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Impact of Physical Therapy following Posterior Spinal Fusion: Assessment of Return to Activity and Level of Play

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Abstract

Research Question: In a cohort of patients ages 10-18 who undergo posterior spinal fusion (PSF), does participation in physical therapy (PT) lead to faster return to prior level of play, increased psychological readiness, and decreased back pain?

Background, Significance, and Rationale for the Question: Scoliosis, or abnormal curvature of the spine, affects 2-3% of the United States population. Scoliosis can affect adolescents who want to participate in physical activity or their sport of choice. However, posterior spinal fusion (PSF) surgery, the most common surgery type for scoliosis patients, has a prolonged recovery time in comparison to other common adolescent orthopedic injuries. Furthermore, the intervention of physical therapy in the post-operative period and the effect on the timeline of return to sport has not been studies after PSF.

Materials and Methods: To answer this question, I prospectively enrolled all patients undergoing PSF surgery who meet the following criteria: between the ages of 10-18, involved in any level of physical activity, prescribed physical therapy as a post-operative recovery intervention, and have undergone PSF surgery at Cook Children's Medical Center in Fort Worth, Texas. Once determined as eligible, each potential study participant was administered several surveys (SRS 22, SRS 30, VAS, Psychological readiness scale and an additional functional sports outcome) pre-operatively, 6 months, 12 months, and 24 months following the surgery.

Preliminary Results and Conclusion: Preliminary results show that adolescents return to the same or higher levels of play with decreased back pain by 1 year following surgery. PT has proven benefits to increase strength, improve range of motion, and decrease back pain following various injuries and procedures and with further data collection, expect this study to influence recommendations for participation in physical therapy after posterior spinal fusion. It can also help to inform current guidelines on when adolescents who undergo PSF can expect to return to a similar or higher level of activities as compared to pre-surgery capabilities.

Research Question

In a cohort of patients with adolescent idiopathic scoliosis who undergo posterior spinal fusion (PSF), does participation in physical therapy (PT) lead to faster return to prior level of play and decreased back pain levels?

Primary Objectives

The primary objective of this study is to assess if adolescents who participate in PT following PSF surgery will return to the same or higher levels of activity in a shortened period of time when compared to PSF surgery patients who do not participate in PT.

Secondary Objectives

A second objective of this study is to assess if adolescents who participate in PT following PSF surgery experience reduced back pain and greater psychologic readiness to return to activity when compared to PSF surgery patients who do not participate in PT.

Introduction and Significance

Introduction

Scoliosis, or an abnormal curvature of the spine, affects 2-3% of the U.S. population, or six to nine million individuals.[1,2] Of adolescents affected by scoliosis, more than 38,000 patients undergo spinal fusion surgery each year to correct the abnormal curvature of the spine.[1] This surgery entails instrumentation and fusion of the spine.[2]

Additionally, many adolescents are involved in youth sports at both the recreational and competitive levels. A 2008 survey demonstrated that over 44 million adolescents were involved in organized sports in the United States, emphasizing the prominence of youth sports' influence as part of youth development and instilling a healthy lifestyle.[3] Many adolescents with AIS and those with AIS that subsequently undergo spinal fusion surgery are heavily involved in athletics and can become concerned with their ability to return to sport and physical activity (RTS) following surgery.[3] In addition, posterior spinal fusion (PSF) surgery has a prolonged recovery times in comparison to other common adolescent orthopedic injuries such as fractures and dislocations.[4] However, little research has assessed effective therapeutic interventions such as physical therapy following PSF surgery and its effect on RTS time and level of play and activities.

Instead, prior literature has focused on providing surgeons and their patients suggested return times because as of 2015 there were no active guidelines for when surgeons can allow patients to return to sports after injury.[3] Studies that have assessed RTS following spinal fusion surgery have only been retrospective in focus and have not assessed PT as an intervention. Therefore, conducting a prospective study can prove useful to provide further inform physicians and their patients if PT following PSF surgery can lessen the RTS time in addition to reducing back pain.

Significance

With thousands of PSF surgery cases each year, and the significant overlap between those undergoing surgery and participation in physical activity and organized youth sports, more extensive post-operative guidelines supported by prospective data need to be explored to better guide and prepare patients and their families before and after surgery regarding the return time to activity and level of play. In addition, given the benefits PT has shown in strength and rehabilitation following various injuries and procedures, assessing PT as an intervention following PSF can help inform such guidelines. Obtaining objective data from patients who are currently in the surgical and recovery process can prove to be more reliable than

relying on adolescent patients to recall the exact dates of return to play times. Additionally, the proposed research can help to inform the extent to which patients may still have back pain even with the therapeutic intervention of PT.

Finally, in a health care climate that continues to question the necessity of insurance support to interventions such as PT, it is important to assess and measure the benefits to patients. Literature to support the recommendations of PT postoperatively can further influence the importance of such a health care cost.

Materials and Methods

Overview

This is a single-site, prospective observational study design that aims to include a total of 100 pediatric patients who actively participate in any organized sport (of any level) and will undergo a posterior spinal fusion surgery and are between 10 and 18 years of age at Cook Children's Medical Center located in Fort Worth, TX. These patients are identified and recruited to enroll in the study prior to their scheduled spinal fusion surgery. The planned spinal fusion surgeries are not considered part of this research project, but rather considered standard of care and would occur whether the patient is enrolled in this project or not.

Once a study candidate is identified and meets all inclusion criteria, the PI or a study team member will inform the parent/legally authorized representative (LAR) of the potential child participant of the study and provide a brief summary of the project. If the family is interested to participate in the project, a member of the study team will administer the informed consent and assents (as needed) in order to enroll the potential study subject into the study prior to the patient's planned and scheduled spinal fusion surgery. The participant and parents will complete a total of 3 baseline study questionnaires and also report their pain levels via the VAS pain tool. After surgery, enrolled participants will be followed during their inpatient stay and through their subsequent clinical follow-up visits occurring at 6, 12, and 24 months within the orthopedic department. In conjunction with their post-surgery clinical visits the participants will also complete study related procedures. All child participants and their qualified parent/LAR participants will complete 3 measures at 6, 12, and 24 months. Measures include: 1) VAS Pain Score, 2) SRS-30 Questionnaire, 3) Psychological Readiness Scale and 4) Functional Sports Outcome Measure form. At the end of each study encounter, the study team will update the participants 'return to sport' classification/level into one of three groups as outlined by the First World Congress in Sports Physical Therapy. The 3 groups are defined below:

1. **Return to participation (RTPa):** The athlete may be participating in rehabilitation, training (modified or unrestricted), or sport, but at a level lower than his or her RTS goal. The athlete is physically active, but not yet 'ready' (medically, physically and/or psychologically) to RTS. It is possible to train to perform, but this does not automatically mean RTS.

2. **Return to sport (RTS):** The athlete has returned to his or her defend sport but is not performing at his or her desired performance level. Some athletes may be satisfied with reaching this stage, and this can represent successful RTS for that individual.

3. **Return to performance (RTPf):** This phase is an extension of the RTS phase. The athlete has returned to his or her defend sport and is performing at or above his or her pre-injury level. For some athletes, this stage may be characterized by personal best performance or expected personal growth as it relates to performance.

Study staff will also review enrolled participants medical charts for data collection such as vitals (e.g., BP values, HR value, O2 levels); pain and anxiety score levels; sport played, type of therapy administered; how long the therapy lasted; types of medications prescribed, medication start and end dates, surgical duration, number of spinal fusion levels, Lenke curve type, any long-term or short-term complications associated with their spinal fusion surgery, any physical therapy, length of hospital stay, return to sport date. Each subject's medical record will be reviewed at each study encounter by a research team member by reviewing clinical and therapy notes and data variables will be collected and entered into our study database. The study team will enter the data from these chart reviews and the measures listed above into a REDCap database for further review.

Participant Flow Chart

- Study team will identify and invite patients to participate. A brief study overview will be given to the prospects.

- If patient is interested study team will obtain written consent in-person on pre- operation visit or on the day of admission prior to scheduled surgery.
    - Patient ineligible or refuses.
    - No further contact.

- Participant reports pre-surgery pain and anxiety scores.
- Administer baseline questionnaires (5 total).
    - Collect Parent Demographic Form, VAS Pain Score, SRS-30 Questionnaire, Pediatric PSF and Return to Sport/Activity Assessment Form, Anxiety Thermometer score, PROMIS Pediatric Anxiety 8a short-form v2.0, and a PedsQL questionnaire data at baseline.

- Participant scheduled for post-op visits at months 6, 12, and 24. Meets criteria after surgery.
    - Collect pain and anxiety scores at each post-op visit.
    - Collect VAS Pain Score, SRS-30 Questionnaire, Pediatric PSF and Return to Sport/Activity Assessment Form, Anxiety Thermometer score, PROMIS Pediatric Anxiety 8a short-form v2.0, and a PedsQL questionnaire data at post-op 6 Month visit.
    - Collect Parent Demographic Form, VAS Pain Score, SRS-30 Questionnaire, Pediatric PSF and Return to Sport/Activity Assessment Form, Anxiety Thermometer score, PROMIS Pediatric Anxiety 8a short-form v2.0, and a PedsQL questionnaire data at post-op months 12 and 24.
    - Study staff to report Return to Sport Classification at post-op months 6, 12, and 24.

Subject Identification

Subjects are selected to enroll in the study if they meet the following criteria: between the ages of 10-18, have a diagnosis of AIS, and have undergone PSF surgery at Cook Children's Medical Center in Fort Worth, Texas.

Subject Stratification

Although child participants will receive therapy care post-surgery according to standard of care procedures for the recovery of their posterior spinal fusion surgery, study staff will also review their medical charts for data collection such as pain and anxiety score levels; sport played, activity performed, type of therapy administered; how long the therapy lasted; types of medications prescribed, medication start and end dates, time to first bowel movement, other side effects (i.e. nausea/vomiting, sedation, ileus, itching), surgical duration, number of spinal fusion levels, Lenke curve type, any long-term or short-term complications associated with their spinal fusion surgery, demographic data, insurance type, any physical therapy, PT timeframe, PT functional testing, massage therapy sessions, massage therapy timeframe, length of hospital stay, and return to sport clearance and date. Each subject's medical record will be reviewed at each study encounter by a research team member by reviewing clinical and therapy notes so that data variables can be collected and entered into our study database.

Survey Selection

Once enrolled, subjects will be administered a survey pre-operatively, 6 months, 12 months, and 24 months following the surgery. We will utilize the SRS-30, a validated survey built from the SRS 22. This survey from the Scoliosis Research Society is 30 questions and assesses the patient's perception of their back pain and happiness with their treatment plan and outcome. SRS 22 and SRS 30 are the most highly used surveys within scoliosis research as it is short in nature and therefore is a realistic study design to ensure patient compliance within studies. However, neither the SRS-22 nor SRS-30 were designed with the adolescent population (and PSF surgery candidates) in mind. With the addition of VAS scores, psychological readiness for return to sport, and survey for level of activity will better define overall level of activity and function at the aforementioned pre- and post-operative visits.

Research Instruments

Visual Analogue Scale (VAS) Pain Rating Scale. The visual analog **scale** (**VAS**) is a validated, subjective measure for acute and chronic **pain**. Scores are recorded by making a handwritten mark on a 10-cm line that represents a continuum between "no **pain**" and "worst **pain**." This tool will be administered at baseline, post-op months 6, 12, and 24 for all enrollees. (Participants ages 10 and over).

A**nxiety Thermometer.** The anxiety thermometer by Mentally Healthy Schools & Anna Freud National Centre for Children and Families is designed to be utilized by children, young adults, and adults. The thermometer describes feeling on a 10-point scale. Using a feelings thermometer is a great tool to help children recognize what feelings they might be experiencing in any given moment. This tool will be administered at baseline, post-op months 6, 12, and 24 for all enrollees. (Participants ages 10 and over).

Demographic Questionnaire. The enrolled child subject's legal parent/LAR will complete a comprehensive measure to obtain demographic information pertaining to the child, participating parent, and parent's partner/spouse. This inventory will be administered at baseline and annual post-op at 12 and 24 months by enrollee's parent/LAR participants. (Parents ages 18+).

Pediatric Quality of Life Inventory (PedsQL^{TM}). The PedsQL is a 23-item measurement of health-related quality of life in healthy children versus children and teens with acute and chronic health conditions. The multidimensional questionnaire scales physical, emotional, social, and school functioning. Each subset is scored separately. The PedsQL has demonstrated a reliability of $\alpha = .88$ for the child self-report and $\alpha = .90$ for the parent proxy report. The inventory will be completed by every enrolled child and adult participant at baseline and post-surgery at 6, 12, and 24 months during their follow-up clinic visits.

Parents will complete the parent proxy version of the measure regarding the enrolled child participant of any age. (Participants ages 10 and over, Parents ages 18+).

Pediatric Anxiety 8a – Short Form (PROMIS®). This form is an 8-item measurement of anxiety levels over the past 7-day timeframe. This inventory includes a 4-point Likert scale self-report per question. The inventory will be completed by every enrolled child and adult participant at baseline and post-surgery at 6, 12, and 24 months during their follow-up clinic visits. Parents will also complete the parent proxy version of the measure regarding the enrolled child participant of any age. (Participants ages 10 and over, Parents ages 18+).

Scoliosis Patient Questionnaire (SRS-30). The SRS-30 patient outcome questionnaire of the Scoliosis Research Society is a 30-item measurement of health-related items scales items such as function/activity, pain, self-image/appearance, mental health, and satisfaction with management. The inventory will be completed at baseline and post-surgery at 6, 12, and 24 months for all enrollees during their follow-up clinic visits. (Participants ages 10 and over).

Pediatric PSF and Return to Sport/Activity Assessment Form. This assessment form is a 28-item self-report measure that consist of three areas: Activity Level Scale, Psychological Readiness, and Function. This assessment tool will be administered at baseline and post-surgery at 6, 12, and 24 months for all enrollees during their follow-up clinic visits. (Participants ages 10 and over).

Statistical Analysis

The current study is a prospective observational, repeated measures design in which patients will be sampled at prior to surgery and at multiple time points following surgery. Patients will only be sampled once at each time point.

An apriori power analysis was conducted in order maximize power estimates while reducing superfluous recruitment. With 80% power, the results found that 98 participants would be needed in order to detect a moderate size effect should one exist. Therefore, we intend to recruit 100 participants to meet this sample size requirement.

All outcomes will be analyzed using a repeated measures analysis of variance (ANOVA) using the number of time points as a within subject's factor. That is, the mean scores of the SRS-30 Questionnaire, Pediatric PSF and Return to Sport/Activity Assessment Form, PROMIS Pediatric Anxiety 8a short-form

v2.0, and PedsQL questionnaire will be compared between time timepoints. Furthermore, as needed, we will conduct additional repeated measures analyses of covariance (ANCOVA) using the patient demographic form for theoretically meaningful covariates to include in the models.

No analyses will be conducted until the full dataset is collected in order to avoid p- hacking and data snooping. Furthermore, only the mentioned repeated measures ANOVAs and ANCOVAs will be conducted using two-tailed significance testing, along with 95% confidence intervals in order to determine statistical significance. Furthermore, measures of effect size (e.g., eta^2, Cohen's *d*) will be utilized to determine practical significance using traditional conventions.

Potentially confounding variables—including surgical duration and the number of spinal fusions, will be considered as covariates. Both variables are known as major predictors of postoperative outcomes after spinal surgery.

All field data will be evaluated for completeness and missing information will be obtained on site, where available, as soon as possible. Data analyses will be executed utilizing [IBM SPSS 19 (SPSS Inc, Chicago, IL, U.S.A.)] and/or other valid statistical packages. All statistical tests will be two-sided with a critical alpha level of .05 indicating statistical significance and be performed on an intent-to-treat population, unless otherwise stated. To address any inflation in type I error, we will utilize multiple testing correction where applicable.

Results

Baseline (Pre-Operative) Visit

Anxiety Score 1-10 *(anx_score_bv)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
8	5 (38.5%)	5	1	7	3	2	24	1.35	1.70	2	2	3.50	5.60	6.30

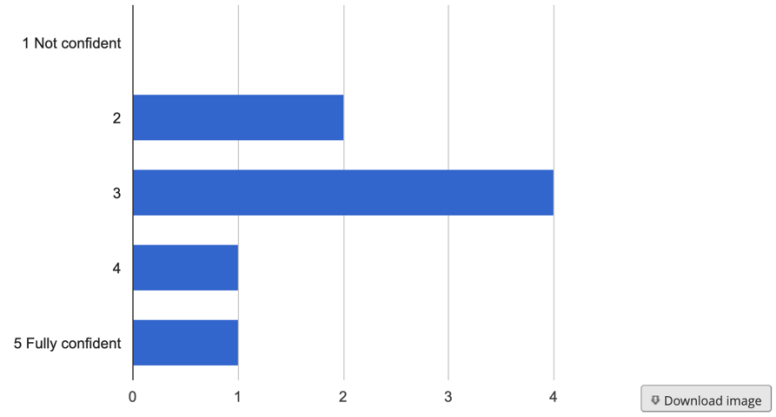
VAS Pain Score 0-10 *(vas_score_bv)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
8	5 (38.5%)	5	0	4	2.50	1.51	20	0.350	0.700	1.75	2.50	4	4	4

1. Are you confident that you can perform at your previous level of sport or physical activity participation after surgery? *(can_perform_bv)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
8	5 (38.5%)	4

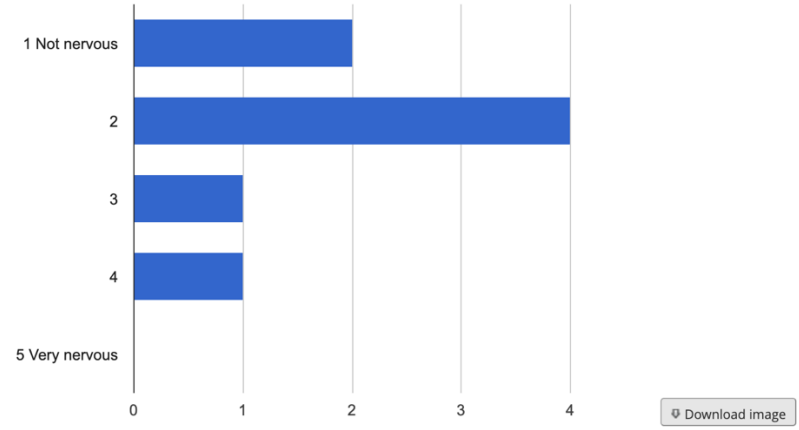
Counts/frequency: 1 Not confident (0, 0.0%), 2 (2, 25.0%), 3 (4, 50.0%), 4 (1, 12.5%), 5 Fully confident (1, 12.5%)



2. Are you nervous about playing your sport or doing physical activity? *(nervous_abtplay_bv)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
8	5 (38.5%)	4

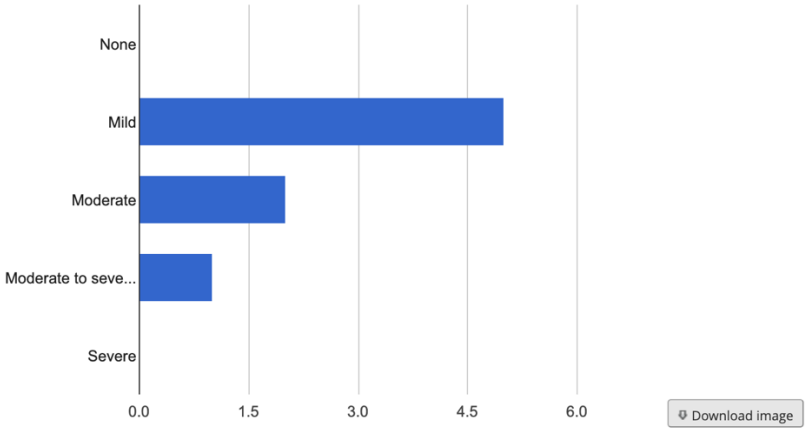
Counts/frequency: 1 Not nervous (2, 25.0%), 2 (4, 50.0%), 3 (1, 12.5%), 4 (1, 12.5%), 5 Very nervous (0, 0.0%)



1. Which one of the following best describes the amount of pain you have experienced during the past 6 months? *(sc_amtofpn_lst6mths_1)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
8	5 (38.5%)	3

Counts/frequency: None (0, 0.0%), Mild (5, 62.5%), Moderate (2, 25.0%), Moderate to severe (1, 12.5%), Severe (0, 0.0%)



6 Month Post-Operative Visit

Anxiety Score 1-10 *(anx_score_v2)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
2	11 (84.6%)	2	1	5	3	2.83	6	1.20	1.40	2	3	4	4.60	4.80

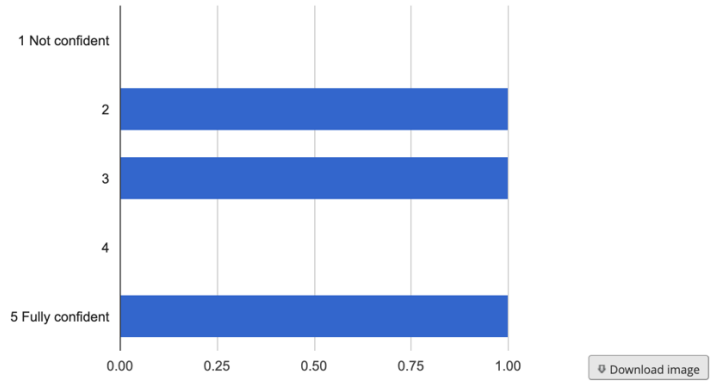
VAS Score 0-10 *(vas_score_v2)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
2	11 (84.6%)	2	0	3	1.50	2.12	3	0.150	0.300	0.750	1.50	2.25	2.70	2.85

1. Are you confident that you can perform at your previous level of sport or physical activity participation after surgery? *(can_perform_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

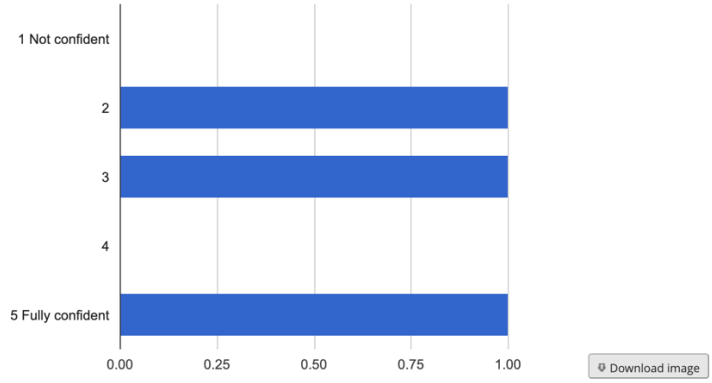
Counts/frequency: 1 Not confident (0, 0.0%), 2 (1, 33.3%), 3 (1, 33.3%), 4 (0, 0.0%), 5 Fully confident (1, 33.3%)



3. Are you confident that your back will be strong while playing your sport or physical activities? *(back_stong_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

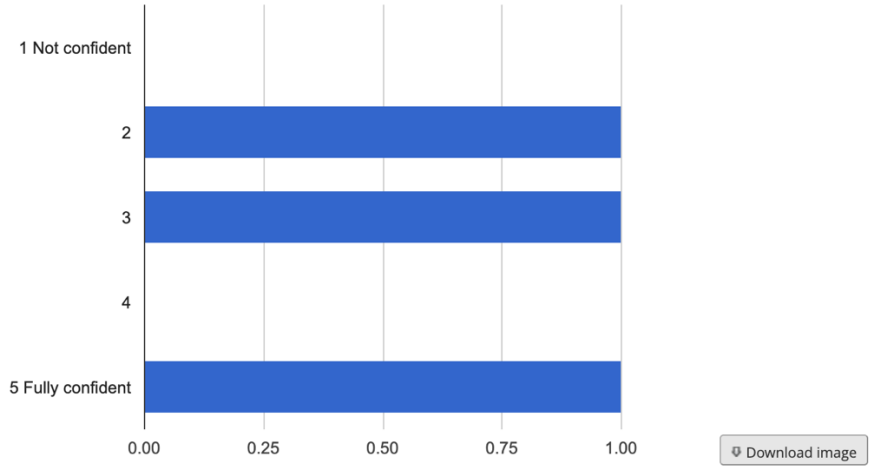
Counts/frequency: 1 Not confident (0, 0.0%), 2 (1, 33.3%), 3 (1, 33.3%), 4 (0, 0.0%), 5 Fully confident (1, 33.3%)



7. Are you confident about your ability to perform well at your sport or doing physical activities right now? *(ablty_to_perform_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

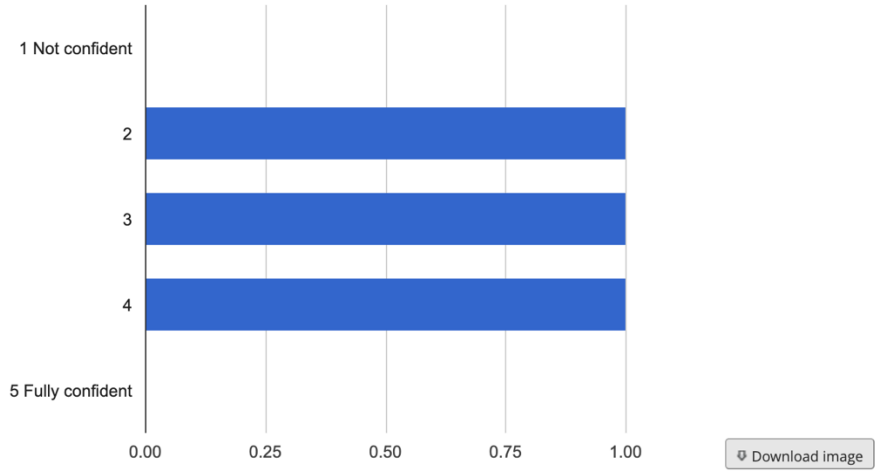
Counts/frequency: 1 Not confident (0, 0.0%), 2 (1, 33.3%), 3 (1, 33.3%), 4 (0, 0.0%), 5 Fully confident (1, 33.3%)



9. Do you feel confident you are currently performing sports or physical activity at a high level? *(curntly_perform_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

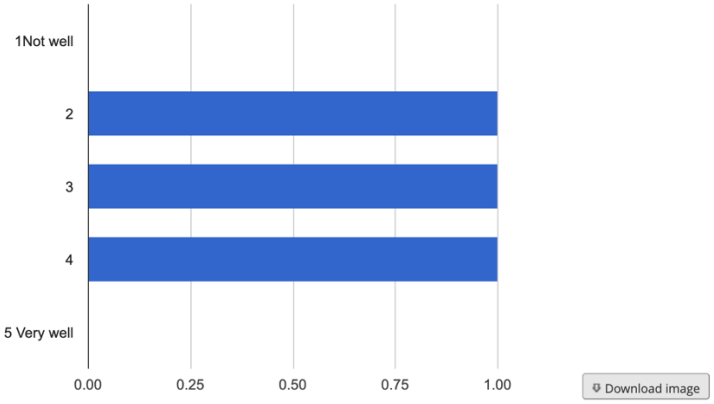
Counts/frequency: 1 Not confident (0, 0.0%), 2 (1, 33.3%), 3 (1, 33.3%), 4 (1, 33.3%), 5 Fully confident (0, 0.0%)



12. How well did your back work before your surgery? *(hwwell_bforsurg_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

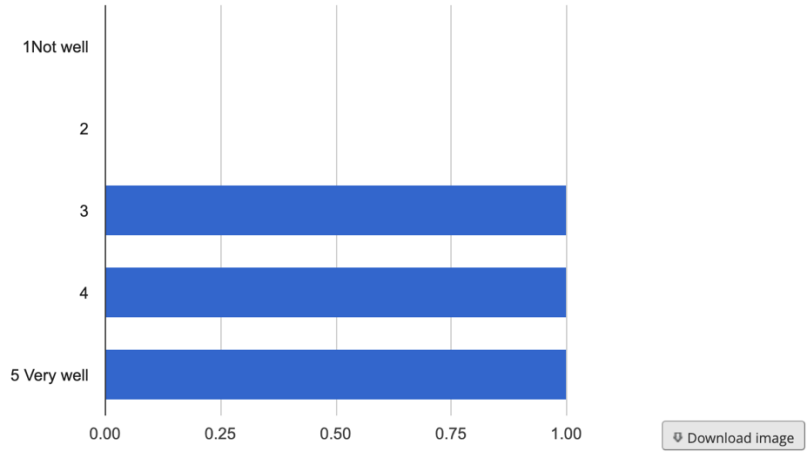
Counts/frequency: 1Not well (0, 0.0%), 2 (1, 33.3%), 3 (1, 33.3%), 4 (1, 33.3%), 5 Very well (0, 0.0%)



13. How well does your back work now? *(hwwell_bckwrknow_v2)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
3	10 (76.9%)	3

Counts/frequency: 1Not well (0, 0.0%), 2 (0, 0.0%), 3 (1, 33.3%), 4 (1, 33.3%), 5 Very well (1, 33.3%)



1 Year Post-Operative Visit

Anxiety Score 1-10 *(anx_score_v3)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
2	11 (84.6%)	2	1	2	1.50	0.710	3	1.05	1.10	1.25	1.50	1.75	1.90	1.95

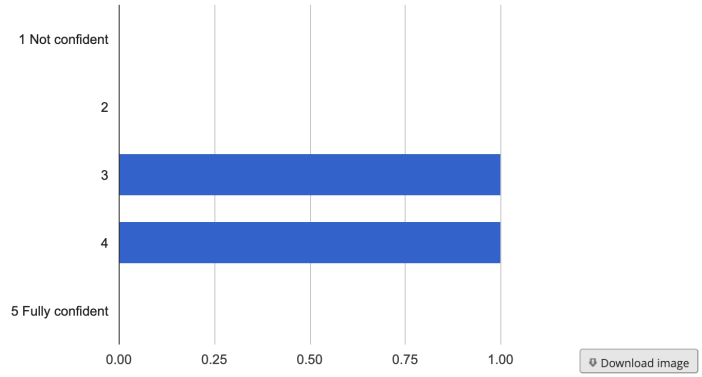
VAS Score 0-10 *(vas_score_v3)* Refresh Plot

Total Count (N)	Missing*	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
2	11 (84.6%)	1	1	1	1	0	2	1	1	1	1	1	1	1

1. Are you confident that you can perform at your previous level of sport or physical activity participation after surgery? *(can_perform_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

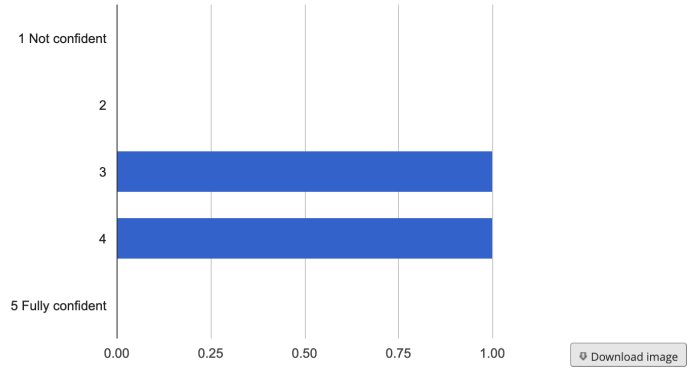
Counts/frequency: 1 Not confident (0, 0.0%), 2 (0, 0.0%), 3 (1, 50.0%), 4 (1, 50.0%), 5 Fully confident (0, 0.0%)



3. Are you confident that your back will be strong while playing your sport or physical activities? *(back_stong_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

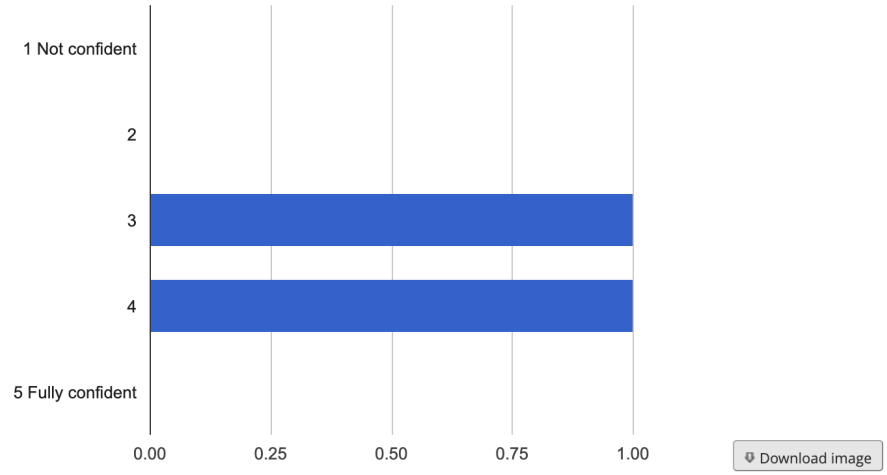
Counts/frequency: 1 Not confident (0, 0.0%), 2 (0, 0.0%), 3 (1, 50.0%), 4 (1, 50.0%), 5 Fully confident (0, 0.0%)



7. Are you confident about your ability to perform well at your sport or doing physical activities right now? *(ablty_to_perform_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

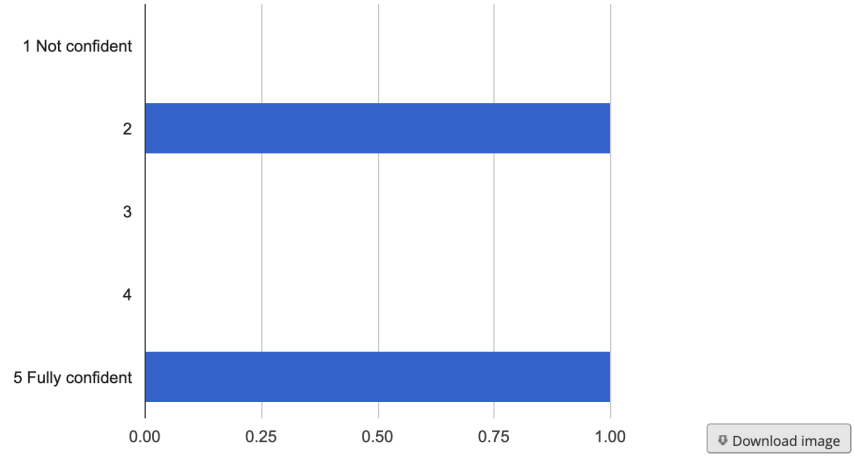
Counts/frequency: 1 Not confident (0, 0.0%), 2 (0, 0.0%), 3 (1, 50.0%), 4 (1, 50.0%), 5 Fully confident (0, 0.0%)



9. Do you feel confident you are currently performing sports or physical activity at a high level? *(curntly_perform_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

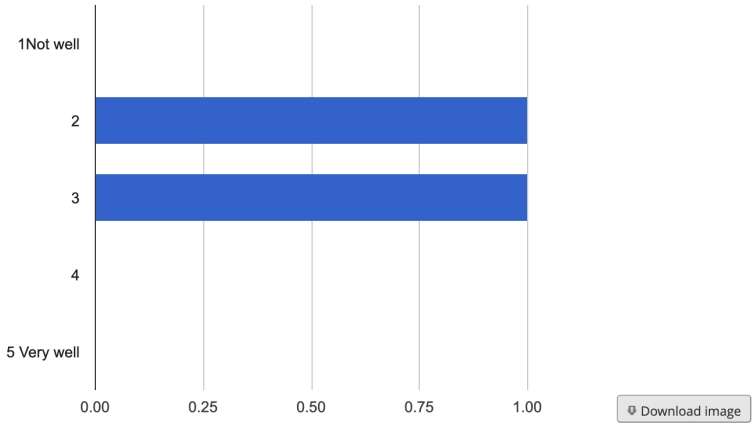
Counts/frequency: 1 Not confident (0, 0.0%), 2 (1, 50.0%), 3 (0, 0.0%), 4 (0, 0.0%), 5 Fully confident (1, 50.0%)



12. How well did your back work before your surgery? *(hwwell_bforsurg_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

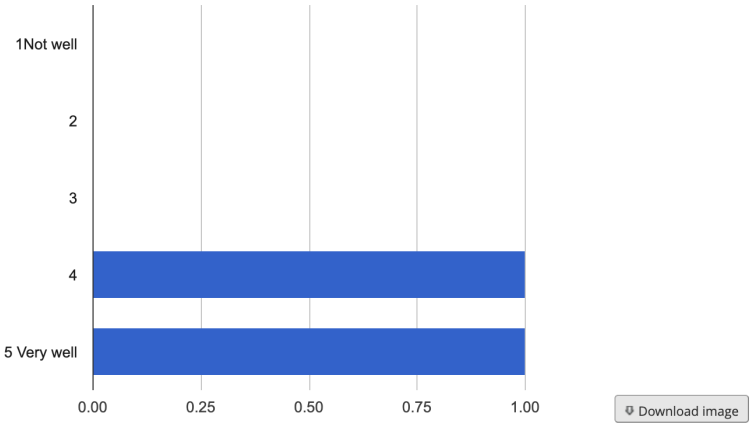
Counts/frequency: 1Not well (0, 0.0%), 2 (1, 50.0%), 3 (1, 50.0%), 4 (0, 0.0%), 5 Very well (0, 0.0%)



13. How well does your back work now? *(hwwell_bckwrknow_v3)* Refresh Plot | View as Bar Chart

Total Count (N)	Missing*	Unique
2	11 (84.6%)	2

Counts/frequency: 1Not well (0, 0.0%), 2 (0, 0.0%), 3 (0, 0.0%), 4 (1, 50.0%), 5 Very well (1, 50.0%)



2 Year Post-Operative Visit

No Data Available at this time

Discussion

Past studies have documented that it remains challenging for adolescent athletes to return to athletic activities at an equal or higher level of play due to a decrease in spinal range of motion and back pain following PSF.[5] In particular, these studies indicate that fewer spinal segments fusions correlate with increased back range of motion and flexibility.[5] However, little research has addressed the impact of physical therapy (PT) following posterior spinal fusion (PSF) surgery and its effects on return to prior level of play and back pain. Therefore, this prospective study aims to inform future post-operation rehabilitation protocols. In addition, as PSF surgery has one of the longest recovery times in comparison to other common adolescent orthopedic surgeries, identifying a therapeutic intervention following surgery over 1-to-2-year period timeline can help to reduce recovery time.[4]

The current data set is very limited. Despite best efforts to enroll patients into the study, only 14 patients are currently enrolled in the study, with only 8 study participants completing all of the baseline questionnaires. Patient follow-up has also prevented data analysis to be completed as only 3 participants filled out questionnaires at their 6-month post-operative visits, and only 2 participants have completed the questionnaires at their 1-year post-operative visit. Therefore, no conclusion can be made at this time regarding the impact of physical therapy and return to activity and level of play. However, based on the limited data that is collected, study participants have been able to return to activity at the same or at a higher level by 1 year following PSF and do have decreased back pain when compared to their pre-operative baseline. Back pain in particular is an important outcome given that patients with scoliosis can have lower back pain that may not go away even following PSF.[6,7] Therefore, continuing to trend pain scores following the PT intervention, VAS score, SRS-30, and other measurements will be critical moving forward with a larger sample size to best identify effective post-operative interventions and reducing or eliminating back pain.

Innovation

We have established a functioning RTS Assessment measure for use towards adolescent PSF patients and return to sport/activity as nothing currently exists for this population. The RTS Assessment tool we designed was developed based on existing validated and non-validated measures of functional outcomes for patients with scoliosis, knee injuries, and back pain. Currently, there are no pediatric

specific outcomes measures for scoliosis or spine problems and nothing pediatric for post spine surgery. In the future we plan to validate this measure in the scoliosis population.

Future Directions

In a health care climate that continues to question the necessity of insurance support to interventions such as PT, it is important to assess and measure the benefits to patients. Literature to support the recommendations of PT postoperatively can further influence the importance of such a health care cost. This study inherently is limited in that PT is a standard order following PSF and therefore were not able to conduct a randomized-control trial. However, with further patient enrollment, we hope to identify patients who may not attend PT in the post-operative period for other reasons (for example: cost, location, or transportation limitations) and compare their outcomes to study participants who did participate in PT.

Conclusion

Conducting a prospective study assessing return to sport and level of play following PSF can guide best recommendations for local and national return to activity protocols as few currently exist. Additionally, understanding how PT can impact a patient's return to activity and decrease back pain will further strengthen post-operative recommendations and can provide patients and their families with more accurate expectations. Continuing to recruit and retain patients in this study is necessary to better assess long-term trends and effects of PT following PSF.

Compliance

Regulatory compliance for human subjects (IRB) approval protocols is ongoing through Cook Children's Medical Center. IRB Number: 2021-072. Continuation of study approved on October 16th, 2023.

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