	9.84
Percentiles: Min	-12	25
25	51	42
50	55	59
75	56	59
Max	56	59
45-54 Years		
Mean	49.80	49.49

Std Dev		9.94	10.48
Percentiles:	Min	-9	25
	25	49	42
	50	54	52
	75	56	59
	Max	56	59
55-64 Years			
	Mean	47.13	49.16
	Std Dev	13.00	9.89
Percentiles:	Min	-7	25
	25	45	42
	50	53	50
	75	56	59
	Max	56	59
65-74 Years			
	Mean	49.07	48.02
	Std Dev	10.25	10.19
Percentiles:	Min	0	25
	25	47	39
	50	54	50
	75	56	59
	Max	56	59
75+ Years			
	Mean	45.92	46.99
	Std Dev	13.10	9.96
Percentiles:	Min	-5	32
	25	43	39
	50	51	48
	75	55	59
	Max	56	59

Ethnicity

Table 5.4: Foot/Ankle Normative Scores by Ethnicity	Global	Comfort
Ethnicity		
White		
Mean	50.06	49.95
Std Dev	9.87	10.01
Percentiles:	Min	-12
	25	49
	50	55
	75	56
	Max	56
Black		
Mean	48.29	49.94
Std Dev	13.19	9.88
Percentiles:	Min	-5
	25	49
	50	54
	75	56

Max	56	59
Hispanic		
Mean	47.86	50.40
Std Dev	14.97	11.88
Percentiles: Min	6	25
25	46	38
50	55	59
75	56	59
Max	56	59
Asian		
Mean	51.40	53.37
Std Dev	7.44	6.97
Percentiles: Min	35	42
25	50	48
50	56	59
75	56	59
Max	56	59
Native American		
Mean	48.74	52.05
Std Dev	10.61	9.19
Percentiles: Min	23	32
25	46	42
50	54	59
75	56	59
Max	56	59
Other Ethnicity		
Mean	43.22	45.60
Std Dev	16.43	10.57
Percentiles: Min	11	33
25	37	33
50	52	45
75	56	59
Max	56	59

Comorbidity Conditions

Table 5.5: Foot/Ankle Normative Scores by Comorbidity Condition	Global	Comfort
Comorbidity		
Heart Disease		
Mean	43.38	45.68
Std Dev	14.16	10.03
Percentiles: Min	0	25
25	34	36
50	50	45
75	54	59
Max	56	59
High Blood Pressure		
Mean	45.82	46.77
Std Dev	13.07	10.33
Percentiles: Min	-12	25

25	42	39
50	51	48
75	55	59
Max	56	59
Lung Disease		
Mean	45.47	46.54
Std Dev	12.26	10.26
Percentiles: Min	4	25
25	38	39
50	49	48
75	55	59
Max	56	59
Diabetes		
Mean	44.75	46.55
Std Dev	13.96	10.27
Percentiles: Min	-5	25
25	37	39
50	52	48
75	55	59
Max	56	59
Ulcer/Stomach Disease		
Mean	44.56	46.13
Std Dev	13.60	10.39
Percentiles: Min	-12	25
25	37	36
50	50	48
75	55	59
Max	56	59
Kidney Disease		
Mean	46.53	47.04
Std Dev	9.72	10.78
Percentiles: Min	27	32
25	38	37
50	51	48
75	55	59
Max	56	59
Liver Disease		
Mean	47.23	46.19
Std Dev	10.63	11.42
Percentiles: Min	17	25
25	41	35
50	53	48
75	55	59
Max	56	59
Anemia/Blood Disease		
Mean	47.32	48.21
Std Dev	13.50	10.07
Percentiles: Min	-5	32
25	47	39
50	54	48
75	56	59
Max	56	59
Cancer		
Mean	44.95	47.61

Std Dev		15.29	10.13
Percentiles:	Min	-5	25
	25	40	39
	50	53	49
	75	56	59
	Max	56	59
Depression			
	Mean	44.63	46.14
	Std Dev	13.70	10.45
Percentiles:	Min	-12	25
	25	38	36
	50	51	48
	75	55	59
	Max	56	59
Osteoarthritis			
	Mean	42.63	44.74
	Std Dev	15.10	9.67
Percentiles:	Min	-12	25
	25	36	36
	50	48	42
	75	55	52
	Max	56	59
Back Pain			
	Mean	47.44	47.53
	Std Dev	11.72	10.43
Percentiles:	Min	-12	25
	25	44	39
	50	53	48
	75	56	59
	Max	56	59
Rheumatoid Arthritis			
	Mean	43.12	46.03
	Std Dev	13.94	10.06
Percentiles:	Min	-9	25
	25	34	39
	50	49	48
	75	54	59
	Max	56	59
Other Medical Problems			
	Mean	46.76	47.90
	Std Dev	12.73	10.07
Percentiles:	Min	-12	25
	25	43	39
	50	52	48
	75	56	59
	Max	56	59

Hip and Knee Questionnaire

Hip and Knee: Overall Normative and AAOS Raw Scores

The hip and knee instrument contains a core hip and knee measure of functioning, as well as four pain measures for the left and right hip and the left and right knee.

To compute a norm-based Hip and Knee score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 6.1 below.

Table 6.1: Hip and Knee Normative Scores	Core	Right Hip Pain	Left Hip Pain	Right Knee Pain	Left Knee Pain
Hip And Knee OVERALL					
Mean	50.00	50.00	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00	10.00	10.00
Percentiles: Min	-11	-27	-30	-21	-22
25	48	54	53	49	54
50	54	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
<i>AAOS Raw Scores</i>					
Mean	91.02	95.58	96.09	94.24	94.68
Std Dev	14.35	12.34	12.08	13.33	13.16

For example, if the patient's AAOS score on the Hip and Knee Core scale is 80.4, then that individual's core norm-based score is calculated as:

$((80.4 - 91.02) / 14.35 * 10) + 50 = 42.6$. In this instance, the patient's normalized score is nearly .8 of one standard deviation from the overall general population mean.

Hip and Knee: Normative Scores by Demographic Markers

Gender

Table 6.2: Hip and Knee Normative Scores by Gender		Core	Right Hip Pain	Left Hip Pain	Right Knee Pain	Left Knee Pain
Gender						
Male						
Mean		51.47	51.24	50.84	50.95	51.09
Std Dev		8.30	8.06	8.28	8.43	7.87
Percentiles:	Min	4	-27	-30	-6	-7
25		50	54	53	54	54
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
Female						
Mean		48.97	49.12	49.40	49.32	49.23
Std Dev		10.92	11.10	11.03	10.95	11.21
Percentiles:	Min	-11	-27	-30	-21	-22
25		46	54	53	49	49
50		54	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54

Age

Table 6.3: Hip and Knee Normative Scores by Age Group		Core	Right Hip Pain	Left Hip Pain	Right Knee Pain	Left Knee Pain
Age						
19-34 Years						
Mean		53.43	52.72	52.12	52.69	52.00
Std Dev		5.77	4.55	5.71	4.86	6.19
Percentiles:	Min	16	-1	-2	9	-7
25		52	54	53	54	54
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
35-44 Years						
Mean		52.35	51.58	51.35	51.75	51.59
Std Dev		6.84	6.78	7.45	6.13	6.84
Percentiles:	Min	16	5	-19	4	3
25		50	54	53	54	54
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
45-54 Years						
Mean		49.69	49.71	50.00	49.61	50.33

Std Dev		10.10	9.99	10.11	10.07	9.59
Percentiles:	Min	-11	-27	-30	-21	-22
	25	47	54	53	49	54
	50	53	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54
55-64 Years						
	Mean	47.88	47.95	48.21	48.47	47.68
	Std Dev	12.21	13.82	12.61	12.77	13.85
Percentiles:	Min	-7	-27	-30	-21	-22
	25	45	54	53	49	49
	50	52	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54
65-74 Years						
	Mean	46.94	47.46	47.95	46.98	48.32
	Std Dev	12.25	12.90	13.07	13.88	11.74
Percentiles:	Min	0	-27	-30	-21	-7
	25	43	45	53	43	49
	50	51	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54
75+ Years						
	Mean	45.92	47.36	47.55	47.06	47.07
	Std Dev	11.81	11.81	11.96	12.47	12.29
Percentiles:	Min	5	-11	-13	-6	-7
	25	39	44	47	45	44
	50	50	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54

Ethnicity

Table 6.4: Hip and Knee Normative Scores by Ethnicity	Core	Right Hip Pain	Left Hip Pain	Right Knee Pain	Left Knee Pain	
Ethnicity						
White						
Mean	49.90	49.92	49.91	49.85	49.89	
Std Dev	10.11	10.10	10.14	10.26	10.21	
Percentiles:	Min	-11	-27	-30	-21	-22
	25	48	54	53	49	54
	50	54	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54
Black						
Mean	50.57	51.19	51.22	50.98	50.61	
Std Dev	8.75	7.43	6.69	7.19	8.72	
Percentiles:	Min	21	5	9	19	14
	25	48	54	53	49	54
	50	56	54	53	54	54
	75	56	54	53	54	54
	Max	56	54	53	54	54

Hispanic						
Mean		52.49	52.12	50.47	53.11	52.81
Std Dev		6.96	3.87	10.00	3.77	3.81
Percentiles:	Min	27	37	4	34	34
25		52	54	53	54	54
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
Asian						
Mean		54.33	51.52	52.41	54.32	52.87
Std Dev		3.70	5.15	2.98	0.00	4.21
Percentiles:	Min	43	37	42	54	39
25		53	54	53	54	54
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
Native American						
Mean		45.96	48.36	45.72	50.25	44.81
Std Dev		14.15	12.86	15.80	10.33	15.86
Percentiles:	Min	8	-1	-2	9	-7
25		36	54	45	54	34
50		54	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
Other Ethnicity						
Mean		50.31	48.72	46.13	52.00	49.83
Std Dev		9.33	13.02	14.52	6.15	8.21
Percentiles:	Min	27	11	12	34	34
25		46	54	45	54	49
50		56	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54

Comorbidity Conditions

Table 6.5: Hip and Knee Normative Scores by Comorbidity	Core	Right Hip Pain	Left Hip Pain	Right Knee Pain	Left Knee Pain	
Comorbidity Conditions						
Mean	43.95	46.09	44.26	46.07	44.48	
Std Dev	14.02	15.92	16.99	15.26	16.46	
Percentiles:	Min	-11	-27	-30	-21	-22
25		35	44	42	45	44
50		48	54	53	54	54
75		56	54	53	54	54
Max		56	54	53	54	54
High Blood Pressure						
Mean	46.59	47.43	47.26	47.28	46.72	
Std Dev	12.73	13.49	13.74	13.59	14.25	
Percentiles:	Min	-11	-27	-30	-21	-22
25		43	48	53	45	44
50		52	54	53	54	54

75	56	54	53	54	54
Max	56	54	53	54	54
Lung Disease					
Mean	42.99	42.06	42.90	44.51	43.90
Std Dev	14.76	20.15	19.16	17.85	17.15
Percentiles: Min	-7	-27	-30	-21	-22
25	37	37	42	45	39
50	48	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Diabetes					
Mean	43.84	44.79	45.64	43.96	43.82
Std Dev	15.70	17.70	16.37	17.73	17.82
Percentiles: Min	-11	-27	-30	-21	-22
25	37	43	45	39	39
50	50	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Ulcer/Stomach Disease					
Mean	43.22	45.05	43.52	44.82	42.94
Std Dev	14.47	15.81	17.62	15.13	16.53
Percentiles: Min	-11	-27	-30	-21	-22
25	36	43	37	39	34
50	48	54	53	54	54
75	54	54	53	54	54
Max	56	54	53	54	54
Kidney Disease					
Mean	39.64	42.46	36.54	42.65	45.10
Std Dev	16.84	22.60	20.99	17.90	18.30
Percentiles: Min	1	-11	-5	-6	-7
25	29	45	19	36	46
50	43	54	48	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Liver Disease					
Mean	45.20	49.30	38.40	50.45	48.19
Std Dev	12.77	10.02	19.01	6.51	14.60
Percentiles: Min	17	21	4	39	8
25	37	52	23	44	54
50	50	54	47	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Anemia/Blood Disease					
Mean	46.19	48.25	44.49	50.08	48.71
Std Dev	12.38	10.81	17.33	7.56	10.23
Percentiles: Min	5	5	-19	19	14
25	38	48	42	49	48
50	52	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Cancer					
Mean	45.92	47.88	46.34	47.37	46.62
Std Dev	12.76	12.08	14.40	13.74	13.28
Percentiles: Min	1	-3	-5	2	1

25	42	48	47	43	39
50	50	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Depression					
Mean	44.06	44.75	43.73	45.98	45.77
Std Dev	14.46	16.56	17.86	14.52	14.96
Percentiles: Min	-11	-27	-30	-21	-22
25	38	43	42	45	44
50	50	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Osteoarthritis					
Mean	38.79	40.93	40.79	40.72	40.53
Std Dev	14.83	18.54	19.15	16.87	17.16
Percentiles: Min	-11	-27	-30	-21	-22
25	30	32	37	34	34
50	42	54	53	47	46
75	50	54	53	54	54
Max	56	54	53	54	54
Back Pain					
Mean	45.85	46.25	46.50	46.82	46.93
Std Dev	12.29	14.18	14.19	13.36	13.10
Percentiles: Min	-11	-27	-30	-21	-22
25	41	43	47	45	44
50	50	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54
Rheumatoid Arthritis					
Mean	38.53	40.78	41.62	40.27	39.97
Std Dev	15.32	19.97	18.87	18.68	18.13
Percentiles: Min	-11	-27	-30	-21	-22
25	31	37	37	34	29
50	42	54	53	49	49
75	50	54	53	54	54
Max	56	54	53	54	54
Other Medical Problem					
Mean	47.79	48.91	47.55	48.69	48.44
Std Dev	12.31	12.21	14.08	12.40	12.53
Percentiles: Min	-11	-27	-30	-21	-22
25	45	54	53	49	49
50	52	54	53	54	54
75	56	54	53	54	54
Max	56	54	53	54	54

Lower Extremity Questionnaire

Lower Limb: Overall Normative and AAOS Raw Scores

The general lower limb instrument has only one scale, a general function or core measure for the lower limb(s).

To compute a norm-based Lower Limb score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 7.1 below.

Table 7.1: Lower Limb Normative Scores	Core
Lower Limb	
OVERALL	
Mean	50.00
Std Dev	10.00
Percentiles: Min	-5
25	47
50	54
75	57
Max	57
<i>AAOS Raw Scores</i>	
Mean	90.52
Std Dev	13.78

For example, if the patient's AAOS score on the Lower Limb Core scale is 70.9, then that individual's norm-based Core scale score is calculated as:

$((70.9 - 90.52) / 13.78 * 10) + 50 = 35.76$. In this instance, the patient's normalized score is almost 1.5 standard deviations from the overall general population mean.

Lower Limb: Normative Scores by Demographic Markers

Gender

Table 7.2: Lower Limb Normative Scores by Gender	Core
Gender	
Male	
Mean	50.88
Std Dev	9.24
Percentiles: Min	-1
25	49
50	55
75	57
Max	57
Female	
Mean	49.36

Std Dev	10.48
Percentiles: Min	-5
25	45
50	54
75	57
Max	57

Age

Table 7.3: Lower Limb Normative Scores by Age Group	Core
Age Group	
19-34 Years	
Mean	53.32
Std Dev	6.45
Percentiles: Min	23
25	53
50	57
75	57
Max	57
35-44 Years	
Mean	50.91
Std Dev	9.88
Percentiles: Min	-5
25	49
50	55
75	57
Max	57
45-54 Years	
Mean	49.54
Std Dev	10.07
Percentiles: Min	-1
25	46
50	53
75	57
Max	57
55-64 Years	
Mean	48.52
Std Dev	11.01
Percentiles: Min	9
25	44
50	53
75	57
Max	57
65-74 Years	
Mean	49.19
Std Dev	9.24
Percentiles: Min	5
25	45
50	53
75	57

Max	57
75+ Years	
Mean	46.20
Std Dev	12.23
Percentiles: Min	5
25	41
50	50
75	57
Max	57

Ethnicity

Table 7.4: Lower Limb Normative Scores by Ethnicity	Core
Ethnicity	
White	
Mean	49.96
Std Dev	9.96
Percentiles: Min	-5
25	47
50	54
75	57
Max	57
Black	
Mean	50.41
Std Dev	10.62
Percentiles: Min	7
25	49
50	55
75	57
Max	57
Hispanic	
Mean	51.93
Std Dev	9.35
Percentiles: Min	15
25	50
50	57
75	57
Max	57
Asian	
Mean	53.62
Std Dev	4.81
Percentiles: Min	45
25	49
50	57
75	57
Max	57
Native American	
Mean	46.27
Std Dev	12.91
Percentiles: Min	16
25	39

50	50
75	57
Max	57
Other Ethnicity	
Mean	44.73
Std Dev	12.51
Percentiles: Min	16
25	40
50	47
75	56
Max	57

Comorbidity Conditions

Table 7.5: Lower Limb Normative Scores by Comorbidity	Core
Comorbidity Conditions	
Heart Disease	
Mean	43.31
Std Dev	13.25
Percentiles: Min	-5
25	36
50	46
75	55
Max	57
High Blood Pressure	
Mean	46.86
Std Dev	11.70
Percentiles: Min	-1
25	42
50	52
75	57
Max	57
Lung Disease	
Mean	44.73
Std Dev	13.94
Percentiles: Min	9
25	37
50	50
75	57
Max	57
Diabetes	
Mean	45.59
Std Dev	12.26
Percentiles: Min	-5
25	38
50	50
75	57
Max	57
Ulcer/Stomach Disease	
Mean	42.91

Std Dev		14.25
Percentiles:	Min	-5
	25	32
	50	46
	75	56
	Max	57
Kidney Disease		
	Mean	40.67
	Std Dev	12.06
Percentiles:	Min	16
	25	32
	50	43
	75	51
	Max	57
Liver Disease		
	Mean	42.76
	Std Dev	14.27
Percentiles:	Min	10
	25	34
	50	46
	75	54
	Max	57
Anemia/Blood Disease		
	Mean	46.31
	Std Dev	13.57
Percentiles:	Min	-5
	25	42
	50	52
	75	57
	Max	57
Cancer		
	Mean	48.07
	Std Dev	10.23
Percentiles:	Min	20
	25	42
	50	52
	75	57
	Max	57
Depression		
	Mean	43.76
	Std Dev	13.45
Percentiles:	Min	-5
	25	36
	50	47
	75	57
	Max	57
Osteoarthritis		
	Mean	40.15
	Std Dev	13.67
Percentiles:	Min	-5
	25	32
	50	43
	75	52
	Max	57

Back Pain		
Mean		45.67
Std Dev		12.03
Percentiles:	Min	-5
	25	41
	50	50
	75	55
Max		57
Rheumatoid Arthritis		
Mean		39.28
Std Dev		13.93
Percentiles:	Min	-5
	25	31
	50	42
	75	52
Max		57
Other Medical Problem		
Mean		47.92
Std Dev		10.85
Percentiles:	Min	4
	25	44
	50	52
	75	57
Max		57

Sports Knee Questionnaire

The sports knee instrument is comprised of a core measure of knee function as well as an assessment of the patient's knee "gives way" during vigorous activity as well as measures of past and current limitations of knee functioning.

Sports Knee: Normative and AAOS Raw Scores

To compute a norm-based Sports Knee score for an individual patient or group of patients, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 8.1 below.

Table 8.1: Sport Knee Normative Scores	Core	Knee Gives way	Previous Limitation	Current Limitation	Pain
Normative Scores					
OVERALL					
Mean	50.00	50.00	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00	10.00	10.00
Percentiles: Min	-15	-14	-2	19	17
25	49	53	53	47	47
50	56	53	53	55	57
75	56	53	53	57	57
Max	56	53	53	57	57
AAOS Raw Scores					
Mean	92.78	95.65	93.80	82.01	83.66
Std Dev	12.35	15.05	17.98	26.38	25.09

For example, if the patient's AAOS score on the Sports Knee Core scale is 73.0, then that individual's norm-based Sports Knee Core scale score is calculated as:

$((73.0 - 92.78) / 12.35 * 10) + 50 = 33.98$. In this instance, the patient's normalized score is over 1½ standard deviations from the overall general population mean.

Sports Knee: Normative Scores by Demographic Markers

Gender

Table 8.3: Sport Knee Normative Scores by Gender	Core	Knee Gives way	Previous Limitation	Current Limitation	Pain
Gender					
Male					
Mean	51.25	50.84	51.32	50.91	50.84
Std Dev	8.28	8.30	7.82	9.26	9.10
Percentiles: Min	-13	-14	5	19	17
25	50	53	53	50	49
50	56	53	53	57	57
75	56	53	53	57	57
Max	56	53	53	57	57
Female					
Mean	49.16	49.38	48.90	49.21	49.26
Std Dev	10.94	11.06	11.40	10.55	10.69
Percentiles: Min	-15	-14	-2	19	17
25	47	53	53	47	47
50	53	53	53	55	57
75	56	53	53	57	57
Max	56	53	53	57	57

Age

Table 8.4: Sport Knee Normative Scores by Age Group	Core	Knee Gives way	Previous Limitation	Current Limitation	Pain
Age Group					
19-34 Years					
Mean	52.70	51.32	52.54	52.36	51.69
Std Dev	5.94	6.77	4.55	7.13	7.87
Percentiles: Min	20	-14	12	26	22
25	51	53	53	50	49
50	56	53	53	57	57
75	56	53	53	57	57
Max	56	53	53	57	57
35-44 Years					
Mean	51.69	50.35	51.47	51.45	51.28
Std Dev	8.12	7.82	7.67	8.21	7.98
Percentiles: Min	7	-2	5	19	19
25	51	53	53	50	49
50	56	53	53	55	57
75	56	53	53	57	57
Max	56	53	53	57	57
45-54 Years					
Mean	49.11	50.10	50.61	49.70	49.67
Std Dev	11.44	10.17	7.58	9.98	10.21
Percentiles: Min	-15	-14	8	19	17
25	48	53	53	47	47
50	55	53	53	52	54
75	56	53	53	57	57
Max	56	53	53	57	57
55-64 Years					
Mean	49.32	50.26	49.67	49.74	50.27
Std Dev	10.33	9.53	10.33	10.73	10.01
Percentiles: Min	-13	-2	8	21	22
25	46	53	53	46	47
50	56	53	53	57	57
75	56	53	53	57	57
Max	56	53	53	57	57
65-74 Years					
Mean	47.58	48.71	46.07	46.06	44.49
Std Dev	11.61	12.67	14.64	12.74	13.80
Percentiles: Min	-2	-14	1	19	17
25	45	53	47	33	30
50	52	53	53	50	49
75	56	53	53	57	57
Max	56	53	53	57	57
75+ Years					
Mean	47.48	46.43	41.42	44.70	47.25
Std Dev	11.68	16.60	18.66	13.62	13.67
Percentiles: Min	3	-14	-2	19	17
25	45	53	26	32	38

50	52	53	53	50	57
75	56	53	53	57	57
Max	56	53	53	57	57

Ethnicity

Table 8.5: Sport Knee Normative Scores by Ethnicity	Core	Knee Gives way	Previous Limitation	Current Limitation	Pain
Ethnicity					
White					
Mean	50.16	50.19	50.18	50.11	50.21
Std Dev	9.74	9.71	9.71	9.82	9.76
Percentiles: Min	-13	-14	-2	19	17
25	49	53	53	47	47
50	56	53	53	55	57
75	56	53	53	57	57
Max	56	53	53	57	57
Black					
Mean	46.74	45.22	45.04	46.98	43.66
Std Dev	14.82	16.75	16.49	12.98	14.75
Percentiles: Min	-15	-14	-2	19	17
25	44	53	40	40	31
50	53	53	53	55	47
75	56	53	53	57	57
Max	56	53	53	57	57
Hispanic					
Mean	48.78	49.72	51.22	53.03	50.06
Std Dev	11.74	8.56	5.01	4.51	9.15
Percentiles: Min	16	20	40	47	32
25	49	53	53	47	44
50	56	53	53	56	55
75	56	53	53	57	57
Max	56	53	53	57	57
Asian					
Mean	49.49	50.57	48.81	47.34	52.13
Std Dev	10.11	4.46	8.03	16.42	7.59
Percentiles: Min	23	42	40	28	43
25	43	49	40	28	43
50	55	53	53	57	57
75	56	53	53	57	57
Max	56	53	53	57	57
Native American					
Mean	47.57	42.46	48.35	46.80	46.75
Std Dev	10.43	22.17	12.64	13.60	13.51
Percentiles: Min	16	-14	8	21	22
25	42	53	53	33	35
50	52	53	53	53	54
75	56	53	53	57	57
Max	56	53	53	57	57
Other Ethnicity					
Mean	47.65	51.51	53.45	50.50	50.49
Std Dev	9.23	3.48	0.00	11.93	11.75

Percentiles:	Min	24	42	53	21	22
	25	41	53	53	46	48
	50	51	53	53	57	57
	75	56	53	53	57	57
	Max	56	53	53	57	57

Comorbidity Conditions

Table 8.6: Sport Knee Normative Scores by Comorbidity	Core	Knee Gives way	Previous Limitation	Current Limitation	Pain	
Comorbidity Conditions						
Mean	44.27	43.77	43.78	41.33	41.19	
Std Dev	12.62	18.54	16.16	13.73	14.00	
Percentiles:	Min	-13	-14	-2	19	17
	25	38	46	38	29	28
	50	47	53	53	43	44
	75	53	53	53	56	57
	Max	56	53	53	57	57
High Blood Pressure						
Mean	47.05	48.05	48.55	46.84	46.76	
Std Dev	12.48	13.47	11.93	12.14	12.61	
Percentiles:	Min	-15	-14	-2	19	17
	25	44	53	53	38	42
	50	52	53	53	52	52
	75	56	53	53	57	57
	Max	56	53	53	57	57
Lung Disease						
Mean	46.25	48.04	48.72	46.32	47.49	
Std Dev	12.26	12.69	11.40	11.01	10.75	
Percentiles:	Min	-2	-2	12	24	22
	25	41	53	53	38	43
	50	51	53	53	50	52
	75	56	53	53	57	57
	Max	56	53	53	57	57
Diabetes						
Mean	43.74	44.14	47.75	43.52	43.67	
Std Dev	14.15	17.70	12.11	12.39	13.66	
Percentiles:	Min	-13	-14	1	19	17
	25	38	42	48	33	32
	50	49	53	53	47	49
	75	56	53	53	57	57
	Max	56	53	53	57	57
Ulcer/Stomach Disease						
Mean	44.80	45.24	47.38	46.09	45.26	
Std Dev	13.48	15.99	13.83	11.87	12.62	
Percentiles:	Min	-13	-14	-2	19	17
	25	39	46	53	38	37
	50	51	53	53	50	49
	75	56	53	53	57	57
	Max	56	53	53	57	57
Kidney Disease						
Mean	41.28	45.45	47.94	43.84	41.20	

Std Dev		15.48	17.04	15.22	16.29	16.06
Percentiles:	Min	9	-2	5	24	22
	25	31	47	52	24	22
	50	45	53	53	54	43
	75	56	53	53	57	57
	Max	56	53	53	57	57
Liver Disease						
	Mean	43.08	49.39	45.38	46.59	48.44
	Std Dev	15.72	7.89	14.09	13.98	5.50
Percentiles:	Min	9	31	19	31	44
	25	30	53	34	31	45
	50	52	53	53	52	47
	75	56	53	53	57	54
	Max	56	53	53	57	57
Anemia/Blood Disease						
	Mean	46.41	49.44	49.31	48.94	51.71
	Std Dev	12.20	8.17	10.37	9.78	7.10
Percentiles:	Min	9	8	19	28	34
	25	40	53	53	38	48
	50	51	53	53	52	57
	75	56	53	53	57	57
	Max	56	53	53	57	57
Cancer						
	Mean	44.33	48.67	44.40	44.90	45.16
	Std Dev	12.91	11.86	15.42	13.73	10.49
Percentiles:	Min	2	-2	12	19	22
	25	37	53	33	30	37
	50	47	53	53	50	49
	75	56	53	53	57	54
	Max	56	53	53	57	57
Depression						
	Mean	45.33	45.36	48.93	44.67	44.90
	Std Dev	13.26	16.52	11.34	12.56	12.73
Percentiles:	Min	-3	-14	-2	19	17
	25	40	53	53	33	37
	50	51	53	53	50	49
	75	56	53	53	57	57
	Max	56	53	53	57	57
Osteoarthritis						
	Mean	40.44	43.75	44.57	40.86	41.25
	Std Dev	15.25	18.38	15.62	13.04	13.52
Percentiles:	Min	-15	-14	-2	19	17
	25	32	48	41	28	29
	50	45	53	53	43	47
	75	53	53	53	55	57
	Max	56	53	53	57	57
Back Pain						
	Mean	47.08	48.36	49.01	48.30	48.24
	Std Dev	11.69	12.47	10.85	10.80	10.56
Percentiles:	Min	-3	-14	-2	19	17
	25	43	53	53	45	47
	50	51	53	53	52	52
	75	56	53	53	57	57
	Max	56	53	53	57	57

Rheumatoid Arthritis						
Mean		39.42	42.81	42.09	41.39	41.83
Std Dev		15.28	18.27	16.37	11.94	13.30
Percentiles:	Min	-13	-14	1	19	17
	25	31	42	29	28	29
	50	42	53	53	45	44
	75	53	53	53	52	57
	Max	56	53	53	57	57
Other Medical Problem						
Mean		47.72	48.34	50.50	47.95	47.38
Std Dev		11.50	12.33	8.74	11.93	12.22
Percentiles:	Min	2	-14	5	19	17
	25	44	53	53	43	42
	50	53	53	53	55	54
	75	56	53	53	57	57
	Max	56	53	53	57	57

CHAPTER SIX: THE PEDIATRIC MEASURES

Parent-Child, Parent-Adolescent & Adolescent Questionnaires

The three pediatric measures include the survey completed by the parent for a child 2-11 years of age, a parent completing the survey for a child 12-18 years of age, and the adolescent completing a matching survey for him or herself.

Parent-Child Questionnaire

The parent-child measure contains six scales; a global functioning assessment, an assessment of the child's functioning in his or her upper extremities, as well as measures of the child's mobility, sports and physical functioning, pain and happiness.

Parent-Child: Normative and AAOS Raw Scores

To compute a norm-based Parent-Child score for an individual patient/child or group of patients/children, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 9.1 below.

Table 9.1: Pediatric Parent Child Normative Scores	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Normative Scores						
OVERALL						
Mean	50.00	50.00	50.00	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00	10.00	10.00	10.00
Percentiles: Min	-30	-123	-23	-11	-7	-57
25	47	53	47	48	47	46
50	54	53	53	56	54	53
75	57	53	58	56	57	57
Max	57	53	58	56	57	59
AAOS Raw Scores						
Mean	91.97	98.35	90.22	92.43	89.80	93.31
Std Dev	11.49	5.68	12.32	13.75	14.10	7.77

For example, if the patient's AAOS score on the Parent-Child Mobility scale is 83.6, then that individual's norm-based Parent-Child Mobility scale score is calculated as:

$((83.6 - 98.35) / 5.68 * 10) + 50 = 24.3$. In this instance, the patient's normalized score is approximately 2½ standard deviations from the overall general population mean.

Parent-Child: Normative Scores by Demographic Markers

Gender

Table 9.2: Pediatric Parent Child Normative Scores by Gender		Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Gender							
Male							
Mean		49.62	49.45	49.88	49.85	49.86	49.65
Std Dev		10.43	11.77	10.34	10.40	10.15	10.69
Percentiles:	Min	-30	-123	-23	-11	-7	-57
	25	47	52	46	50	47	46
	50	54	53	53	56	54	53
	75	57	53	58	56	57	57
	Max	57	53	58	56	57	59
Female							
Mean		50.40	50.58	50.12	50.16	50.15	50.37
Std Dev		9.51	7.68	9.64	9.56	9.85	9.21
Percentiles:	Min	-30	-105	-14	2	-2	-39
	25	47	53	47	48	47	47
	50	54	53	53	56	54	53
	75	57	53	58	56	57	57
	Max	57	53	58	56	57	59

Ethnicity

Table 9.3: Pediatric Parent Child Normative Scores by Ethnicity		Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Ethnicity							
White							
Mean		50.27	50.20	50.18	50.14	50.02	50.29
Std Dev		9.46	9.28	9.77	9.82	9.88	9.45
Percentiles:	Min	-30	-123	-22	-11	-7	-50
	25	47	53	47	50	47	47
	50	54	53	53	56	54	53
	75	57	53	58	56	57	57
	Max	57	53	58	56	57	59

Black							
Mean		48.52	47.84	47.97	48.63	49.99	47.60
Std Dev		14.08	18.53	12.97	11.56	9.43	15.48
Percentiles:	Min	-30	-123	-23	10	15	-57
	25	47	48	44	45	47	46
	50	54	53	53	56	54	52
	75	57	53	56	56	57	57
	Max	57	53	58	56	57	59
Hispanic							
Mean		49.93	48.96	49.47	50.65	50.69	49.77
Std Dev		8.63	7.76	10.06	10.07	10.81	9.80
Percentiles:	Min	20	18	5	5	11	7
	25	47	48	47	50	50	47
	50	54	53	53	56	54	52
	75	57	53	58	56	57	56
	Max	57	53	58	56	57	59
Asian							
Mean		46.85	49.38	51.05	53.46	52.58	50.60
Std Dev		12.33	7.07	8.04	5.50	7.21	9.03
Percentiles:	Min	20	21	28	29	29	23
	25	36	48	48	56	49	47
	50	52	53	54	56	57	55
	75	57	53	58	56	57	57
	Max	57	53	58	56	57	59
Native American							
Mean		49.06	49.82	47.98	49.60	48.87	48.73
Std Dev		9.13	7.19	10.44	11.11	11.58	10.45
Percentiles:	Min	22	18	5	5	11	7
	25	45	53	42	50	43	45
	50	52	53	51	56	54	52
	75	57	53	55	56	57	56
	Max	57	53	58	56	57	59
Other Ethnicity							
Mean		46.27	47.31	47.69	45.87	43.23	45.19
Std Dev		14.56	10.63	12.88	12.11	16.44	13.58
Percentiles:	Min	3	18	12	13	4	8
	25	36	48	43	42	33	37
	50	54	53	53	48	49	50
	75	57	53	58	56	57	56
	Max	57	53	58	56	57	59

Comorbidity Conditions

Table 9.4: Pediatric Parent Child Normative Scores by Comorbidity	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Comorbidity Conditions						
Juvenile Arthritis (1-2 Joints)						
Mean	54.37	52.90	44.14	38.20	34.19	43.17
Std Dev	3.59	0.00	6.42	12.02	13.11	1.82

Percentiles:	Min	50	53	38	24	18	41
	25	50	53	39	28	21	41
	50	57	53	43	38	36	44
	75	57	53	49	49	46	44
	Max	57	53	55	56	47	44
Juvenile Arthritis (Many Joints)							
	Mean	44.80	38.82	49.82	20.61	53.69	32.87
	Std Dev						
Percentiles:	Min	45	39	50	21	54	33
	25	45	39	50	21	54	33
	50	45	39	50	21	54	33
	75	45	39	50	21	54	33
	Max	45	39	50	21	54	33
Anorexia/Bulimia							
	Mean	39.58	46.15	42.25	45.20	37.73	38.02
	Std Dev	22.59	14.10	20.39	16.16	18.86	22.76
Percentiles:	Min	10	18	11	21	11	5
	25	15	40	19	27	19	15
	50	54	53	52	56	41	47
	75	57	53	58	56	55	57
	Max	57	53	58	56	57	59
Asthma							
	Mean	49.82	48.61	48.11	46.38	48.01	47.19
	Std Dev	11.16	15.47	12.51	13.69	11.74	14.64
Percentiles:	Min	-30	-123	-23	-11	-7	-57
	25	47	53	44	39	43	43
	50	54	53	52	56	54	51
	75	57	53	58	56	57	56
	Max	57	53	58	56	57	59
Attention/Behavioral Problems							
	Mean	48.96	49.45	47.29	46.96	43.67	47.03
	Std Dev	11.23	7.67	11.87	12.53	12.94	11.67
Percentiles:	Min	3	12	2	-8	4	-1
	25	47	49	43	40	36	42
	50	54	53	51	56	47	51
	75	57	53	55	56	57	56
	Max	57	53	58	56	57	59
Chronic Allergy/Sinus							
	Mean	51.08	50.14	49.00	46.28	47.68	48.25
	Std Dev	9.42	9.00	10.84	12.60	11.52	11.60
Percentiles:	Min	-8	-72	-22	-11	-7	-50
	25	50	53	45	37	43	44
	50	54	53	52	50	54	52
	75	57	53	58	56	57	56
	Max	57	53	58	56	57	59
Developmental Delay							
	Mean	39.26	39.24	38.04	43.62	41.48	37.09
	Std Dev	19.24	32.44	18.62	15.93	14.76	20.76
Percentiles:	Min	-30	-123	-23	-11	-7	-57
	25	32	41	27	34	32	32
	50	47	53	43	50	47	43
	75	54	53	52	56	54	51

Max	57	53	58	56	57	59
Mental Retardation						
Mean	15.16	8.48	20.15	37.50	33.97	14.93
Std Dev	28.36	61.74	20.72	22.19	13.01	30.70
Percentiles: Min	-30	-123	-23	-8	15	-57
25	4	14	9	22	22	3
50	13	32	22	50	38	21
75	38	50	34	56	46	37
Max	57	53	52	56	54	55
Diabetes						
Mean	52.34	52.02	52.79	48.96	46.60	51.96
Std Dev	4.22	2.16	3.19	8.77	7.77	5.61
Percentiles: Min	47	48	50	34	36	43
25	49	52	50	40	41	48
50	52	53	51	53	45	52
75	57	53	56	56	55	57
Max	57	53	58	56	57	59
Epilepsy						
Mean	32.58	24.20	33.00	42.61	38.76	31.82
Std Dev	26.78	53.73	23.83	20.71	17.06	30.89
Percentiles: Min	-30	-123	-23	-11	-7	-57
25	20	26	19	36	27	22
50	47	48	43	56	47	42
75	54	53	51	56	54	52
Max	57	53	58	56	57	57
Hearing Impairment/Deafness						
Mean	46.61	46.23	48.63	43.68	46.60	46.27
Std Dev	16.02	25.18	10.71	15.07	10.31	12.71
Percentiles: Min	-30	-123	6	-6	22	3
25	42	48	45	32	40	42
50	53	53	51	50	50	48
75	57	53	55	56	55	56
Max	57	53	58	56	57	59
Heart Problems						
Mean	39.80	43.07	40.15	43.99	43.86	38.31
Std Dev	17.00	22.07	18.07	17.32	14.28	21.37
Percentiles: Min	-8	-72	-22	-11	-7	-50
25	28	38	32	37	34	28
50	45	53	46	56	43	42
75	54	53	55	56	57	55
Max	57	53	58	56	57	59
Learning Problems						
Mean	43.34	42.57	42.25	42.62	39.39	40.24
Std Dev	18.83	29.27	17.11	15.66	15.27	19.84
Percentiles: Min	-30	-123	-23	-11	-7	-57
25	39	42	34	32	29	33
50	51	53	49	50	43	46
75	57	53	55	56	54	54
Max	57	53	58	56	57	59
Sleep Disturbance						
Mean	46.31	44.00	43.70	42.71	42.11	41.54
Std Dev	15.96	25.36	16.34	15.25	15.99	19.59
Percentiles: Min	-30	-123	-23	-11	-7	-57

25	42	48	36	37	32	36
50	53	53	50	50	48	46
75	57	53	55	56	57	53
Max	57	53	58	56	57	59
Speech Problems						
Mean	46.71	46.62	46.27	45.84	46.33	45.12
Std Dev	15.36	22.50	14.37	13.52	12.39	15.83
Percentiles: Min	-30	-123	-23	-8	4	-57
25	42	48	43	37	40	39
50	54	53	51	56	50	50
75	57	53	55	56	57	56
Max	57	53	58	56	57	59
Vision Problems						
Mean	49.29	46.77	47.03	46.22	46.06	46.65
Std Dev	14.10	23.18	15.66	13.98	13.24	16.87
Percentiles: Min	-30	-123	-23	-11	-7	-57
25	47	53	46	40	40	42
50	54	53	53	50	50	52
75	57	53	58	56	57	56
Max	57	53	58	56	57	59

Parent-Adolescent Questionnaire

The parent-adolescent measure contains the same six scales found in the parent-child instrument; a global functioning assessment, an assessment of the child's functioning in his or her upper extremities, as well as measures of the child's mobility, sports and physical functioning, pain and happiness.

Parent-Adolescent: Overall Normative and AAOS Raw Scores

To compute a norm-based Parent-Adolescent score for an individual patient/child or group of patients/children, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 9.1 below.

Table 10.1: Pediatric Parent Adolescent Normative Scores	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Normative Scores						
OVERALL						
Mean	50.00	50.00	50.00	50.00	50.00	50.00

Std Dev		10.00	10.00	10.00	10.00	10.00	10.00
Percentiles:	Min	-145	-168	-32	-3	5	-66
	25	52	52	48	46	46	47
	50	52	52	53	57	52	54
	75	52	52	56	57	60	57
	Max	52	52	56	57	60	57
<i>AAOS Raw Scores</i>							
	Mean	98.82	99.22	93.66	88.96	81.47	95.15
	Std Dev	5.08	4.56	10.99	16.67	18.01	7.24

Parent-Adolescent: Normative Scores by Demographic Markers

For example, if the patient's AAOS score on the Parent-Adolescent Happiness scale is 73.6, then that individual's Parent-Adolescent Happiness scale score is calculated as:

$((73.6 - 81.47) / 18.01 * 10) + 50 = 45.63$. In this instance, the patient's normalized score is nearly .5 standard deviations from the overall general population mean.

Gender

Table 11.2: Pediatric Parent Adolescent Normative Scores by Gender	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function	
Gender							
Male							
Mean	50.13	50.09	50.11	50.56	50.48	50.40	
Std Dev	10.68	9.03	10.08	9.72	9.67	9.83	
Percentiles:	Min	-145	-168	-32	-3	13	-66
	25	52	52	48	47	46	47
	50	52	52	53	57	52	54
	75	52	52	56	57	60	57
	Max	52	52	56	57	60	57
Female							
Mean	49.86	49.91	49.88	49.41	49.49	49.57	
Std Dev	9.22	10.94	9.92	10.26	10.32	10.16	
Percentiles:	Min	-145	-168	-31	-3	5	-64
	25	52	52	48	43	44	46
	50	52	52	53	57	52	53
	75	52	52	56	57	60	57
	Max	52	52	56	57	60	57

Ethnicity

Table 11.3: Pediatric Parent Adolescent Normative Scores by Ethnicity		Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Ethnicity							
White							
Mean		50.16	49.98	50.02	50.03	49.96	50.04
Std Dev		9.69	10.45	10.02	10.02	9.93	10.10
Percentiles:	Min	-145	-168	-32	-3	5	-66
25		52	52	48	46	44	47
50		52	52	53	57	52	54
75		52	52	56	57	60	57
Max		52	52	56	57	60	57
Black							
Mean		48.92	50.13	50.06	49.35	50.66	49.54
Std Dev		14.38	5.53	8.97	10.98	10.00	9.62
Percentiles:	Min	-119	12	5	7	24	8
25		52	52	48	43	44	46
50		52	52	53	57	55	54
75		52	52	56	57	60	57
Max		52	52	56	57	60	57
Hispanic							
Mean		49.50	50.40	49.43	48.29	49.39	49.06
Std Dev		8.92	4.17	10.73	10.90	10.77	9.55
Percentiles:	Min	-13	25	-11	15	8	7
25		52	52	48	41	43	44
50		52	52	53	57	52	54
75		52	52	56	57	58	57
Max		52	52	56	57	60	57
Asian							
Mean		49.37	50.78	48.97	49.83	48.81	49.58
Std Dev		4.95	2.98	8.55	9.59	11.27	7.10
Percentiles:	Min	37	39	13	26	13	32
25		44	52	46	46	44	47
50		52	52	52	52	52	51
75		52	52	56	57	58	55
Max		52	52	56	57	60	57
Native American							
Mean		48.91	47.49	47.95	48.80	48.67	47.91
Std Dev		10.53	12.89	11.92	11.44	11.19	12.34
Percentiles:	Min	-5	-34	-12	10	8	-17
25		52	52	46	41	41	42
50		52	52	52	57	49	53
75		52	52	56	57	58	57
Max		52	52	56	57	60	57
Other Ethnicity							
Mean		45.39	50.46	49.09	47.91	49.40	47.72
Std Dev		24.67	4.20	9.24	10.76	10.01	10.42
Percentiles:	Min	-119	32	17	15	24	7

25	52	52	45	41	44	43
50	52	52	52	52	49	52
75	52	52	56	57	58	55
Max	52	52	56	57	60	57

Comorbidity Conditions

Table 11.4: Pediatric Parent Adolescent Normative Scores by Comorbidity	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Comorbidity Conditions						
Juvenile Arthritis (1-2 Joints)						
Mean	41.02	38.04	39.24	35.01	45.08	33.62
Std Dev	30.20	34.90	18.61	15.05	11.84	22.06
Percentiles: Min	-137	-168	-31	6	5	-64
25	44	39	33	21	40	23
50	52	52	46	37	46	39
75	52	52	51	45	54	49
Max	52	52	56	57	60	57
Juvenile Arthritis (Many Joints)						
Mean	33.37	30.60	37.44	33.42	43.76	29.72
Std Dev	41.78	47.13	21.23	16.57	12.71	27.74
Percentiles: Min	-137	-168	-28	6	5	-64
25	31	29	25	20	38	17
50	52	45	42	36	44	35
75	52	52	56	51	53	52
Max	52	52	56	57	60	57
Anorexia/Bulimia						
Mean	45.15	44.89	45.57	43.12	43.26	42.68
Std Dev	13.47	13.11	15.53	14.58	14.37	16.57
Percentiles: Min	-5	-1	-5	10	10	-10
25	39	45	41	35	30	36
50	52	52	53	48	46	46
75	52	52	56	57	55	57
Max	52	52	56	57	60	57
Asthma						
Mean	49.25	49.80	47.45	47.25	48.37	47.21
Std Dev	9.05	6.10	11.07	11.42	10.12	10.70
Percentiles: Min	-70	-34	-20	-3	5	-19
25	52	52	44	41	44	43
50	52	52	52	52	49	51
75	52	52	56	57	58	55
Max	52	52	56	57	60	57
Attention/Behavioral Problems						
Mean	47.60	48.72	46.47	47.94	45.44	46.83
Std Dev	14.16	10.95	12.73	11.56	11.61	12.10
Percentiles: Min	-119	-102	-31	6	5	-30

25	52	52	43	41	38	43
50	52	52	51	52	46	51
75	52	52	56	57	55	55
Max	52	52	56	57	60	57
Chronic Allergy/Sinus						
Mean	48.97	48.90	47.69	46.57	48.27	46.81
Std Dev	13.26	14.05	12.28	11.76	10.30	12.73
Percentiles: Min	-145	-168	-32	-3	5	-66
25	52	52	46	41	44	43
50	52	52	52	50	49	51
75	52	52	56	57	58	55
Max	52	52	56	57	60	57
Developmental Delay						
Mean	39.53	43.76	38.45	46.63	42.81	40.82
Std Dev	28.66	28.58	18.93	12.50	13.03	19.33
Percentiles: Min	-145	-168	-32	6	8	-66
25	37	52	29	37	33	36
50	52	52	46	52	46	47
75	52	52	52	57	55	53
Max	52	52	56	57	60	57
Mental Retardation						
Mean	32.37	35.62	30.83	45.39	46.09	34.66
Std Dev	42.50	39.61	25.31	15.49	14.05	26.65
Percentiles: Min	-145	-168	-32	6	8	-66
25	33	34	17	34	38	21
50	52	52	39	57	49	41
75	52	52	53	57	58	55
Max	52	52	56	57	60	57
Diabetes						
Mean	49.48	46.90	48.26	48.22	49.80	47.77
Std Dev	11.49	10.14	10.00	13.05	8.79	12.84
Percentiles: Min	-5	14	23	6	30	14
25	52	50	43	43	46	44
50	52	52	52	57	52	54
75	52	52	56	57	58	57
Max	52	52	56	57	60	57
Epilepsy						
Mean	40.54	41.00	41.05	46.81	45.74	41.66
Std Dev	36.36	34.51	20.30	13.26	12.83	22.61
Percentiles: Min	-145	-168	-31	16	8	-52
25	44	45	33	41	35	37
50	52	52	50	57	49	51
75	52	52	56	57	58	57
Max	52	52	56	57	60	57
Hearing Impairment/Deafness						
Mean	47.22	45.67	44.15	45.93	47.58	44.31
Std Dev	11.62	19.70	17.24	13.36	9.60	15.18
Percentiles: Min	-30	-87	-26	6	19	-11
25	44	52	40	37	41	41
50	52	52	51	52	49	48
75	52	52	56	57	55	56
Max	52	52	56	57	60	57
Heart Problems						

Mean		48.38	48.91	46.15	47.09	48.04	46.62
Std Dev		11.54	8.55	12.61	11.98	10.76	11.88
Percentiles:	Min	-13	-1	-20	-3	16	0
	25	52	52	41	37	44	39
	50	52	52	49	52	49	51
	75	52	52	56	57	58	55
	Max	52	52	56	57	60	57
Learning Problems							
Mean		45.40	46.43	43.92	47.19	45.36	44.72
Std Dev		21.88	21.36	16.43	12.07	12.16	16.18
Percentiles:	Min	-145	-168	-32	6	5	-66
	25	44	52	39	41	38	41
	50	52	52	50	52	46	50
	75	52	52	56	57	55	55
	Max	52	52	56	57	60	57
Sleep Disturbance							
Mean		47.37	47.46	43.35	42.52	43.50	42.34
Std Dev		9.54	8.96	13.06	13.60	11.86	12.73
Percentiles:	Min	-5	-8	-3	4	5	3
	25	44	45	37	32	35	35
	50	52	52	48	45	46	46
	75	52	52	53	57	52	53
	Max	52	52	56	57	60	57
Speech Problems							
Mean		44.14	44.58	43.74	48.86	47.64	45.12
Std Dev		26.33	28.35	17.62	11.24	11.49	18.20
Percentiles:	Min	-145	-168	-32	6	13	-66
	25	44	52	40	43	41	43
	50	52	52	51	57	49	51
	75	52	52	56	57	58	55
	Max	52	52	56	57	60	57
Vision Problems							
Mean		49.04	48.90	47.87	48.57	48.42	48.00
Std Dev		12.85	15.30	12.31	10.84	10.22	12.07
Percentiles:	Min	-145	-168	-31	-3	8	-64
	25	52	52	46	42	44	44
	50	52	52	52	52	49	53
	75	52	52	56	57	58	55
	Max	52	52	56	57	60	57

Pediatric Adolescent Questionnaire

As in the parent-child and the parent-adolescent surveys, the adolescent measure is comprised of six scales; a global functioning assessment, an assessment of the child's functioning in his or her upper extremities, as well as measures of the child's mobility, sports and physical functioning, pain and happiness.

Adolescent: Overall Normative and AAOS Raw Scores

To compute a norm-based Adolescent score for an individual adolescent or group of adolescents, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 11.1 below.

Table 11.1: Pediatric Adolescent Normative Scores	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Adolescent Normative Scores						
OVERALL						
Mean	50.00	50.00	50.00	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00	10.00	10.00	10.00
Percentiles: Min	-150	-161	-48	23	3	11
25	53	52	51	46	46	45
50	53	52	55	57	52	56
75	53	52	55	57	57	58
Max	53	52	55	57	60	58
<i>AAOS Raw Scores</i>						
Mean	98.71	99.05	95.51	89.31	81.83	95.88
Std Dev	4.73	4.70	9.74	14.79	17.59	5.38

For example, if the patient's AAOS score on the Adolescent Happiness scale is 63.7, then that individual's Adolescent Happiness scale score is calculated as:

$((63.7 - 81.83) / 17.59 * 10) + 50 = 39.69$. In this instance, the patient's normalized score is just greater than one standard deviations from the overall general population mean.

Adolescent: Normative Scores by Demographics

Gender

Table 11.2: Pediatric Adolescent Normative Scores by Gender		Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Gender							
Male							
Mean		50.51	50.23	50.98	50.85	51.11	51.84
Std Dev		9.47	9.57	9.01	9.76	9.51	8.52
Percentiles:	Min	-150	-161	-48	23	3	22
25		53	52	51	46	46	48
50		53	52	55	57	55	56
75		53	52	55	57	60	58
Max		53	52	55	57	60	58
Female							
Mean		49.46	49.75	48.97	49.00	48.82	47.85
Std Dev		10.51	10.43	10.86	10.29	10.37	11.21
Percentiles:	Min	-150	-161	-48	23	3	11
25		53	52	46	46	43	41
50		53	52	55	57	52	50
75		53	52	55	57	57	58
Max		53	52	55	57	60	58

Ethnicity

Table 11.3: Pediatric Adolescent Normative Scores by Ethnicity		Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Ethnicity							
White							
Mean		50.04	50.08	50.01	49.49	49.91	49.58
Std Dev		9.96	9.68	9.98	10.37	9.95	10.30
Percentiles:	Min	-150	-161	-48	23	3	11
25		53	52	51	46	46	43
50		53	52	55	57	52	54
75		53	52	55	57	57	58
Max		53	52	55	57	60	58
Black							
Mean		48.96	49.37	48.81	55.95	51.61	54.55
Std Dev		13.40	14.71	12.15	3.83	9.42	7.32
Percentiles:	Min	-106	-135	-48	46	23	35
25		53	52	47	57	46	55
50		53	52	55	57	55	58
75		53	52	55	57	60	58
Max		53	52	55	57	60	58
Hispanic							

Mean	49.90	48.89	49.35	51.28	49.43	50.22
Std Dev	14.49	17.03	11.71	9.70	10.90	8.41
Percentiles: Min	-106	-135	-48	35	6	37
25	53	52	47	42	43	43
50	53	52	55	57	52	50
75	53	52	55	57	57	58
Max	53	52	55	57	60	58
Asian						
Mean	47.23	46.75	48.99	49.79	49.57	48.98
Std Dev	23.44	27.57	15.66	12.88	9.24	13.44
Percentiles: Min	-106	-135	-48	35	26	33
25	53	52	49	35	43	33
50	53	52	55	57	52	56
75	53	52	55	57	57	58
Max	53	52	55	57	60	58
Native American						
Mean	48.22	46.50	47.21	51.48	49.12	53.01
Std Dev	17.45	22.35	15.92	6.64	10.60	4.42
Percentiles: Min	-106	-135	-48	46	9	48
25	53	52	46	46	43	49
50	53	52	55	51	52	53
75	53	52	55	57	57	57
Max	53	52	55	57	60	58
Other Ethnicity						
Mean	46.22	46.49	47.90	57.23	49.77	55.79
Std Dev	21.06	24.36	14.41	0.00	10.64	2.63
Percentiles: Min	-106	-135	-48	57	21	54
25	44	48	46	57	43	54
50	53	52	52	57	55	56
75	53	52	55	57	57	58
Max	53	52	55	57	60	58

Comorbidity Conditions

Table 11.4: Pediatric Adolescent Normative Scores by Comorbidity	Upper Extremity	Mobility	Sports/ Physical Functioning	Pain	Happiness	Global Function
Comorbidity Conditions						
Juvenile Arthritis (1-2 Joints)						
Mean	44.61	45.80	44.47	34.75	45.91	32.10
Std Dev	19.29	19.66	14.57	15.94	11.94	16.01
Percentiles: Min	-106	-135	-48	23	3	22
25	44	46	39	23	40	22
50	53	52	50	29	46	25
75	53	52	55	52	55	49
Max	53	52	55	57	60	56
Juvenile Arthritis (Many Joints)						
Mean	36.82	34.95	38.92	34.91	45.85	27.92
Std Dev	44.66	49.05	26.33		10.65	

Percentiles:	Min	-150	-161	-48	35	3	28
	25	44	46	40	35	43	28
	50	53	52	47	35	46	28
	75	53	52	55	35	54	28
	Max	53	52	55	35	60	28
Anorexia/Bulimia							
	Mean	45.94	41.60	42.31	43.20	41.75	41.86
	Std Dev	23.40	30.83	19.49	10.65	14.21	13.61
Percentiles:	Min	-106	-135	-48	35	3	24
	25	44	46	36	35	35	28
	50	53	52	51	40	46	44
	75	53	52	55	54	51	54
	Max	53	52	55	57	60	56
Asthma							
	Mean	49.09	49.16	47.47	45.98	47.84	47.43
	Std Dev	10.52	10.28	11.93	12.40	10.85	12.78
Percentiles:	Min	-106	-135	-48	23	3	11
	25	53	52	44	35	43	43
	50	53	52	55	46	49	52
	75	53	52	55	57	57	58
	Max	53	52	55	57	60	58
Attention/Behavioral Problems							
	Mean	48.54	48.57	47.17	53.45	46.24	52.30
	Std Dev	11.63	12.75	13.11	6.65	11.43	8.49
Percentiles:	Min	-106	-135	-48	35	3	30
	25	53	52	44	48	40	48
	50	53	52	55	57	46	58
	75	53	52	55	57	55	58
	Max	53	52	55	57	60	58
Chronic Allergy/Sinus							
	Mean	48.41	48.65	47.91	46.57	48.03	45.61
	Std Dev	14.73	14.22	12.46	11.46	10.86	12.80
Percentiles:	Min	-150	-161	-48	23	3	11
	25	53	52	46	35	43	37
	50	53	52	55	46	49	50
	75	53	52	55	57	57	58
	Max	53	52	55	57	60	58
Developmental Delay							
	Mean	37.96	40.22	38.56	50.47	43.05	46.87
	Std Dev	34.04	35.76	23.89	10.02	13.32	13.30
Percentiles:	Min	-150	-161	-48	35	12	30
	25	36	46	34	40	34	33
	50	53	52	47	57	46	54
	75	53	52	55	57	55	58
	Max	53	52	55	57	60	58
Mental Retardation							
	Mean	33.17	32.20	31.90	34.91	45.20	29.78
	Std Dev	48.02	48.53	28.71		11.01	
Percentiles:	Min	-150	-161	-48	35	18	30
	25	36	39	24	35	35	30
	50	53	52	39	35	46	30
	75	53	52	55	35	55	30
	Max	53	52	55	35	60	30

Diabetes						
Mean	45.57	44.65	45.59	57.23	44.96	53.94
Std Dev	29.52	33.36	19.24		14.00	
Percentiles: Min	-106	-135	-48	57	3	54
25	53	52	46	57	39	54
50	53	52	53	57	48	54
75	53	52	55	57	55	54
Max	53	52	55	57	60	54
Epilepsy						
Mean	35.27	37.93	40.19	57.23	44.58	57.65
Std Dev	44.22	43.17	25.39		12.56	
Percentiles: Min	-150	-161	-48	57	15	58
25	42	46	37	57	36	58
50	53	52	49	57	46	58
75	53	52	55	57	55	58
Max	53	52	55	57	60	58
Hearing Impairment/Deafness						
Mean	46.80	45.16	44.37	49.79	47.57	53.94
Std Dev	17.50	24.62	18.63	12.88	11.65	5.26
Percentiles: Min	-106	-135	-48	35	7	50
25	44	48	42	35	40	50
50	53	52	51	57	49	54
75	53	52	55	57	57	58
Max	53	52	55	57	60	58
Heart Problems						
Mean	48.41	47.68	46.73	57.23	48.21	57.65
Std Dev	17.14	20.76	14.28		9.15	
Percentiles: Min	-106	-135	-48	57	15	58
25	53	52	43	57	43	58
50	53	52	51	57	46	58
75	53	52	55	57	55	58
Max	53	52	55	57	60	58
Learning Problems						
Mean	46.04	45.35	44.05	50.87	46.15	48.36
Std Dev	21.87	24.05	18.09	9.31	11.47	10.48
Percentiles: Min	-150	-161	-48	35	3	30
25	44	52	42	43	38	37
50	53	52	51	57	46	52
75	53	52	55	57	55	58
Max	53	52	55	57	60	58
Sleep Disturbance						
Mean	46.64	46.67	44.94	47.16	43.50	45.62
Std Dev	15.23	16.22	13.26	13.46	12.15	15.14
Percentiles: Min	-106	-135	-48	23	3	11
25	44	46	39	35	38	35
50	53	52	51	57	46	54
75	53	52	55	57	52	58
Max	53	52	55	57	60	58
Speech Problems						
Mean	44.17	43.32	43.83	50.76	47.40	50.48
Std Dev	29.31	31.66	20.59	12.79	11.50	12.89
Percentiles: Min	-150	-161	-48	23	12	22
25	44	52	42	46	40	50

50	53	52	52	57	49	58	
75	53	52	55	57	57	58	
Max	53	52	55	57	60	58	
Vision Problems							
Mean	48.77	48.74	48.01	52.05	48.17	51.15	
Std Dev	13.55	14.87	12.30	8.10	10.76	8.85	
Percentiles:	Min	-150	-161	-48	35	3	30
25	53	52	46	46	43	46	
50	53	52	55	57	49	56	
75	53	52	55	57	57	58	
Max	53	52	55	57	60	58	

CHAPTER SEVEN: COMORBIDITY INDEXES

Adult and Pediatric Comorbidity Scales

As described in chapter one, each of the survey instruments contained a 14-item comorbidity check-list asking respondents to indicate whether or not they have problems due to one or more of the comorbid conditions listed, if they have received treatment for the condition(s) and if the condition(s) limit their activities. Responses from each of these response categories were used to calculate three comorbidity sub-scales and an overall comorbidity score value. Reported below in tables 12 and 13 are the aggregated norm-based scores for the eight adult and three pediatric measures. Tables 12.1 and 13.1 contain the AAOS raw scores required for the conversion of patients' AAOS raw scores to norm-based values.

Adult Comorbidity Scale

Adult Comorbidities: Overall Normative and AAOS Raw Scores

To compute a norm-based Adult Comorbidity score for an individual or group, use the scoring algorithm described above in the chapter one. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 12.1 below.

Overall Adult Comorbidity Normative and AAOS Raw Scores

Table 12.1: Adult Comorbidity Normative Scores	Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Normative Scores				
OVERALL				
Mean	50.00	50.00	50.00	50.00
Std Dev	10.00	10.00	10.00	10.00
Percentiles: Min	128	126	122	122
25	41	40	42	42
50	46	46	49	49
75	54	52	56	56
Max	41	40	42	42
<i>AAOS Raw Scores</i>				
Mean	8.19	11.85	9.84	9.84
Std Dev	9.04	11.66	9.84	9.84

For example, if the patient's AAOS score on the Adult Comorbidity Index is 7.22, then that individual's norm-based score is calculated as:

$((7.22 - 8.19) / 9.04 * 10) + 50 = 48.93$. In this instance, the patient's normalized score is just greater than 1/10 of a standard deviation from the overall general population mean.

Adult Comorbidities: Normative Scores by Demographic Markers

Gender

Table 12.2: Adult Comorbidity Normative Scores by Gender		Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Gender					
Male					
Mean		48.96	48.90	49.19	49.19
Std Dev		9.35	9.40	9.39	9.39
Percentiles:	Min	128	126	122	122
25		41	40	42	42
50		46	46	49	49
75		52	52	56	56
Max		41	40	42	42
Female					
Mean		50.70	50.74	50.55	50.55
Std Dev		10.36	10.32	10.35	10.35
Percentiles:	Min	117	126	114	114
25		41	40	42	42
50		49	46	49	49
75		54	58	56	56
Max		41	40	42	42

Age

Table 12.3: Adult Comorbidity Normative Scores by Age Group		Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Age					
19-34 Years					
Mean		46.21	45.96	46.09	46.09
Std Dev		6.76	6.99	6.33	6.33
Percentiles:	Min	41	40	42	42
25		41	40	42	42
50		43	46	42	42
75		49	52	49	49

Max	89	83	86	86
35-44 Years				
Mean	47.43	47.26	47.24	47.24
Std Dev	8.09	8.27	7.62	7.62
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	46	46	42	42
75	52	52	49	49
Max	102	101	100	100
45-54 Years				
Mean	50.16	50.07	50.09	50.09
Std Dev	10.17	9.98	9.98	9.98
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	46	46	49	49
75	54	52	56	56
Max	128	126	122	122
55-64 Years				
Mean	52.34	52.51	52.40	52.40
Std Dev	11.37	11.22	11.47	11.47
Percentiles: Min	41	40	42	42
25	43	46	42	42
50	49	52	49	49
75	56	58	56	56
Max	117	126	107	107
65-74 Years				
Mean	53.32	53.54	53.71	53.71
Std Dev	10.58	10.30	11.05	11.05
Percentiles: Min	41	40	42	42
25	46	46	42	42
50	52	52	49	49
75	60	58	56	56
Max	117	108	122	122
75+ Years				
Mean	54.26	54.70	54.45	54.45
Std Dev	11.17	10.95	11.52	11.52
Percentiles: Min	41	40	42	42
25	46	46	42	42
50	52	52	49	49
75	60	58	63	63
Max	123	108	114	114

Ethnicity

Table 12.4: Adult Comorbidity Normative Scores by Ethnicity	Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Ethnicity				
White				
Mean	49.22	49.00	49.22	49.22
Std Dev	10.21	9.98	9.94	9.94
Percentiles: Min	41	40	42	42
25	41	40	42	42

50	46	46	49	49
75	52	52	56	56
Max	128	108	122	122
Black				
Mean	52.07	52.08	51.29	51.29
Std Dev	12.34	11.33	11.77	11.77
Percentiles: Min	41	40	42	42
25	43	46	42	42
50	49	49	49	49
75	57	58	56	56
Max	96	83	93	93
Hispanic				
Mean	51.76	51.47	50.53	50.53
Std Dev	12.85	11.71	11.66	11.66
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	46	46	49	49
75	56	58	49	49
Max	96	83	93	93
Asian				
Mean	47.18	47.39	47.79	47.79
Std Dev	7.87	9.01	8.35	8.35
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	46	46	42	42
75	52	52	49	49
Max	83	83	86	86
Native American				
Mean	47.96	47.84	47.71	47.71
Std Dev	10.40	10.78	9.50	9.50
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	43	46	42	42
75	52	52	49	49
Max	96	89	93	93
Other Ethnicity				
Mean	52.00	50.82	50.35	50.35
Std Dev	12.81	11.70	10.46	10.46
Percentiles: Min	41	40	42	42
25	41	40	42	42
50	49	46	49	49
75	60	58	56	56
Max	96	83	93	93

Comorbidity Conditions

Table 12.5: Adult Comorbidity Normative Scores by Comorbidity	Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Comorbidity Condition				
Heart Disease				
Mean	63.18	63.19	62.73	62.73
Std Dev	12.88	11.82	13.21	13.21
Percentiles: Min	43	46	42	42
25	54	52	56	56
50	60	65	63	63
75	70	71	72	72
Max	128	126	122	122
High Blood Pressure				
Mean	57.49	58.13	58.02	58.02
Std Dev	11.39	10.66	11.63	11.63
Percentiles: Min	43	46	42	42
25	49	52	49	49
50	54	58	56	56
75	62	65	63	63
Max	128	126	122	122
Lung Disease				
Mean	64.69	64.21	62.67	62.67
Std Dev	14.27	13.34	14.72	14.72
Percentiles: Min	43	46	42	42
25	54	52	49	49
50	62	65	56	56
75	73	71	72	72
Max	128	126	122	122
Diabetes				
Mean	61.36	61.79	61.79	61.79
Std Dev	13.19	12.31	13.25	13.25
Percentiles: Min	43	46	42	42
25	52	52	49	49
50	56	58	56	56
75	67	71	72	72
Max	128	126	122	122
Ulcer/Stomach Disease				
Mean	58.56	59.24	58.44	58.44
Std Dev	12.52	11.89	12.58	12.58
Percentiles: Min	43	46	42	42
25	49	52	49	49
50	54	58	56	56
75	64	65	63	63
Max	128	126	122	122
Kidney Disease				
Mean	68.19	69.62	66.17	66.17
Std Dev	15.64	16.13	16.36	16.36
Percentiles: Min	43	46	42	42

25	56	58	56	56
50	64	65	63	63
75	77	77	79	79
Max	128	126	122	122
Liver Disease				
Mean	66.55	69.13	62.75	62.75
Std Dev	16.05	16.79	16.32	16.32
Percentiles: Min	43	46	42	42
25	54	58	49	49
50	64	65	63	63
75	75	77	72	72
Max	123	126	114	114
Anemia/Blood Disease				
Mean	61.45	62.80	59.56	59.56
Std Dev	14.21	13.44	15.01	15.01
Percentiles: Min	43	46	42	42
25	52	52	49	49
50	56	58	56	56
75	70	71	72	72
Max	123	126	122	122
Cancer				
Mean	61.95	62.80	61.56	61.56
Std Dev	13.76	13.33	14.29	14.29
Percentiles: Min	43	46	42	42
25	52	52	49	49
50	60	58	56	56
75	67	71	72	72
Max	123	126	122	122
Depression				
Mean	60.76	61.38	58.02	58.02
Std Dev	12.51	11.38	13.49	13.49
Percentiles: Min	43	46	42	42
25	52	52	49	49
50	60	58	56	56
75	67	71	63	63
Max	128	126	122	122
Osteoarthritis				
Mean	62.60	62.86	60.53	60.53
Std Dev	12.66	11.14	14.01	14.01
Percentiles: Min	43	46	42	42
25	54	52	49	49
50	60	58	56	56
75	70	71	72	72
Max	128	126	122	122
Back Pain				
Mean	56.21	57.00	54.35	54.35
Std Dev	11.41	10.35	12.21	12.21
Percentiles: Min	43	46	42	42
25	49	52	42	42
50	54	52	49	49
75	62	65	63	63
Max	128	126	122	122
Rheumatoid Arthritis				
Mean	62.83	63.72	60.12	60.12

Std Dev		13.74	12.28	15.09	15.09
Percentiles:	Min	43	46	42	42
	25	52	52	49	49
	50	60	65	56	56
	75	70	71	72	72
	Max	128	126	122	122
Other Medical Problem					
	Mean	56.87	56.99	55.65	55.65
	Std Dev	11.49	10.75	11.90	11.90
Percentiles:	Min	43	46	42	42
	25	49	52	49	49
	50	54	52	49	49
	75	62	65	63	63
	Max	128	126	122	122

Pediatric Comorbidity Scale

Pediatric Comorbidities: Overall Normative and AAOS Raw Scores

To compute a norm-based Pediatric Comorbidity score for an child or group of children, use the scoring algorithm described above in the introduction. The AAOS mean scores and standard deviations for calculating the norm-based values can be accessed in the overall population scores in Table 13.1 below.

Table 13.1: Pediatric Comorbidity Normative Scores	Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Normative Scores				
OVERALL				
	Mean	50.00	50.00	50.00
	Std Dev	10.00	10.00	10.00
Percentiles:	Min	43	43	44
	25	43	43	44
	50	47	49	44
	75	53	56	53
	Max	165	143	156
AAOS Raw Scores				
	Mean	4.08	7.21	3.91
	Std Dev	6.18	9.93	6.69

For example, if the patient's AAOS score on the Pediatric Comorbidity Index scale is 5.08, then that individual's functional symptoms norm-based score is calculated as:

$((5.08-4.08) / 6.18 * 10) + 50 = 51.62$. In this instance, the patient's Comorbidity Index scale score a little more than .15 standard deviations from the overall general population mean.

Adolescent Comorbidities; Normative Scores by Demographic Markers

Gender

Table 13.2: Pediatric Comorbidity Normative Scores by		Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Gender					
Male					
Mean		50.71	50.81	50.49	50.49
Std Dev		10.62	10.51	10.57	10.57
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		47	49	44	44
75		53	56	53	53
Max		152	143	128	128
Female					
Mean		49.24	49.14	49.48	49.48
Std Dev		9.23	9.35	9.33	9.33
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		47	49	44	44
75		50	49	53	53
Max		165	143	156	156

Age

Table 13.3: Pediatric Comorbidity Normative Scores by Age		Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Age Group					
10 Years and Younger					
Mean		48.69	48.44	48.95	48.95
Std Dev		9.90	9.15	10.28	10.28
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		43	43	44	44
75		50	49	53	53
Max		121	131	138	138
11 - 18 Years					
Mean		50.33	50.39	50.26	50.26
Std Dev		10.00	10.16	9.91	9.91
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		47	49	44	44
75		53	56	53	53
Max		165	143	156	156

Ethnicity

Table 13.4: Pediatric Comorbidity Normative Scores by Ethnicity		Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Ethnicity					
White					
Mean		49.93	49.98	49.92	49.92
Std Dev		9.67	9.87	9.69	9.69
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		47	49	44	44
75		53	56	53	53
Max		134	143	128	128
Black					
Mean		51.23	51.06	51.08	51.08
Std Dev		12.30	11.78	12.14	12.14
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		50	49	44	44
75		53	56	53	53
Max		152	143	138	138
Hispanic					
Mean		52.54	52.23	51.99	51.99
Std Dev		15.00	13.77	13.51	13.51
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		50	49	44	44
75		56	56	53	53
Max		165	143	156	156
Asian					
Mean		51.43	51.46	50.14	50.14
Std Dev		13.11	14.18	8.49	8.49
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		50	49	44	44
75		53	56	53	53
Max		152	143	81	81
Native American					
Mean		52.65	52.52	51.66	51.66
Std Dev		13.92	13.36	12.00	12.00
Percentiles:	Min	43	43	44	44
25		43	43	44	44
50		50	49	44	44
75		56	56	53	53
Max		152	143	128	128
Other Ethnicity					
Mean		51.87	51.57	50.58	50.58
Std Dev		13.11	12.35	9.46	9.46
Percentiles:	Min	43	43	44	44
25		43	43	44	44

50	50	49	44	44
75	53	56	53	53
Max	152	143	90	90

Comorbidity Condition

Table 13.5: Pediatric Comorbidity Normative Scores by Comorbidity	Comorbidity Index	Subscale 1	Subscale 2	Subscale 3
Comorbidity Conditions				
Juvenile Arthritis (1-2 Joints)				
Mean	67.59	69.46	60.26	60.26
Std Dev	19.46	22.55	17.61	17.61
Percentiles: Min	47	49	44	44
25	56	56	44	44
50	64	62	53	53
75	74	74	64	64
Max	165	143	156	156
Juvenile Arthritis (Many Joints)				
Mean	81.84	90.12	62.61	62.61
Std Dev	19.80	31.89	18.57	18.57
Percentiles: Min	50	49	44	44
25	68	68	44	44
50	81	81	53	53
75	97	126	73	73
Max	152	143	110	110
Anorexia/Bulimia				
Mean	73.00	81.86	59.49	59.49
Std Dev	22.37	32.61	18.41	18.41
Percentiles: Min	47	49	44	44
25	53	56	44	44
50	68	68	53	53
75	94	96	66	66
Max	152	143	138	138
Asthma				
Mean	59.60	59.83	58.69	58.69
Std Dev	13.23	13.50	13.59	13.59
Percentiles: Min	47	49	44	44
25	50	49	53	53
50	56	56	53	53
75	64	62	64	64
Max	165	143	156	156
Attention/Behavioral Problems				
Mean	62.67	63.47	59.95	59.95
Std Dev	15.37	14.51	16.20	16.20
Percentiles: Min	47	49	44	44
25	50	56	44	44
50	56	62	53	53

75	71	68	64	64
Max	165	143	156	156
Chronic Allergy/Sinus				
Mean	58.21	59.04	57.05	57.05
Std Dev	12.55	12.47	12.97	12.97
Percentiles: Min	47	49	44	44
25	50	49	44	44
50	53	56	53	53
75	64	62	64	64
Max	165	143	156	156
Developmental Delay				
Mean	75.07	74.22	69.10	69.10
Std Dev	18.71	17.17	21.16	21.16
Percentiles: Min	47	49	44	44
25	60	62	53	53
50	71	74	64	64
75	87	81	81	81
Max	165	143	156	156
Mental Retardation				
Mean	90.89	93.08	76.18	76.18
Std Dev	18.43	25.41	26.62	26.62
Percentiles: Min	50	56	44	44
25	81	74	44	44
50	94	84	81	81
75	100	112	93	93
Max	165	143	156	156
Diabetes				
Mean	71.55	84.24	56.01	56.01
Std Dev	21.80	37.62	12.26	12.26
Percentiles: Min	47	49	44	44
25	53	49	44	44
50	68	68	53	53
75	92	124	64	64
Max	152	143	90	90
Epilepsy				
Mean	78.04	82.73	67.01	67.01
Std Dev	24.05	28.92	23.94	23.94
Percentiles: Min	47	49	44	44
25	56	62	44	44
50	77	74	64	64
75	94	93	81	81
Max	165	143	156	156
Hearing Impairment/Deafness				
Mean	67.64	71.82	59.77	59.77
Std Dev	20.65	23.82	20.09	20.09
Percentiles: Min	47	49	44	44
25	53	56	44	44
50	60	62	53	53
75	78	81	64	64
Max	165	143	156	156
Heart Problems				
Mean	64.00	68.78	56.60	56.60
Std Dev	18.35	24.77	15.40	15.40

Percentiles:	Min	47	49	44	44
	25	50	56	44	44
	50	56	62	53	53
	75	74	74	64	64
	Max	152	143	119	119
Learning Problems					
	Mean	67.75	67.92	64.30	64.30
	Std Dev	16.91	15.84	18.12	18.12
Percentiles:	Min	47	49	44	44
	25	56	56	53	53
	50	64	62	64	64
	75	77	74	73	73
	Max	165	143	156	156
Sleep Disturbance					
	Mean	66.75	68.96	60.78	60.78
	Std Dev	18.65	19.21	19.10	19.10
Percentiles:	Min	47	49	44	44
	25	53	56	44	44
	50	60	62	53	53
	75	77	74	73	73
	Max	165	143	156	156
Speech Problems					
	Mean	65.20	66.97	61.07	61.07
	Std Dev	18.05	17.72	18.83	18.83
Percentiles:	Min	47	49	44	44
	25	53	56	44	44
	50	60	62	53	53
	75	74	74	73	73
	Max	165	143	156	156
Vision Problems					
	Mean	57.60	58.18	57.37	57.37
	Std Dev	12.50	13.03	12.23	12.23
Percentiles:	Min	47	49	44	44
	25	50	49	53	53
	50	53	56	53	53
	75	60	62	64	64
	Max	165	143	156	156

Appendix A: General Scoring Issues: Original AAOS Raw Scale Scores

Obtaining Original AAOS Raw Scale Scores

Following is a description of how the raw scale scores will be scored in the AAOS/COMSS/COSS Outcomes Data Collection Questionnaires. Each instrument contains a number of questions, some of which may be assessed individually, and others, which may be combined to form scales. To convert the **raw scores** to the new **Norms Based Scores** refer to the appropriate section of this document.

Each AAOS/COMSS/COSS Outcomes Data Collection Instrument contains summated scales designed to measure patient physical and mental function and symptoms (including pain). The scoring algorithms in this documentation are to be used with Version 2000 of the AAOS/COMSS/COSS Outcomes Data Collection Instruments. If you need the algorithms that are match the number of the Version 2.0 please contact the American Academy of Orthopaedic Surgeons for the separate appropriate scoring documentation.

Each summated outcomes scale (excluding comorbidities and single-item scales) is composed of the scores from related items that are averaged and then re-scaled so that each is scored from 0 (poor outcome) to 100 (best possible outcome). Final scale scores should be rounded to the nearest whole number. This is based on the scaling of the Medical Outcomes Study SF-36™. The additional instruments for adults are designed to supplement the SF-36™ with items more specific to the region and activity of interest (for example, lower limb, foot and ankle). In the region and activity-specific scales we do not score answers of 'cannot do activity due to other reason' (e.g., besides pain, swelling, knee problems), as this preserves these scales' focus on symptom- or region-related limitations of interest that add to the general functional ability captured by the SF-36™. In addition to the scales developed for adults, there are scales that have been developed to go along with the pediatric instruments.

Note: Summative scale scores should be generated if a respondent answered at least half of the items in a multi-item scale (or half plus one in the case of scales with an odd number of items); otherwise the score should not be calculated. Missing Items: If an item contained within a scale is not answered, that item is not computed into the mean used for that scale. Exceptions to the preceding rule are the Hip/Knee module 'function and limitation' scale, the Foot and Ankle module 'global foot and ankle' scale, and the DASH module. For an explanation of these exceptions refer to the sections on scoring these modules.

Please note that the above rules in this appendix do not apply to the SMFA. For the scoring rules for the SMFA refer to Appendix 5.

Appendix B: SF-36™ 2.0 Standard Version

The 2000 edition of the AAOS Outcomes Questionnaires contain the new SF-36™ 2.0 Standard Version (questions 19 to 29 in each questionnaire). The SF-36™ is a general health status questionnaire, which has been widely used, validated, and provides a common metric for all of the instruments. The SF-36™ questions are those numbered from #18-28 in the Current Health Assessment. The SF-36™ contains eight sub-scales and two summative scales (one for physical function and one for mental health). The two summative scale-scoring algorithms are unusual in that each response category for each item is independently weighted.

Scoring manuals for the SF-36™ Version 2.0 can be obtain from Quality Metric Inc. through their web site <http://www.qmetric.com/>.

Appendix C: Scoring the Current Health Assessment Raw Scale Scores:

Comorbidity Index

The Comorbidities scale is composed of the scores from related items that are averaged and then re-scaled so that each is scored from 0 (no comorbidities) to 100 (highest level of comorbidities). This scale is derived from responses to questions #4-17.

The algorithm for comorbidity is as follows:

X = Starting at zero, add one point for each “yes” answer in the three columns (had disease, being treated for it, limits me) of questions #4-17.

Note: if no “yes's” were chosen, then x= 0, as we are assuming that no “yes's” means no comorbidities.

*******Note:** If the respondent has answered “yes” to either Column 2, 'Do you receive treatment for it?' or Column 3, 'Does it Limit your activities' for a given comorbidity question, then score one point for Column 1, 'Do you have the problem?' if the respondent did not answer the column for that question.*****

$$\text{Comorbidity Index} = \frac{X}{42} \times 100$$

Comorbidity Sub-scales

The Comorbidities sub-scales are composed of the scores from related items that are averaged and then re-scaled so that each is scored from 0 (no comorbidities) to 100 (highest level of comorbidities). These scales are derived from responses to questions #4-17.

Sub-scale 1 'Do you have the problem'

This scale is derived from responses in column 1 to questions #4-17.

The algorithm for the 'Do you have the problem' comorbidity sub-scale is as follows:

X= Starting at zero add one point for each “yes” answer in column 1 'Do you have the problem' of questions #4-17.

$$\text{Comorbidity Index} = \frac{X}{14} \times 100$$

Sub-scale 2 'Do you receive treatment for it'

This scale is derived from responses in column 2 to questions #4-17.

The algorithm for the 'Do you receive treatment for it' comorbidity sub-scale is as follows:

X= Starting at zero add one point for each “yes” answer in column 2 'Do you receive treatment for it' of questions #4-17.

$$\text{Comorbidity Index} = \frac{X}{14} \times 100$$

Sub-scale 3 'Does it limit your activity'

This scale is derived from responses in column 3 to questions #4-17.

The algorithm for the 'Does it limit your activity' comorbidity sub-scale is as follows:

X= Starting at zero add one point for each "yes" answer in column 3 'Does it limit your activity' of questions #4-17.

$$\text{Comorbidity Index} = \frac{X}{14} \times 100$$

Physical Health and Pain

This scale is derived by using a simple mean of the three physical health scales ('Physical Functioning', 'Role-Physical' and 'Bodily Pain') from the SF-36 portion of this questionnaire. **Please note that this is not a SF-36 score.** This score was shown to track well with the Physician Assessed Patient Function during the validity and reliability testing of the AOSS/COMSS/COSS Instruments.

Treatment expectations

This scale is derived from responses to questions #36-40 (excluding N/A responses). If responses to more than two questions are missing this scale should not be calculated.

The algorithm for expectations is as follows:

X= the mean of questions #36-40

$$\text{Expectations} = \frac{(X-1) 100}{4}$$

The following scale replaces the treatment expectations scale in the Follow-up versions of the questionnaires.

Treatment expectations met

This scale is derived from responses to questions #36-40 (excluding N/A responses). If responses to more than two questions are missing this scale should not be calculated.

The algorithm for expectations is as follows:

X= the mean of questions #36-40

$$\text{Expectations} = 100 - \frac{(X-1) 100}{4}$$

Appendix D: Scoring the DASH (Disabilities of the Arm Shoulder and Hand)

Raw Scale Scores:

The DASH is scored in three components. First the function/symptom questions (30 items, scored 1-5), second the optional high performance sports/musicians section (4 items, scored 1-5), and third the optional high performance work section (4 items, scored 1-5).

Function/Symptoms Score

The responses to the first 30 items (questions #37-66) of the DASH are summed to form a raw score. The maximum score possible is 150; the minimum score is 30 (range of scores = 120). The raw score is then transformed to a 0 to 100 scale with 0 reflecting no disability (good function) and 100 reflecting a lot of disability.

To transform the score, follow this formula:

Function/Symptom scale (30 items, questions #45-74):

$$\frac{\text{Raw score} - 30 \text{ (minimum score)}}{\text{-----}} = \text{DASH function/symptom score}$$
$$1.20 \text{ (score range/100)}$$

Sports/Music Optional Module

The Sports/Music optional module is four items (questions #67-70), which may or may not be used by individuals because of the nature of the questions. The goal was to include items in the **QuickDASH** which would capture the very fine difficulties that professional musicians or athletes might encounter in their occupation but that might not affect their activities of daily living. The maximum score of this section is 20 with a minimum of 4. The range of scores therefore is 16. This score is also transformed to a 0-100 scale with lower scores reflecting minimal disability, and higher scores reflecting more disability.

Sports/Music Optional Module (4 items, questions #75-78):

$$\frac{\text{Raw score} - 4 \text{ (minimum score)}}{\text{-----}} = \text{DASH optional component score}$$
$$.16 \text{ (score range/100)}$$

Work Optional Module

The Work optional module is four items (questions #71-74) which may or may not be used by individuals because of the nature of the questions. The goal was to include items in the **QuickDASH**, which would capture the very fine difficulties that workers might encounter in their occupation but that might not affect their activities of daily living. The maximum score of this section is 20 with a minimum of 4. The range of scores therefore is 16. This score is also transformed to a 0-100 scale with lower scores reflecting minimal disability, and higher scores reflecting more disability.

Work Optional Module (4 items, questions #79-82)

$$\frac{\text{Raw score} - 4 \text{ (minimum score)}}{\text{-----}} = \text{DASH optional component score}$$
$$.16 \text{ (score range/100)}$$

Missing items

If less than 10% of the items (3 function/symptom questions) are left blank by the respondent, the mean (average of the scores to the other items) may be substituted in for this item. For instance, if a person responds with 28 "3" scores and two blanks, the missing values can be replaced by the value "3" as the mean of the other responses. If more than 10% are left blank, you will not be able to calculate a **DASH** score. By this same rule, no missing values can be tolerated in the high performance sports/work/music module (only 4 items).

Appendix E: Scoring the SMFA Raw Scale Scores:

Short Form Musculoskeletal Function Assessment (SMFA) Scoring

I. SCORE VALUES

A. Questions 1-25:	Not at all difficult	1
	A little difficult	2
	Moderately difficult	3
	Very difficult	4
	Unable to do	5
B. Questions 26-34	None of the time	1
	A little of the time	2
	Some of the time	3
	Most of the time	4
	All of the time	5
C. Questions 35-46	Not at all bothered	1
	A little bothered	2
	Moderately bothered	3
	Very bothered	4
	Extremely bothered	5

II. HANDLING OF MISSING RESPONSES

A. Questions 1-34:

If patients have fewer than 50% of the answers missing in any one category, substitute the mean value of that category for the missing item(s). Please see the attached form identifying items and categories for this portion of the analysis.

B. Questions 35-46 (Bother Index):

Patients with missing answers are omitted from the analyses of the Bother Index.

III. CALCULATION OF SCORES

A. Raw scores are created by summing items 1-34 for the Function Index and items 35-46 for the Bother Index, after corrections and omissions for missing values (see above); raw scores for categories are created by summing the items within each category.

B. Scores are standardized, with high scores indicating poor function and low scores indicating good function. The formula for standardization is:
$$(\text{Actual raw score} - \text{lowest possible raw score}) / \text{possible raw score range} * 100$$

C. Below are listed the values to be used for standardization:

1. Daily Activities Category:

$$((\text{raw summed score for daily activities items}-10)/40) * 100$$

2. Emotional Status Category:

$$((\text{raw summed score for emotional status items}-7)/28) * 100$$

3. Arm and Hand Function Category:

$$((\text{raw summed score for arm and hand function items}-8)/32) * 100$$

4. Mobility Category:
 ((raw summed score for mobility items - 9)/36 * 100

5. Function Index:
 ((raw summed score for items 1-34 - 34)/136) * 100

6. Bother Index:
 ((raw summed score for items 35-46 -12)/48 * 100

SMFA CATEGORIES, ITEM NUMBERS AND ITEM NAMES

Quest. #	Item	Question
Daily Activities Category		
3	house12m	How diff. to shop?
14	conf3m	How difficult to go out by yourself?
15	conf5m	How diff. for you to drive?
20	rec2m	How diff. –usual physical recreation?
21	rec4m	How diff. –usual leisure activities?
22	sex2m	How diff. –sexual activity?
23	hswrk1	How diff. –light house or yard work?
24	hswrk2	How diff. –heavy house or yard work?
25	work8m	How diff. –your usual work?
33	feel25m	How often – feel disabled?
Emotional Status Category		
7	rest8m	How diff. To get comfortable to sleep?
27	feel5m	How often –avoid using painful limbs?
29	thk2m	How often –problems concentrating?
30	feel19m	Does doing too much affect next day?
31	fam14m	How often –act irritable toward others?
32	rest3m	How often are you tired?
34	feel34m	How often frustrated –injury/arthritis?
Arm and Hand Function Category		
2	hand8m	How diff. to open medicine bottles?
5	fine2m	How diff. to make a tight fist?
9	self7m	How diff. –buttons, snaps, zippers?
10	self14m	How diff. to cut your own fingernails?
11	self11m	How diff. to dress yourself?
16	self21m	How diff. to clean after toilet?
17	hand5m	How diff. to turn knobs or levers?
18	hand7m	How diff. to write or type?
Mobility Category		
1	mobil24m	How difficult to get in/out of chair?

4	mobil13m	How diff. to climb stairs?
6	self16m	How diff. to get in/out of tub or shower?
8	mobil26m	How diff. to bend or kneel down?
12	mobil11m	How diff. to walk?
13	mobil18m	How diff. to move after sitting or lying?
19	mobil8m	How diff. to pivot?
26	mobil20m	How often –walk with a limp?
28	mobil22m	How often does leg lock or give way?

SMFA CATEGORIES, ITEM NUMBERS AND ITEM NAMES

Quest. #	Item	Question
Bother Index		
35	mobilrm	Problems using hands, arms or legs
36	backrm	Problems using back
37	houserrm	Problems doing work around home
38	selfrm	Problems –bathing, dressing, toileting
39	restrm	Problems –sleep and rest
40	rechrmm	Problems –leisure or recreation
41	famrm	Problems –friends, family
42	thkrmm	Problems –think, concentrate, memory
43	feelrm	Problems coping –injury/arthritis
44	workrm	Problems doing usual work
45	depenrm	Problems –feeling dependent
46	painrm	Problems –stiffness and pain

Appendix F: Scoring the Spine Questionnaire Raw Scale Scores:

Lumbar Spine and Cervical Spine Scales

Neurogenic symptoms

This scale is derived from responses to questions #47-49, #51-53. If responses to more than three questions are missing, this scale should not be calculated.

The algorithm for neurogenic symptoms is as follows:

X= the mean of questions #47-49 and #51-53

$$\text{Neurogenic symptoms} = 100 - \frac{(X - 1) 100}{5}$$

Pain/disability

This scale is derived from responses to questions #46, 50, and 54-62. If responses to more than five questions are missing, this scale should not be calculated.

The algorithm for pain/disability is as follows:

X= the mean of questions #46, 50 and 54-62

$$\text{Pain/disability} = 100 - \frac{(X - 1) 100}{5}$$

Cervical Spine Myelopathy Scale

Scoring for this scale will be made available upon the completion of testing.

Appendix G: Scoring the Lower Extremity Questionnaires Raw Scale Scores:

Lower Limb Questionnaire Scales

Lower Limb Core Scale

This scale is derived from responses to questions #45-51. If responses to more than three questions are missing this scale should not be calculated.

The algorithm for the lower limb core scale is as follows:

$$a = \frac{(\text{the response to question 45} - 1)5}{4}$$

$$b = \frac{(\text{the response to question 46} - 1)5}{4}$$

c = the response to question 47 – 1

d = the response to question 48 – 1

e = the response to question 49 – 1

$$f = \frac{(\text{the response to question 50} - 1)5}{6}$$

g = the response to question 51 – 1

x = the mean of questions a, b, c, d, e, f, g

lower limb core scale = 100 - x(20)

Foot and Ankle Module Scales

Global Foot and Ankle Scale

This scale is derived from responses to questions #45-62 and 73-74. If responses to more than seven questions are missing this scale should not be calculated.

The algorithm for the global foot and ankle scale is as follows:

$$a = \frac{(\text{the response to question 45} - 1)5}{4}$$

$$b = \frac{(\text{the response to question 46} - 1)5}{4}$$

c= the response to question 47 – 1

d= the response to question 48 – 1

e= the response to question 49 – 1

f= the response to question 50 – 1

$$g = \frac{(\text{the response to question 51} - 1)5}{3}$$

$$h = \frac{(\text{the response to question 52} - 1)5}{3}$$

$$i = \frac{(\text{the response to question 53} - 1)5}{3}$$

$$j = \frac{(\text{the response to question 54} - 1)5}{6}$$

k= the response to question 55 – 1

l= the response to question 56 – 1

m= the response to question 57 – 1

n= the response to question 58 – 1

o= the response to question 59 – 1

p= the response to question 60 – 1

q= the response to question 61 – 1

r= the response to question 62 – 1

s= the response to question 73 – 1

t= the response to question 74 – 1

x= the mean of questions a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t

global foot & ankle scale= 100 - x(20)

Shoe comfort

This scale is derived from responses to questions items #64-72, after dropping items scored ‘not applicable’. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for Shoe comfort is as follows:

x= the mean of questions 64 through 72

$$\text{Shoe comfort} = 100 - ((x - 1) 100)$$

Hip and Knee Questionnaire Scales

Hip/Knee Core Scale

This scale is derived from responses to questions #45-51, excluding items answered 'could not do for other reasons'. If responses to more than three questions are missing this scale should not be calculated.

The algorithm for the hip/knee core scale is as follows:

$$a = \frac{(\text{the response to question 45} - 1)5}{4}$$

$$b = \frac{(\text{the response to question 46} - 1)5}{4}$$

c= highest of the 4 scores in question 47 – 1

d= highest of the 4 scores in question 48 – 1

e= highest of the 4 scores in question 49 – 1

$$f = \frac{(\text{the response to question 50} - 1)5}{6}$$

g= the response to question 51– 1

x= the mean of a, b, c, d, e, f, g

$$\text{hip/knee core scale} = 100 - x(20)$$

Right Hip Pain Scale

This scale is derived from responses to questions #47-49. If responses to more than one question is missing this scale should not be calculated.

The algorithm for the right hip pain scale is as follows:

x= the mean of the right hip section of questions 47,48 and 49.

$$\text{right hip pain scale} = 100 - (x-1)20$$

Left Hip Pain Scale

This scale is derived from responses to questions #47-49. If responses to more than one question is missing this scale should not be calculated.

The algorithm for the left hip pain scale is as follows:

x= the mean of the left hip section of questions 47,48 and 49.

$$\text{left hip pain scale} = 100 - (x-1)20$$

Right Knee Pain Scale

This scale is derived from responses to questions #47-49. If responses to more than one question is missing this scale should not be calculated.

The algorithm for the right knee pain scale is as follows:

x= the mean of the right knee section of questions 47,48 and 49.

$$\text{right knee pain scale} = 100 - (x-1)20$$

Left Knee Pain Scale

This scale is derived from responses to questions #47-49. If responses to more than one question is missing this scale should not be calculated.

The algorithm for the left knee pain scale is as follows:

x= the mean of the left knee section of questions 47,48 and 49.

$$\text{left knee pain scale} = 100 - (x-1)20$$

Sports Knee Questionnaire Scales

Lower Limb Core Scale

This scale is derived from responses to questions #45-49, 58 and 59. If responses to more than three questions are missing this scale should not be calculated.

The algorithm for the lower limb core scale is as follows:

$$a = \frac{(\text{the response to question 45} - 1)5}{4}$$

$$b = \frac{(\text{the response to question 46} - 1)5}{4}$$

c= the response to question 47 – 1

d= the response to question 48 – 1

e= the response to question 49 – 1

$$f = \frac{(\text{the response to question 58} - 1)5}{6}$$

g= the response to question 59 – 1

x= the mean of questions a, b, c, d, e, f, g

lower limb core scale= 100 - x(20)

Knee giving way on activity

This scale is derived from responses to questions #50-53, after dropping items with 5 (could not do for other reasons) as the response. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for knee giving way on activity is as follows:

x= the mean of questions 50 through 53

$$\text{Knee giving away on activity} = 100 - \frac{(x - 1)100}{3}$$

Knee locking or catching on activity

This scale is derived from responses to questions #54-57, after dropping items with 5 (could not do activity for other reasons) as the response. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for knee locking or catching on activity is as follows:

x= the mean of questions 54 through 57

$$\text{Knee locking or catching on activity} = 100 - \frac{(x - 1)100}{3}$$

Pre-injury activity limitations due to the knee

This scale is derived from responses to questions #60-63, excluding items answered 'cannot do for other reasons'. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for pre-injury activity limitations due to the knee is as follows:

x= the mean of questions 60 through 63

$$\text{Pre-injury activity limitations due to the knee} = 100 - \frac{(x - 1)100}{4}$$

Current activity limitations due to the knee

This scale is derived from responses to questions #64-67, excluding items answered 'cannot do for other reasons'. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for current activity limitations due to the knee is as follows:

x= the mean of questions 64 through 67

$$\text{Current activity limitations due to the knee} = 100 - \frac{(x - 1)100}{4}$$

Pain on activity due to knee

This scale is derived from responses to questions #70-73, excluding items answered 'cannot do for other reasons'. If responses to more than two questions are missing this scale should not be calculated.

The algorithm for pain on activity due to knee is as follows:

x= the mean of questions 70 through 73

$$\text{Pain on activity due to knee} = 100 - \frac{(x - 1)100}{4}$$

Appendix H: Scoring the Pediatrics Outcome Data Collection Questionnaires Raw Scale Scores:

All Pediatrics Questionnaires

Pediatric Comorbidity Index

The Comorbidities scale is composed of the scores from related items that are averaged and then re-scaled so that each is scored from 0 (no comorbidities) to 100 (highest level of comorbidities). This scale is derived from responses to questions #7-22.

The algorithm for comorbidity is as follows:

x= Starting at zero, add one point for each yes answer in the three columns (had disease, being treated for it, limits me) of questions 7 through 22.

Note: if no yes's were chosen then x= 0 as we are assuming that no yes's means no comorbidities.

*****Note: If the respondent has answered yes to either Column 2 'Does your child receive treatment for it now?' or Column 3 'Are your child's activities limited by it now?' for a given comorbidity question then score one point for Column 1 'Has your child ever had it?' if the respondent did not answer the column for that question. *****

$$\text{Comorbidity Index} = \frac{x}{48} \times 100$$

Comorbidity Sub-scales

The Comorbidities sub-scales are composed of the scores from related items that are averaged and then re-scaled so that each is scored from 0 (no comorbidities) to 100 (highest level of comorbidities). These scales are derived from responses to questions #7-22.

Sub-scale 1 'Has your child ever had it?'

This scale is derived from responses in column 1 to questions #7-22.

The algorithm for the 'Has your child ever had it?' comorbidity sub-scale is as follows:

x= Starting at zero add one point for each yes answer in column 1 'Has your child ever had it?' of questions 7 through 22

$$\text{'Has your child ever had it?' comorbidity sub-scale Index} = \frac{x}{16} \times 100$$

Sub-scale 2 'Does your child receive treatment for it now?'

This scale is derived from responses in column 2 to #7-22.

The algorithm for the 'Does your child receive treatment for it now?' comorbidity sub-scale is as follows:

x= Starting at zero add one point for each yes answer in column 2 'Does your child receive treatment for it now?' of questions 7 through 22.

$$\text{'Does your child receive treatment for it now?' comorbidity sub-scale Index} = \frac{x}{16} \times 100$$

Sub-scale 3 'Are your child's activities limited by it now?'

This scale is derived from responses in column 3 to questions #7-22.

The algorithm for the 'Are your child's activities limited by it now?' comorbidity sub-scale is as follows:

x= Starting at zero add one point for each yes answer in column 3 'Are your child's activities limited by it now?' of questions 7 through 22

$$\text{'Are your child's activities limited by it now?' comorbidity sub-scale Index} = \frac{x}{16} \times 100$$

Parent (Child) Questionnaire

Upper extremity and physical function

This scale is derived from responses to questions #26, 27, 28, 29, 30, 31, 33, and 57, omitting those scored 'too young'. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the upper extremity and physical function is as follows:

x=mean of questions #26, 27, 28, 29, 30, 31, 33, and 57.

$$\text{Upper extremity and physical function} = \frac{(4 - x) \times 100}{3}$$

Transfers and basic mobility

This scale is derived from responses to questions #32, 46, 49, 50, 53, 54, 55, 56, 58, 59, 60, omitting those scored 'too young'. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the Transfers and basic mobility is as follows:

$$y = \frac{(\text{the response to question 59} - 1) \times 3}{4} + 1$$

$$z = \frac{(\text{the response to question 60} - 1) \times 3}{4} + 1$$

x=mean of questions #32, 46, 49, 50, 53, 54, 55, 56, 58, y, and z.

$$\text{Transfers and basic mobility} = \frac{(4 - x) 100}{3}$$

Sports and physical function

This scale is derived from responses to questions #43, 44, 45, 47, 48, 51, 52, 61, 69, 77, 85, 91, omitting those scored 'too young'. If responses to more than 6 questions are missing this scale should not be calculated. If 85 is scored 3, and 87 is scored 1, then question 85 will be treated as a missing answer, and xy should be omitted from the mean. If 91 is scored 3 and 97 or 98 are scored 1, then question 91 will be treated as a missing answer, and xz should be omitted from the mean. If 91 is scored 4, then question 91 will be treated as a missing answer, and xz should be omitted from the mean.

$$y = \frac{(\text{the response to question 51} - 1)3}{4} + 1$$

$$z = \frac{(\text{the response to question 52} - 1)3}{4} + 1$$

$$xy = \frac{(\text{the response to question 85} - 1)3}{2} + 1$$

$$xz = \frac{(\text{the response to question 88} - 1)3}{2} + 1$$

x= the mean of #43, 44, 45, 47, 48, y, z, 61, 69, 77, xy, and xz.

$$\text{Sports and physical function} = \frac{(4 - x) 100}{3}$$

Pain/comfort

This scale is derived from responses to questions 100, 101, 42 (reversed). If responses to more than 1 question are missing this scale should not be calculated.

$$y = \frac{(4 - \text{the response to question 42}) 4}{3} + 1$$

$$z = \frac{(\text{the response to question 100} - 1)4}{5} + 1$$

x= the mean of y, z, and question #101.

$$\text{Pain/comfort} = \frac{(4 - (x - 1)) 100}{4}$$

Expectations

This scale is derived from responses to questions #102-110. If responses to more than 4 questions are missing this scale should not be calculated.

x= the mean of questions #102-110.

$$\text{Expectations} = 100 - \frac{(x - 1)100}{4}$$

Happiness

This scale is derived from responses to questions #35-39. If responses to more than 2 questions are missing this scale should not be calculated; omitting those scored 'too young'.

x= the mean of questions #35-39.

$$\text{Happiness} = \frac{(5 - x) 100}{4}$$

Satisfaction with symptoms

This scale is derived from the response to question #111 scaled 1-5 (reversed in order to maintain consistency between all AAOS questionnaires), where 1=very dissatisfied and 5=very satisfied. If there was no response to question #111 then this scale cannot be calculated.

Global function and symptoms

This scale is derived from the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function'; and 'Pain/comfort'. If the scores to any of the four scales are missing then this scale should not be calculated.

Global function and symptoms= take the mean of the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function' and 'Pain/comfort'.

Parent (Adolescent) Questionnaire

Upper extremity and physical function

This scale is derived from responses to questions #26, 27, 28, 29, 30, 31, 33, and 57, omitting those scored 'too young'. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the upper extremity and physical function is as follows:

x=mean of questions #26, 27, 28, 29, 30, 31, 33, and 57.

$$\text{Upper extremity and physical function} = \frac{(4 - x) 100}{3}$$

Transfers and basic mobility

This scale is derived from responses to questions #32, 46, 49, 50, 53, 54, 55, 56, 58, 59, 60, omitting those scored 'too young'. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the Transfers and basic mobility is as follows:

$$y = \frac{(\text{the response to question 59} - 1)3}{4} + 1$$

$$z = \frac{(\text{the response to question 60} - 1)3}{4} + 1$$

x = mean of questions #32, 46, 49, 50, 53, 54, 55, 56, 58, y, and z.

$$\text{Transfers and basic mobility} = \frac{(4 - x) 100}{3}$$

Sports and physical function

This scale is derived from responses to questions #43, 44, 45, 47, 48, 51, 52, 61, 69, 77, 85, 91, omitting those scored 'too young'. If responses to more than 6 questions are missing this scale should not be calculated. If 85 is scored 3, and 87 is scored 1, then question 85 will be treated as a missing answer, and xy should be omitted from the mean. If 91 is scored 3 and 97 or 98 are scored 1, then question 91 will be treated as a missing answer, and xz should be omitted from the mean. If 91 is scored 4, then question 91 will be treated as a missing answer, and xz should be omitted from the mean.

$$y = \frac{(\text{the response to question 51} - 1)3}{4} + 1$$

$$z = \frac{(\text{the response to question 52} - 1)3}{4} + 1$$

$$xy = \frac{(\text{the response to question 85} - 1)3}{2} + 1$$

$$xz = \frac{(\text{the response to question 88} - 1)3}{2} + 1$$

x = the mean of #43, 44, 45, 47, 48, y, z, 61, 69, 77, xy, and xz.

$$\text{Sports and physical function} = \frac{(4 - x) 100}{3}$$

Pain/comfort

This scale is derived from responses to questions 100, 101, 42 (reversed). If responses to more than 1 question are missing this scale should not be calculated.

$$y = \frac{(4 - \text{the response to question 42}) 4}{3} + 1$$

$$z = \frac{(\text{the response to question 100} - 1) 4}{5} + 1$$

x = the mean of y, z, and question #101.

$$\text{Pain/comfort} = \frac{(4 - (x - 1)) 100}{4}$$

Expectations

This scale is derived from responses to questions #102-110. If responses to more than 4 questions are missing this scale should not be calculated.

x = the mean of questions #102-110.

$$\text{Expectations} = 100 - \frac{(x - 1) 100}{4}$$

Happiness

This scale is derived from responses to questions #35-39. If responses to more than 2 questions are missing this scale should not be calculated; omitting those scored 'too young'.

x = the mean of questions #35-39.

$$\text{Happiness} = \frac{(5 - x) 100}{4}$$

Satisfaction with symptoms

This scale is derived from the response to question #111 scaled 1-5 (reversed in order to maintain consistency between all AAOS questionnaires), where 1=very dissatisfied and 5=very satisfied. If there was no response to question #111 then this scale cannot be calculated.

Global function and symptoms

This scale is derived from the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function'; and 'Pain/comfort'. If the scores to any of the four scales are missing then this scale should not be calculated.

Global function and symptoms= take the mean of the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function' and 'Pain/comfort'.

Adolescent Questionnaire

Upper extremity and physical function

This scale is derived from responses to questions #26, 27, 28, 29, 30, 31, 33 and 57. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the upper extremity and physical function is as follows:

x=mean of questions #26, 27, 28, 29, 30, 31, 33 and 57.

$$\text{Upper extremity and physical function} = \frac{(4 - x) 100}{3}$$

Transfers and basic mobility

This scale is derived from responses to questions #32, 46, 49, 50, 53, 54, 55, 56, 58, 59, and 60. If responses to more than 4 questions are missing this scale should not be calculated.

The algorithm for the Transfers and basic mobility is as follows:

$$y = \frac{(\text{the response to question 59} - 1)}{4} + 1$$

$$z = \frac{(\text{the response to question 60} - 1)3}{4} + 1$$

x=mean of questions #32, 46, 49, 50, 53, 54, 55, 56, 58, y, and z.

$$\text{Transfers and basic mobility} = \frac{(4 - x) 100}{3}$$

Sports and physical function

This scale is derived from responses to questions #43, 44, 45, 47, 48, 51, 52, 61, 68, 75, 82, 88. If responses to more than 6 questions are missing this scale should not be calculated. If 79 is scored 3, and 84 is scored 1, then question 79 will be treated as a missing answer, and xy should be omitted from the mean. If 85 is scored 3, and 91 or 92 are scored 1, then question 85 will be treated as a missing answer, and xz should be omitted from the mean. If 85 is scored 4, then question 85 will be treated as a missing answer, and xz should be omitted from the mean.

$$y = \frac{(\text{the response to question 51} - 1)3}{4} + 1$$

$$z = \frac{(\text{the response to question 52} - 1)3}{4} + 1$$

$$xy = \frac{(\text{the response to question 82} - 1)3}{2} + 1$$

$$xz = \frac{(\text{the response to question 88} - 1)3}{2} + 1$$

x = the mean of #43, 44, 45, 47, 48, y, z, 61, 68, 88, xy, and xz.

$$\text{Sports and physical function} = \frac{(4 - x) 100}{3}$$

Pain/comfort

This scale is derived from responses to questions 97, 98, 42 (reversed). If responses to more than 1 question are missing this scale should not be calculated.

$$y = \frac{(4 - \text{the response to question 42}) 4}{3} + 1$$

$$z = \frac{(\text{the response to question 97} - 1) 4}{5} + 1$$

x = the mean of y, z, and question #98

$$\text{Pain/comfort} = \frac{(4 - (x - 1)) 100}{4}$$

Expectations

This scale is derived from responses to questions 99 - 107. If responses to more than 4 questions are missing this scale should not be calculated.

x= the mean of questions 99-107.

$$\text{Expectations} = 100 - \frac{(x - 1)100}{4}$$

Happiness

This scale is derived from responses to questions #35- 39. If responses to more than 2 questions are missing this scale should not be calculated; omitting those scored 'too young'.

x= the mean of questions #35-39.

$$\text{Happiness} = \frac{(5 - x) 100}{4}$$

Satisfaction with symptoms

This scale is derived from the response to question #108 scaled 1-5 (reversed in order to maintain consistency between all AAOS questionnaires), where 1=very dissatisfied and 5=very satisfied. If there was no response to question #108 then this scale cannot be calculated.

Global function and symptoms

This scale is derived from the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function'; and 'Pain/comfort'. If the scores to any of the four scales are missing then this scale should not be calculated. Global function and symptoms= the mean of the scale scores from the following four scales: 'Upper extremity and physical function'; 'Transfer and basic mobility'; 'Sports and physical function' and 'Pain/comfort'.

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