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Does the Oswestry or SF-36 Help a Therapist to Predict Treatment Classification

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DOES THE OSWESTRY OR SF-36
HELP A THERAPIST TO PREDICT
TREATMENT CLASSIFICATION

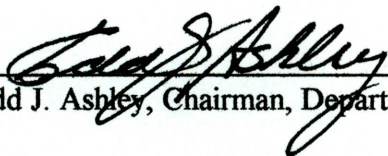
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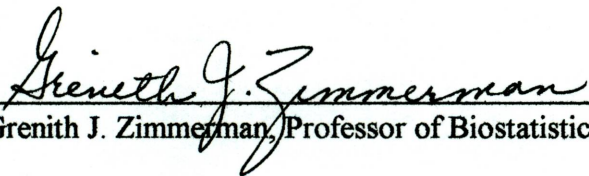
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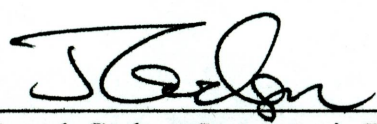
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in Partial Fulfillment of the Requirements for
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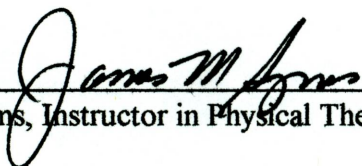
June 1998

Each person whose signature appears below certifies that this publishable paper in their opinion is adequate, in scope and quality, as a publishable paper in lieu of a thesis for the degree Doctor of Physical Therapy.


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ABSTRACT

DOES THE OSWESTRY OR SF-36 HELP A THERAPIST TO PREDICT TREATMENT CLASSIFICATION

Denese Kaufeldt-Soliz, Amy Crawford, and Joseph Godges

The purpose of this study was to determine the relationship of two disability questionnaires, the Oswestry Low Back Pain Disability Questionnaire (Oswestry) and the Medical Outcome Study Short Form-36 (SF-36), and a standardized physical examination and diagnostic classification system. The physical examination was performed by the evaluating therapists from the clinic and classification was determined by the evaluating therapists and the investigators to ensure correct subject placement into treatment Stages Ia, Ib, or II. Data collection occurred at an outpatient physical therapy clinic in a metropolitan area health maintenance organization, where a sample of 221 subjects with low back pain were obtained. Once the questionnaires were completed by the subjects, the ten items on the Oswestry and the eight items on the SF-36 were then scored by the investigators. Step-wise discriminant analysis was utilized to determine which items from the two self reporting questionnaires could predict the physical therapist assigned treatment classification. When classifying into Stage I versus Stage II, correct treatment classification could be predicted 83.6% of the time using four sub-scores (pain intensity, general health, role-physical, and sleeping). The predictability, utilizing all the sub-scores, was 87.9%. When classifying into category Ib versus Ia and II, classification into Stage Ib with the sub-scores of pain intensity and traveling had a 92.9% predictability rate.

Key Words: low back pain, assessment, Oswestry, SF-36, treatment classification, subjective exams.

Low back pain affects the majority of the adult population at some time during their life and problems associated with the low back are the most common cause of disability in adults under the age of 45¹. Patients with low back problems are commonly referred to physical therapists for evaluation and treatment. Delitto et al.² suggests that physical therapy treatment for patients with low back disorders was most efficacious if the treatment was based on data gathered during the history and physical examination. Included in the history, as described by Delitto et al.² and Jette and Jette³, is the use of standardized questionnaires.

Delitto et al.² purported that scores obtained from a commonly used questionnaire, the Oswestry, can assist the physical therapist in determining the treatment classification. Patients with Oswestry scores above 40 receive one of five Stage I treatments. The type of Stage I treatment is determined by the physical examination. Patients with Oswestry scores between 20 and 40 are thought to be less disabled and fit the criteria to receive Stage II treatments. Generally, patients who fit Stage II categories have less irritable symptoms. Accordingly, they may attend group back education and exercise instruction. Patients who have Oswestry scores of less than 20, according to Delitto, are thought to be the least disabled and fit the criteria to receive Stage III treatments. The focus on Stage III intervention is on endurance training for occupational or recreational specific activities.² The correlation between reported disabilities and physical examination findings, diagnostic categorization, or pathological processes has not been studied directly.⁴

The purpose of this study was to determine the relationship of two disability

questionnaires and a standardized physical examination and diagnostic classification system. The specific research question was: Does an Oswestry score or an SF-36 score predict treatment classification?

Methodology

Interrater Reliability Study

The researchers conducted a preliminary study to determine the interrater reliability of the objective examination. This study included five evaluators or raters and data was collected on thirty subjects with the same inclusion/exclusion criteria as listed in the *subjects* section. Each subject was evaluated by two of the five evaluators. A Chi-square test was utilized to determine if there was a significant difference for the matched versus no match of the treatment groups. The evaluators were able to classify patients into treatment groups on 87% of the samples.

Subjects

Data collection occurred for a 12 month period from March 1,1997 to March 1,1998. The site of data collection was an outpatient physical therapy clinic in a metropolitan area health maintenance organization. Data was collected on 221 persons receiving physician referral for low back examination and treatment who were scheduled and obtained their initial physical therapy evaluation on Wednesday afternoons. This study was based on data normally collected by the evaluating physical therapist involved in the examination and

treatment of low back pain patients in this clinic. No patient contact occurred by the investigators.

Instrument/ Tools

The Oswestry questionnaire is a self reporting questionnaire designed to quantify the degree of functional limitations in the following ten areas: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and in travel. Oswestry scores have demonstrated a strong reliability in determining the degree of disability in individuals experiencing low back pain. Oswestry scores are also a reliable indicator of the degree of disability an individual might be experiencing that is directly related to low back pain.^{5,6,7,8,9,10} The Oswestry score for each subject was determined using the method described by Fairbanks et al.¹¹. The Oswestry has ten sections, with each section having a possible score from 0 to 5. If all ten sections are scored by the subject, the sum of the ten sections is obtained and multiplied by two to get a final score ranging from 0 to 100. If less than ten sections are scored by the subject, the sum of the scored sections are obtained, divided by the total possible sum of the sections scored, and then multiplied by 100 to obtain a correct percentage. Each Oswestry score is given a specific disability interpretation. Persons with scores from 0 to 20 are classified as minimally disabled, 21 to 40 as moderately disabled, 41 to 60 as severely disabled, 61 to 80 as crippled, and 81 to 100 as bed bound or as having additional psychological components. Raw data regarding the number of subjects and level of disability is provided in Table 2.

The SF-36 was given to determine the general health status of an individual. It was designed to address eight core health attributes which fall under three aspects of health¹². The three aspects are functional ability, well being, and overall health. The eight health attributes are as follows: "limitations in physical activities because of health problems", "limitations in social activities because of physical or emotional problems", "limitations in usual role activities because of physical health problems", "bodily pain", "general mental health", "limitations in usual role activities because of emotional problems", "vitality", and "general health perceptions".¹³ The SF-36 has demonstrated reliability in measuring the general health status of persons.^{13,14} It has also been shown to be a reliable self-reporting questionnaire.¹² The SF-36 is scored and interpreted separately for each section as directed by the MOS trust. Each item is given a value from 1 to 6. Scores from each item in each section are totaled. The higher the score, the higher the level of functioning of the patient. Specific items for each concept are examined independently.

The physical examination in this study was designed to determine the presence and extent of impairment, measurements of neurological status, mobility of the spine, mobility of the pelvic girdle, pain related to movement of the spine, pelvic girdle positional symmetry, sacroiliac ligament tenderness, muscle/nerve flexibility, muscle strength, coordination, and body mechanics. Individuals who receive the Stage I treatment classification have (1) symptoms which centralize or peripheralize with repeated movements,^{15,16} or (2) physical examination findings which purportedly respond to manipulation.^{2,17,18} Individuals who receive the Stage II treatment classification have only

flexibility, strength, or coordination deficits. In this study, mobility of the spine and pain assessment with single and repetitive movement of the spine was based on the McKenzie and the Delitto et al physical examination.¹⁹ This type of evaluation has been found to have a poor intertester reliability²⁰, but good test-retest reliability.^{20,21}

In our study, a patient received the stage Ia classification if the physical examination revealed that his/her low back symptoms either: 1) increased in intensity *upon initiation* of standing active movements of sidebending, flexion, or extension; or 2) the *location* of the symptoms changed with repeated movements of flexion, extension, lateral shift right, or lateral shift left (i.e., the symptoms centralize or peripheralize). Depending upon the physical examination findings, the patients who received Stage Ia classification were placed into one of the following treatment categories: flexion exercises, extension exercises, lateral shift procedures, or stabilization procedures. Stage Ib classification is the mobilization /manipulation procedures category. A patient received this category if the physical examination revealed that 1) his/her low back symptoms *increased at the end range* of sidebending left or sidebending right, or 2) he/she had two out of three physical examination findings suggesting a sacroiliac disorder including an innominate movement disorder and ligament tenderness and he/she did not fit the Stage Ia classification. A patient received the Stage II classification if his/her symptoms were either painfree or the location of the symptoms did not change with repeated active movements of standing flexion or extension and he/she did not fit the criteria to be placed in either the Stage Ia or Stage Ib categories. In summary, patients who fitted the Stage Ia category had physical

examination findings suggesting that they were the most symptomatic and patients who fitted the Stage II category had physical examination findings suggesting that they were the least symptomatic.

Procedures

All forms were collected by the evaluating therapist at the outpatient physical therapy clinic and forwarded to the investigators. Forms collected included the Oswestry questionnaire, SF-36 Survey and the physical impairment examination for each subject. The investigators blacked out the subjects names on all forms to maintain confidentiality and each subject was given a number and gender identity. The investigators individually read the objective evaluation to determine the treatment classification to be sure that both the investigators and the evaluating therapist from the physical therapy clinic agreed on the treatment classification.

Data Analysis

According to Hinkle and Oliver²² the minimum sample size needed for the type of data analysis used for this study is 208 subjects. The sample size of this study had a power of 95% to reject the null hypothesis at the 0.05 level of significance. The ten items on the Oswestry questionnaire and the eight items on the SF-36 survey were then scored and data was entered into the computer utilizing the SPSS 7.5 statistical package²³ to determine their ability to predict and classify the subject into the treatment classification assigned by

the investigators and the evaluating therapist from the outpatient clinic. Step-wise discriminant analysis was utilized to determine predictability of the physical therapists assigned treatment classification from the Oswestry Scale and/or SF-36 Survey. The independent variables were the Oswestry scores and the SF-36 Survey scores. The dependent variable was the treatment classification into Stage Ia, Ib, or II.

Results

Stratification by Treatment Group Classification

Table 1 shows the distribution of gender as well as the level of impairment of the subjects. Of the subjects 42.1%(93) were male and 57.9% (128) were female. The mean age was 47 years old (SD = 13.0 years, minimum = 18, maximum = 73).

Table 1. Distribution of Gender and Level of Impairment

| | Count | Percent |
|----------------------------|-------|---------|
| Gender | | |
| Male | 93 | 42.1 |
| Female | 128 | 57.9 |
| Level of Impairment | | |
| Minimum (0-20) | 96 | 43.6 |
| Moderate (21-40) | 69 | 31.4 |
| Severe (41-60) | 47 | 21.4 |
| Crippled (61-80) | 7 | 3.2 |
| Bedbound (81-100) | 1 | .5 |

This study had a sample of 221 subjects. Data from seventeen subjects was not utilized due to the fact that they were missing one or more of the discriminating sub-scores. Of the 204 subjects used in data analysis, there were 61 subjects classified into treatment Stage Ia, 112 subjects in treatment Stage Ib, and 31 subjects in treatment Stage II. Analysis of variance was used to compare means among the three treatment

group classifications (Ia, Ib, II). All ten transformed sub-scores in the Oswestry questionnaire were significantly different among the three group's means (Table 2). For each sub-score the means in group Ia were larger than Ib, with group II having the lowest mean value, with the exception of the sub-score social life, where the reverse was seen. The transformed scores were calculated using the given values (0-5 on the Oswestry and 1-6 on the SF-36) using the designated equations discussed in the instrument section. For the MOS SF-36 sub-scores, physical functioning, role-physical, bodily pain, and social functioning showed statistically significant differences among Stages with all means in Stage Ia smaller than Ib, Stage II having the largest means with the exception of the sub-score social functioning, where the reverse was seen. Analysis of the self reported questionnaire values gave similar results (Table 3). By using the self reported values a clinician would be able to place a patient into treatment classifications. For example, the larger the self reported Oswestry sub-score, the more likely that the patient will be placed in Stage I categories and receive the appropriate intervention. Thus, if a patient rated his/her pain intensity as 3 and traveling as 3, then he/she would likely be placed into Stage Ia treatment category. If he/she rated pain intensity as 1 and traveling as 1, he/she would likely be placed in the least Stage II treatment category. The values would not have to be calculated in order to reach a specific category, only compared with Table 3.

Table 2. Comparison of Mean Transformed Scores for the Oswestry and MOS SF-36 among the Three Treatment Stages

| | Ia Mean (SD) | Ib Mean (SD) | II Mean (SD) | P-value |
|-------------------------|--------------------|---------------------|--------------------|---------|
| Oswestry | | | | |
| 1. Pain Intensity | 51.5 (\pm 31.2) | 41.4 (\pm 33.2) | 25.6 (\pm 24.0) | .001 |
| 2. Personal Care | 21.6 (\pm 25.0) | 10.6 (\pm 16.3) | 3.6 (\pm 10.6) | .000 |
| 3. Lifting | 55.0 (\pm 27.1) | 38.6 (\pm 28.0) | 33.9 (\pm 27.6) | .000 |
| 4. Walking | 30.2 (\pm 27.2) | 17.4 (\pm 21.9) | 9.7 (\pm 20.7) | .000 |
| 5. Sitting | 38.3 (\pm 28.0) | 28.7 (\pm 25.2) | 18.2 (\pm 22.6) | .001 |
| 6. Standing | 41.2 (\pm 26.5) | 28.6 (\pm 24.4) | 23.1 (\pm 25.5) | .001 |
| 7. Sleeping | 29.9 (\pm 27.6) | 20.3 (\pm 29.8) | 5.3 (\pm 12.8) | .000 |
| 8. Sex Life | 32.5 (\pm 30.2) | 20.0 (\pm 30.0) | 13.3 (\pm 20.0) | .004 |
| 9. Social Life | 50.3 (\pm 26.6) | 67.7 (\pm 25.8) | 76.1 (\pm 21.3) | .000 |
| 10. Traveling | 38.0 (\pm 28.2) | 21.2 (\pm 21.6) | 11.3 (\pm 17.6) | .000 |
| MOS SF-36 | | | | |
| 1. Physical Functioning | 44.1 (\pm 27.7) | 58.0 (\pm 24.8) | 67.5 (\pm 23.4) | .000 |
| 2. Role-Physical | 25.4 (\pm 33.9) | 34.0 (\pm 39.8) | 51.4 (\pm 42.0) | .006 |
| 3. Bodily Pain | 26.1 (\pm 18.4) | 38.5 (\pm 20.3) | 44.3 (\pm 18.4) | .000 |
| 4. General Health | 65.6 (\pm 21.5) | 67.9 (\pm 21.1) | 63.2 (\pm 17.9) | .471 |
| 5. Vitality | 47.8 (\pm 20.2) | 50.6 (\pm 21.5) | 51.0 (\pm 19.4) | .649 |
| 6. Social Functioning | 41.6 (\pm 28.4) | 25.01 (\pm 26.0) | 17.6 (\pm 21.7) | .000 |
| 7. Role-Emotional | 56.4 (\pm 41.7) | 56.3 (\pm 44.4) | 65.7 (\pm 43.2) | .502 |
| 8. Mental Health | 63.5 (\pm 20.5) | 68.6 (\pm 18.2) | 71.0 (\pm 16.1) | .096 |

Table 3. Comparison of Mean Self Reported Scores for the Oswestry and MOS SF-36 among the Three Treatment Stages

| | Ia Means (SD) | Ib Means (SD) | II Means (SD) | p-value |
|-------------------------|-------------------|-------------------|-------------------|---------|
| Oswestry | | | | |
| 1. Pain Intensity | 2.6 (\pm 1.6) | 2.1 (\pm 1.7) | 1.3 (\pm 1.2) | .001 |
| 2. Personal Care | 1.1 (\pm 1.3) | .5 (\pm .8) | .2 (\pm .5) | .000 |
| 3. Lifting | 2.8 (\pm 1.4) | 1.9 (\pm 1.4) | 1.7 (\pm 1.4) | .000 |
| 4. Walking | 1.5 (\pm 1.4) | .9 (\pm 1.1) | .5 (\pm 1.0) | .000 |
| 5. Sitting | 2.0 (\pm 1.4) | 1.4 (\pm 1.4) | .9 (\pm 1.1) | .001 |
| 6. Standing | 2.0 (\pm 1.3) | 1.4 (\pm 1.2) | 1.2 (\pm 1.3) | .001 |
| 7. Sleeping | 1.5 (\pm 1.4) | 1.0 (\pm 1.5) | .3 (\pm .6) | .000 |
| 8. Sex Life | 1.7 (\pm 1.5) | 1.0 (\pm 1.3) | .7 (\pm 1.0) | .002 |
| 9. Social Life | 2.1 (\pm 1.4) | 1.3 (\pm 1.3) | .9 (\pm 1.1) | .000 |
| 10. Traveling | 1.9 (\pm 1.4) | 1.1 (\pm 1.1) | .6 (\pm .9) | .000 |
| MOS SF-36 | | | | |
| 1. Physical Functioning | 18.4 (\pm 5.8) | 21.7 (\pm 5.1) | 23.5 (\pm 4.7) | 0 |
| 2. Role-Physical | 5.0 (\pm 1.4) | 5.4 (\pm 1.6) | 6.1 (\pm 1.7) | .006 |
| 3. Bodily Pain | 4.6 (\pm 1.8) | 5.8 (\pm 2.1) | 6.4 (\pm 1.8) | .000 |
| 4. General Health | 18.2 (\pm 4.1) | 18.6 (\pm 4.2) | 18.0 (\pm 3.1) | .699 |
| 5. Vitality | 13.6 (\pm 4.0) | 14.1 (\pm 4.3) | 14.2 (\pm 3.9) | .644 |
| 6. Social Functioning | 6.1 (\pm 2.1) | 7.4 (\pm 2.1) | 8.1 (\pm 1.7) | .000 |
| 7. Role-Emotional | 4.7 (\pm 1.3) | 4.7 (\pm 1.3) | 5.0 (\pm 1.3) | .558 |
| 8. Mental Health | 20.9 (\pm 5.1) | 22.1 (\pm 4.5) | 22.5 (\pm 4.2) | .155 |

Predictability Using All or Some of the Variables of the Oswestry and SF-36 for

Treatment Stage Classification

When all of the transformed sub-scores from the Oswestry and the SF-36 were entered into the discriminant analysis process, and the three stages of treatment classification were compared, 65.38% of cases that were correctly classified into one of the three treatment Stages. Utilizing all of the transformed sub-scores of the two scales,

51.1% (23) of the cases for Stage Ia were correctly classified, 80.7% (71) of the cases for Stage Ib were correctly classified, and 34.8% (8) of the cases for Stage II were correctly classified. With the Step-wise method 59.31% of the cases were correctly classified based on two sub-scores (pain intensity and traveling).

An equation was derived that could determine classification into Stage I versus Stage II at an 83.6% predictability rate. The equation utilizing the step-wise method, would be; $D_{\text{treatment classification I versus II}} = -2.334 + (\text{pain intensity})(.019) + (\text{general health})(.024) + (\text{role-physical})(-.012) + (\text{sleeping})(.018)$. Once a score is obtained then a treatment stage classification can be determined into Stage I or Stage II. Utilizing this equation, if the score, rounded to the nearest whole number, equals (+/-) 1 the treatment stage would be Stage I and if the score, rounded to the nearest whole number, equals (+/-) 2 the treatment stage would be Stage II. Then a further step is taken to differentiate Ia versus Ib. The equation utilizing the step-wise method, would be;

$D_{\text{treatment classification Ia versus Ib}} = -1.112 + \text{social life} (.037)$. Utilizing this equation, if the score, rounded to the nearest whole number, equals (+/-) 1 the treatment would be Stage Ia and if the score, rounded to the nearest whole number, equals (+/-) 2 the treatment stage would be Ib. This equation has a 66.7% predictability rate for classification into Ia versus Ib. Utilizing the step-wise method, 27.9% (17) of the cases of group IA were correctly classified, 92.9% (104) of the cases of group IB were correctly classified, and 0% (0) of the cases of group II were correctly classified. This could be due to smaller sample sizes in treatment Stage Ia and Stage II. The Step-wise method gave a higher percentage of

correct classifications into treatment Stage Ib and a higher percentage of misclassifications into treatment Stages Ia and II. There was also a high percentage of misclassification into Stage Ia and II utilizing all the subscores to determine treatment classification.

Discussion

The purpose of this study was to determine if the Oswestry and/or SF-36 self reporting questionnaires could be utilized to predict the treatment classification of a patient with the use of all or some of the sub-scores. If a patient's level of symptoms could be determined through the use of a questionnaire, this would assist the therapist in more accurately determining the treatment stage and thus guide intervention. Thus, a particular patient at a specific stage in an episode of low back pain would receive the most appropriate intervention, e.g.; education, activity modification, spinal manipulation, specific therapeutic exercises, general conditioning exercises, or endurance training.

Eighteen variables were considered as possible predictors of treatment classification. These variables included the ten items on the Oswestry (pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling) and the eight items on the SF-36 (physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional, and mental health). Our results, utilizing Step-wise discriminant analysis, indicated that with the use of pain intensity, general health, role-emotional, and sleeping an equation could be derived that would classify into Stage I versus Stage II at a 83.6% predictability rate. To further classify into stage Ia

versus Ib, utilizing step-wise discriminant analysis, an equation was derived using only the sub-score of social life; which resulted in a 66.7% predictability rate.

Utilizing all the sub-scores, we were able to formulate two equations, one that would predict treatment classification into I versus II 87.9% of the time and one that would predict treatment classification into Ia versus Ib 75.9% of the time, indicating a fair to good level of accuracy for classification into treatment Stages. These equations present with greater accuracy than in the step-wise discriminant analysis, however, they are so extensive that it would not be feasible to use them in the clinic due to time restraints. This ability to predict classification suggests that this equation could be used in addition to the physical assessment for the purposes of obtaining accurate treatment classification at the time of the initial examination.

In addition, giving the clinician the ability to use the table on the actual self reporting sub-score values (Table 3) would assist in determination of treatment stage, though it would not give a specific percentage of predictability. This would be true due to the consistent trends revealed in Table 3. The sub-scores on the Oswestry, going from Stage Ia to II, decrease from greater to lesser values. The sub-scores on the SF-36, with the exception of general health, increase from lesser to greater values. For example, if all the sub-scores on the Oswestry were above 3, it could be predicted that the patient would begin treatment in Stage Ia.

The results of our study suggest that it is possible to predict treatment classification with the use of the Oswestry and SF-36 in specific parts or as a whole to

determine treatment classification. In addition, classification into treatment Stage Ib would be consistent the majority of the time, in our study over 50% of the subjects fell into this category. Further research is indicated to standardize muscle and nerve flexibility testing, muscle strength testing, and coordination testing.

Conclusion

This study, however, provides an additional tool to assist the clinician in appropriate treatment classification. Generalizability of the findings is limited by the fact that this study utilized a convenience sampling of members assigned to a Health Maintenance Organization Health System.

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APPENDIX A

Oswestry Data Scoring Procedures for research on low back assessments

1. Assign values to all answers given
 - a. There are six possible answers in each of the ten sections (pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, and traveling); the answers are numbered 1 - 6.
 - b. Values: 1 = 0, 2 = 1, 3 = 2, 4 = 3, 5 = 4, and 6 = 5
 - c. Give only one value per section; if more than one answer is marked, take the highest value.
2. For the purpose of this study, each section is to be scored individually. This value is determined by taking the highest value in each specific section and dividing by 5 then multiplying by 100%. (i.e.- a score of 4 in section 1 = $4/5 = .8$ (100%) = 80%)
3. Normally the Oswestry is scored as a whole. All values are calculated together. (i.e. - if all sections were answered and resulted in a total score of 45; 45 would be divide by 50 = .9, then multiplied by 100% = 90%. If only 8 sections were answered, then the total value would by divided by the amount of sections answered multiplied by 5. So, $(8)(5)=40$. If the total score for the 8 sections = 32, the answer would = $(32/40) \times 100\% = 80\%$.
4. Assigning disability level:
 - 0 -20% = Minimal Disability
 - 21 -40% = Moderate Disability
 - 41 - 60% = Severe Disability
 - 61 - 80% = Crippled
 - 81 - 100% = bed bound or symptoms exaggerated

MOS SF-36 scoring procedures for research on low back pain assessments

1. The SF-36 is made up of 8 main categories (general health, vitality, social functioning, role - emotional, mental health, role - physical, bodily pain, and physical functioning). The items are broken up into each of these 8 categories; with exception to item #2 which doesn't fall into any of these categories. It is reserved for reported health transition.

2. Assign Values by Category

Reported Health Transition

Item #2 - answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Mental Health

Item # 9b, 9c, & 9f - answer value for 1=1, 2=2, 3=3, 4=4, 5=5, 6=6

Item # 9d & 9h - answer value for 1=6, 2=5, 3=4, 4=3, 5=2, and 6=1

Role-Emotional

Item # 5a - 5c answer value for 1=1 and 2=2

Social Functioning

Item # 6 answer value for 1=5, 2=4, 3=3, 4=2, and 5=1

Item #10 answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Vitality

Item # 9a & 9e answer value for 1= 6, 2=5, 3=4, 4=3, 5=2, and 6=1

Item # 9g & 9i answer value for 1=1, 2=2, 3=3, 4=4, 5=5, and 6=6

General Health

Item # 1 answer value for 1 =5.0, 2=4.4, 3=3.4, 4=2.0, 5=1.0

Item # 11a & 11c answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Item # 11b & 11d answer value for 1=5, 2=4, 3=3, 4=2, and 5=1

Bodily Pain

Item # 7 answer value for 1=6, 2=5.4, 3=4.2, 4=3.1, 5=2.2, and 6=1

Item # 8 answer value for (if 7 & 8 were answered 1 then 1 is valued at 6) otherwise; 1=5, 2=4, 3=3, 4=2, and 5=1

Role - Physical

Item # 4a -4d answer value for 1=1 and 2=2

Physical Functioning

Item # 3a - 3 j answer value for 1=1, 2=2, and 3=3

3. Key for value by Item number

Item # 1 answer value for 1 =5.0, 2=4.4, 3=3.4, 4=2.0, 5=1.0

Item #2 - answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Item # 3a - 3 j answer value for 1=1, 2=2, and 3=3

Item # 4a -4d answer value for 1=1 and 2=2

Item # 5a - 5c answer value for 1=1 and 2=2

Item # 6 answer value for 1=5, 2=4, 3=3, 4=2, and 5=1

Item # 7 answer value for 1=6, 2=5.4, 3=4.2, 4=3.1, 5=2.2, and 6=1

Item # 8 answer value for (if 7 & 8 were answered 1 then 1 is valued at 6) otherwise; 1=5, 2=4, 3=3, 4=2, and 5=1

Item # 9a, 9d, 9e, &9h answer value for 1= 6, 2=5, 3=4, 4=3, 5=2, and 6=1

Item # 9b, 9c, 9f, 9g, &9i - answer value for 1=1, 2=2, 3=3, 4=4, 5=5, 6=6

Item #10 answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Item # 11a & 11c answer value for 1=1, 2=2, 3=3, 4=4, and 5=5

Item # 11b & 11d answer value for 1=5, 2=4, 3=3, 4=2, and 5=1

4. Once all value are transformed, then a score is calculated by category as given above in

2. The formula for each category = (actual raw score - lowest possible raw score)/ possible raw score all multiplied by 100.

$$\text{Physical Functioning} = \frac{((3a+3b+3c+3d+3e+3f+3g+3h+3i+3j) - 10)}{20} \times 100$$

$$\text{Role - Physical} = \frac{((4a+4b+4c+4d) - 4)}{4} \times 100$$

$$\begin{aligned}
 \textit{Bodily Pain} &= \left(\frac{(7 + 8) - 2}{10} \right) \times 100 \\
 \textit{General Health} &= \left(\frac{(1+11a+11b+11c+11d) - 5}{20} \right) \times 100 \\
 \textit{Vitality} &= \left(\frac{(9a+9e+9g+9i) - 4}{20} \right) \times 100 \\
 \textit{Social Functioning} &= \left(\frac{(6 + 10) - 2}{8} \right) \times 100 \\
 \textit{Role-Emotional} &= \left(\frac{(5a+5b+5c) - 3}{3} \right) \times 100 \\
 \textit{Mental Health} &= \left(\frac{(9b+9c+9d+9f+9h) - 5}{25} \right) \times 100
 \end{aligned}$$

5. Higher Scores = Better Health State. With these values and through statistical analysis we hope to be able to determine if this survey will assist the therapist in determining what treatment category to place a patient experiencing low back related symptoms into.

Subject # _____
 Sex M / F
 Age _____

Treatment Group Classification A I / II
 D I / II
 K I / II

Scoring Sheet for the Oswestry and the MOS SF-36

| A. SF-36 Formulas Worksheet | Raw Value / Transformed Value |
|--|-------------------------------|
| <u>Physical Functioning</u> = $\frac{((\quad) - 10)}{20} \times 100$ | _____ / _____ |
| <u>Role - Physical</u> = $\frac{((\quad) - 4)}{4} \times 100$ | _____ / _____ |
| <u>Bodily Pain</u> = $\frac{((\quad) - 2)}{10} \times 100$ | _____ / _____ |
| <u>General Health</u> = $\frac{((\quad) - 5)}{20} \times 100$ | _____ / _____ |
| <u>Vitality</u> = $\frac{((\quad) - 4)}{20} \times 100$ | _____ / _____ |
| <u>Social Functioning</u> = $\frac{((\quad) - 2)}{8} \times 100$ | _____ / _____ |
| <u>Role-Emotional</u> = $\frac{((\quad) - 3)}{3} \times 100$ | _____ / _____ |
| <u>Mental Health</u> = $\frac{((\quad) - 5)}{25} \times 100$ | _____ / _____ |

| B. Oswestry Formula Worksheet | Disability Level _____ | |
|-------------------------------|------------------------|-------------------|
| Oswestry by Section | Raw Score | Transformed Score |
| 1. <u>Pain Intensity</u> | _____ | _____ |
| 2. <u>Personal Care</u> | _____ | _____ |
| 3. <u>Lifting</u> | _____ | _____ |
| 4. <u>Walking</u> | _____ | _____ |
| 5. <u>Sitting</u> | _____ | _____ |
| 6. <u>Standing</u> | _____ | _____ |
| 7. <u>Sleeping</u> | _____ | _____ |
| 8. <u>Sex Life</u> | _____ | _____ |
| 9. <u>Social Life</u> | _____ | _____ |
| 10. <u>Traveling</u> | _____ | _____ |
| 11. <u>Total</u> | _____ | _____ |

Appendix B

Predictability Equation for Treatment Stage Classification

Because there is a higher percentage of correct classification with the use of all the variables, the analysis and formula for discrimination included all of the variables in the equation.

The prediction equation to discriminate in Stage I versus Stage II, using all sub-scores of the Oswestry and the SF-36, is determined as:

$$D_{\text{treatment classification I versus II}} = -.051 + \text{Pain Intensity} * (-.081) + \text{Personal Care} * (.003) + \text{Lifting} * (.010) + \text{Walking} * (-.009) + \text{Sitting} * (-.004) + \text{Standing} * (.006) + \text{Sleeping} * (-.013) + \text{Sex Life} (.014) + \text{Social Life} * (.010) + \text{Traveling} * (-.011) + \text{Physical Functioning} * (.013) + \text{Role Physical} * (.009) + \text{Bodily Pain} * (-.002) + \text{General Health} * (-.023) + \text{Vitality} * (-.001) + \text{Social Functioning} * (.012) + \text{Role Emotional} * (.000) + \text{Mental Health} * (.002)$$

Once a score is obtained then a treatment stage classification can be determined. If the score equals (+/-) one the treatment Stage would be I and (+/-) two equals Stage II.

To further classify into Stage Ia versus Stage Ib, the equation would be:

$$D_{\text{treatment classification Ia versus Ib}} = -.295 + \text{Pain Intensity} * (.007) + \text{Personal Care} * (.000) + \text{Lifting} * (.008) + \text{Walking} * (-.003) + \text{Sitting} * (.006) + \text{Standing} * (.005) + \text{Sleeping} * (.005) + \text{Sex Life} (.001) + \text{Social Life} * (.009) + \text{Traveling} * (-.001) + \text{Physical}$$

**Functioning * (-.004) + Role Physical * (.005) + Bodily Pain * (-.006) + General
Health * (.002) + Vitality * (.033) + Social Functioning * (-.022) + Role Emotional *
(.014) + Mental Health * (-.030)**

**Once a score is obtained then a treatment stage classification can be determined. If
the score equals (+/-) one the treatment Stage would be Ia and (+/-) two equals Stage
Ib.**