SUPPLEMENTARY MATERIAL

Supplementary material for: Effectiveness of psychosocial interventions for pediatric patients with scoliosis: A systematic review

SEARCH STRATEGY

Searches were run from database inception to March 20, 2022.

Database 1: Medline (1946 to March 20, 2022)

1 Psychotherapy/
2 Psychosocial intervention/
3 Patient Education as Topic/
4 Self Care/
5 Professional-patient relations/
6 Psych*.ti,ab.
7 Biopsychosocial.ti,ab.
8 Bio psychosocial.ti,ab.
9 Bio psycho social.ti,ab.
10 Biopsycho social.ti,ab.
11 Integrated care.ti,ab.
12 Collaborative care.ti,ab.
13 Case manage*.ti,ab.
14 Social work*.ti,ab.
15 Monitor*.ti,ab.
16 Patient center*.ti,ab.
17 Patient centre*.ti,ab.
18 Mental health.ti,ab.
19 Counsel*.ti,ab.
20 ((behav* or cognitive or relaxation or acceptance or commitment) adj3 (therap* or treatment*)).ti,ab.
21 CBT.ti,ab.
22 Mindful*.ti,ab.
23 ((Patient* or health) adj3 (educat* or learn* or teach* or train*)).ti,ab.
24 Self care.ti,ab.
25 Self manag*.ti,ab.
26 Self help.ti,ab.
27 Complian*.ti,ab.
28 Behaviour therap*.ti,ab.
29 Relaxation.ti,ab.
30 Child/
31 Adolescent/
32 Child*.ti,ab.
33 Adolescen*.ti,ab.
34 Youth*.ti,ab.
35 Young*.ti,ab.
36 Teen*.ti,ab.
37 Juvenile*.ti,ab.
38 Junior*.ti,ab.
39 Pediatric*.ti,ab,jw.
40 Paediatric*.ti,ab,jw.
41 Scoliosis/
42 Scoliosis.ti,ab,kw.
43 AIS.ti,ab,kw.
44 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
45 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
46 41 or 42 or 43
47 44 and 45 and 46
48 47 not (editorial or comment or guideline or letter or protocol).ti,ab.

Database 2: PsycINFO (1806 to March 20, 2022)

1 Psychotherapy/
2 Psychotherapeutic Techniques/
3 Self Care/
4 Psych*.ti,ab.
5 Biopsychosocial.ti,ab.
6 Bio psychosocial.ti,ab.
7 Bio psycho social.ti,ab.
8 Biopsycho social.ti,ab.
9 Integrated care.ti,ab.
10 Collaborative care.ti,ab.
11 Case manage*.ti,ab.
12 Social work*.ti,ab.
13 Monitor*.ti,ab.
14 Patient center*.ti,ab.
15 Patient centre*.ti,ab.
16 Mental health.ti,ab.
17 Counsel*.ti,ab.
18 ((behav* or cognitive or relaxation or acceptance or commitment) adj3 (therap* or treatment*)).ti,ab.
19 CBT.ti,ab.
20 Mindful*.ti,ab.
21 ((Patient* or health) adj3 (educat* or learn* or teach* or train*)).ti,ab.
22 Self care.ti,ab.
23 Self manag*.ti,ab.
24 Self help.ti,ab.
25 Complian*.ti,ab.
26 Behaviour therap*.ti,ab.
27 Relaxation.ti,ab.
28 Childhood Development/
29 Adolescent Development/
30 Child*.ti,ab.
31 Adolescen*.ti,ab.
32 Youth*.ti,ab.
33 Young*.ti,ab.
34 Teen*.ti,ab.
35 Juvenile*.ti,ab.
36 Junior*.ti,ab.
37 Pediatric*.ti,ab,jw.
38 Paediatric*.ti,ab,jw.
39 Scoliosis.ti,ab.
40 AIS.ti,ab.
41 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27
42 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38
43 39 or 40
44 41 and 42 and 43
45 44 not (editorial or comment or guideline or letter or protocol).ti,ab.

Database 3: Embase (1974 to March 20, 2022)

1 Psychotherapy/
2 Psychosocial intervention/
3 Patient Education as Topic/
4 Self Care/
5 Professional-patient relations/
6 Psych*.ti,ab.
7 Biopsychosocial.ti,ab.
8 Bio psychosocial.ti,ab.
9 Bio psycho social.ti,ab.
10 Biopsycho social.ti,ab.
11 Integrated care.ti,ab.
12 Collaborative care.ti,ab.
13 Case manage*.ti,ab.
14 Social work*.ti,ab.
15 Monitor*.ti,ab.
16 Patient center*.ti,ab.
17 Patient centre*.ti,ab.
18 Mental health.ti,ab.
19 Counsel*.ti,ab.
20 ((behav* or cognitive or relaxation or acceptance or commitment) adj3 (therap* or treatment*)).ti,ab.
21 CBT.ti,ab.
22 Mindful*.ti,ab.
23 ((Patient* or health) adj3 (educat* or learn* or teach* or train*)).ti,ab.
24 Self care.ti,ab.
25 Self manag*.ti,ab.
26 Self help.ti,ab.
27 Complian*.ti,ab.
28 Behaviour therap*.ti,ab.
29 Relaxation.ti,ab.
30 Child/
31 Adolescent/
32 Child*.ti,ab.
33 Adolescen*.ti,ab.
34 Youth*.ti,ab.
35 Young*.ti,ab.
36 Teen*.ti,ab.
37 Juvenile*.ti,ab.
38 Junior*.ti,ab.
39 Pediatric*.ti,ab,jw.
40 Paediatric*.ti,ab,jw.
41 Scoliosis/
42 Scoliosis.ti,ab,kw.
43 AIS.ti,ab,kw.
44 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
45 30 or 31 or 32 or 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40
46 41 or 42 or 43
47 44 and 45 and 46
48 47 not (editorial or comment or guideline or letter or protocol).ti,ab.

Database 4: EBSCO CINAHL (1937 to March 20, 2022)

S1	(MH "Psychotherapy") OR (MH "Patient Education") OR (MH "Self Care") OR (MH "Psychiatric Care") OR (MH "Orthopedic Care") OR (MH "Holistic Care") OR (MH "Professional-Patient Relations")
S2	TI (psych* OR biopsychosocial OR "bio psychosocial" OR "Bio psycho social" OR "Biopsycho social" OR "Integrated care" OR "Collaborative care" OR "Case manage*" OR "Social work*" OR Monitor* OR "Patient center*" OR "Patient centre*" OR "Mental health" OR Counsel* OR CBT OR Mindful* OR "Self care" OR "Self manag*" OR "Self help" OR Complian* OR "Behaviour therap*" OR Relaxation) OR AB (psych* OR biopsychosocial OR "bio psychosocial" OR "Bio psycho social" OR "Biopsycho social" OR "Integrated care" OR "Collaborative care" OR "Case manage*" OR "Social work*" OR Monitor* OR "Patient center*" OR "Patient centre*" OR "Mental health" OR Counsel* OR CBT OR Mindful* OR "Self care" OR "Self manag*" OR "Self help" OR Complian* OR "Behaviour therap*" OR Relaxation) OR TI ((behav* n3 therap*) OR (cognitive n3 therap*) OR (relaxation n3 therap*) OR (acceptance n3 therap*) OR (commitment n3 therap*) OR (behav* n3 treatment*) OR (cognitive n3 treatment*) OR (relaxation n3 treatment*) OR (acceptance n3 treatment*) OR (commitment n3 treatment*)) OR AB ((behav* n3 therap*) OR (cognitive n3 therap*) OR (relaxation n3 therap*) OR (acceptance n3 therap*) OR (commitment n3 therap*) OR (behav* n3 treatment*) OR (cognitive n3 treatment*) OR (relaxation n3 treatment*) OR (acceptance n3 treatment*) OR (commitment n3 treatment*)) OR TI ((Patient* n3 educat*) OR (Health n3 educat*) OR (Patient* n3 learn*) OR (Health n3 learn*) OR (Patient* n3 teach*) OR (Health n3 teach*) OR (Patient* n3 train*) OR (Health n3 train*)) OR AB ((Patient* n3 educat*) OR (Health n3 educat*) OR (Patient* n3 learn*) OR (Health n3 learn*) OR (Patient* n3 teach*) OR (Health n3 teach*) OR (Patient* n3 train*) OR (Health n3 train*))
S3	(MH "Child Health") OR (MH "Child Psychiatry") OR (MH "Adolescent Health") OR (MH "Adolescent Psychiatry")
S4	TI (Child* OR Adolescen* OR Youth* OR Young* OR Teen* OR Juvenile* OR Junior* OR Pediatric* OR Paediatric*) OR AB (Child* OR Adolescen* OR Youth* OR Young* OR Teen* OR Juvenile* OR Junior* OR Pediatric* OR Paediatric*)
S5	(MH "Scoliosis")
S6	TI (Scoliosis OR AIS) OR AB (Scoliosis OR AIS)
S7	S1 or S2
S8	S3 or S4
S9	S5 or S6
S10	S7 AND S8 AND S9

Database 5: Cochrane Central Register of Controlled Trials (CENTRAL) (1992 to March 20, 2022)

#1	MeSH descriptor: [Psychotherapy] explode all trees
#2	MeSH descriptor: [Patient Education as Topic] explode all trees
#3	MeSH descriptor: [Self Care] explode all trees
#4	MeSH descriptor: [Professional-Patient Relations] explode all trees
#5	(Psych*):ti,ab,kw
#6	(Biopsychosocial):ti,ab,kw
#7	(Bio psychosocial):ti,ab,kw
#8	(Bio psycho social):ti,ab,kw
#9	(Biopsycho social):ti,ab,kw
#10	(Integrated care):ti,ab,kw
#11	(Collaborative care):ti,ab,kw
#12	(Case manage*):ti,ab,kw
#13	(Social work*):ti,ab,kw
#14	(Monitor*):ti,ab,kw
#15	(Patient center*):ti,ab,kw
#16	(Patient centre*):ti,ab,kw
#17	(Mental health):ti,ab,kw
#18	(Counsel*):ti,ab,kw
#19	(behav* n3 therap*):ti,ab,kw
#20	(cognitive n3 therap*):ti,ab,kw
#21	(relaxation n3 therap*):ti,ab,kw
#22	(acceptance n3 therap*):ti,ab,kw
#23	(commitment n3 therap*):ti,ab,kw
#24	(behav* n3 treatment*):ti,ab,kw
#25	(cognitive n3 treatment*):ti,ab,kw
#26	(relaxation n3 treatment*):ti,ab,kw
#27	(acceptance n3 treatment*):ti,ab,kw
#28	(commitment n3 treatment*):ti,ab,kw
#29	(Patient* n3 educat*):ti,ab,kw
#30	(Health n3 educat*):ti,ab,kw
#31	(Patient* n3 learn*):ti,ab,kw
#32	(Health n3 learn*):ti,ab,kw
#33	(Patient* n3 teach*):ti,ab,kw
#34	(Health n3 teach*):ti,ab,kw
#35	(Patient* n3 train*):ti,ab,kw
#36	(Health n3 train*):ti,ab,kw
#37	(CBT):ti,ab,kw
#38	(Mindful*):ti,ab,kw
#39	(Self care):ti,ab,kw
#40	(Self manag*):ti,ab,kw
#41	(Self help):ti,ab,kw
#42	(Complian*):ti,ab,kw
#43	(Behaviour therap*):ti,ab,kw
#44	(Relaxation):ti,ab,kw
#45	MeSH descriptor: [Child] explode all trees
#46	MeSH descriptor: [Adolescent] explode all trees
#47	(Child*):ti,ab,kw
#48	(Adolescen*):ti,ab,kw
#49	(Youth*):ti,ab,kw
#50	(Young*):ti,ab,kw
#51	(Teen*):ti,ab,kw
#52	(Juvenile*):ti,ab,kw
#53	(Junior*):ti,ab,kw
#54	(Pediatric*):ti,ab,kw
#55	(Paediatric*):ti,ab,kw
#56	MeSH descriptor: [Scoliosis] explode all trees

#57 (Scoliosis):ti,ab,kw
#58 (AIS):ti,ab,kw
#59 59 and 60 and 61
#60 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44
#61 #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55
#62 #56 or #57 or #58
#63 #60 and #61 and #62

Grey Literature

Database 1: ClinicalTrials.Gov
Search term: “Scoliosis”
Restrictions: “Completed”

Database 2: International Clinical Trials Registry Platform (ICTRP)
Search term: “Scoliosis”

Supplementary Table 1. Effectiveness of psychosocial interventions in pediatric patients with scoliosis undergoing **bracing**

General		Sample Characteristics		Study Groups		Outcomes	
Study (Country)	**Study Design & Dates**	**Selection Criteria**	**Sample Size, Age, % Female, Curve Size**	**Intervention Group**	**Comparison Group**	**Outcome Measure(s)**	**Result(s) & Key Takeaway**
Karol et al 2016 [23] (USA)	2-arm, cluster randomized trial (cluster = treating physician) 2008 to 2013	Adolescent with idiopathic scoliosis; spinal curvature 25° to 45°; Risser stage 0 to 2; if female, < 1 year post-menarche.	**Total** N = 171 analyzed (222 randomized) Mean (SD) age = NR % female = 90%* Brace = TLSO brace **Intervention group** N = 93 analyzed Mean (SD) age = NR Mean (SD) curve size = 33.2° (NR) % female = 88% **Control group** N = 78 analyzed Mean (SD) age = NR Mean (SD) curve size = 33.9° (NR) % female = 92%	**Brace prescription + brace compliance monitoring and counselling:** patients prescribed brace with temperature sensor and **informed** compliance was being monitored; orthopedist and orthopedic surgeon aware of compliance data; orthopedist and orthopedic surgeon offered counselling using compliance data ≥ 1 every 3 months.	**Brace prescription + usual compliance advice:** patients prescribed brace with temperature sensor and **not informed** compliance was being monitored; orthopedist, orthopedic surgeon, and patient did not have access to compliance data; patients received usual advice regarding compliance (i.e., not informed by data from sensors).	**Primary** Brace compliance (number of hrs. of daily brace wear via temperature sensor) throughout course of treatment. **Secondary** Curve progression (measured using radiograph) at brace termination.	**Primary** (intervention vs. control) ***Average hours of daily brace wear at 180 days: 15.0 hrs. vs. 12.5 hrs. (p=0.0095)***. ***Average hours of daily brace wear throughout course of brace treatment: 13.8 hrs. vs. 10.8 hrs. (p= 0.002).*** **Secondary** Curve progression < 6°, ≥ 6°, or ≥50° (magnitude needing surgery): no significant between-group differences in proportions. **Key Takeaway** Knowledge of brace compliance monitoring and counselling can improve brace compliance in patients with AIS.
Matsunaga et al 2005 [24] (Japan)	Prospective cohort study Study dates NR	Female adolescent with idiopathic scoliosis; brace therapy alone.	**Total** N = 145 analyzed Mean (range) age = 12.4 (11 to 16) years % female = 100% Brace = Milwaukee (24%*) & TSLO (76%*)	**Brace prescription based on psychologic testing (Maudsley Personality Inventory):** *Before brace therapy*: patients completed psychological test and received introversion/extraversion score (E) and neuroticism score (N); patients rated as: **1 = Normal** **2 = Abnormal** *2a* = E(-)N(-): introverted *2b* = E(-)N(+): highly anxious *2c* = E(+)N(-): passionate *2d* = E(+)N(+): passionate	**No comparison group.**	**Primary** Emotional distress (Maudsley Personality Inventory) measured at 1- and 2-months post-brace therapy.	**Primary** **Emotional Distress** Before brace therapy (baseline) Normal: 92%* Abnormal: 8%* 1 month post-brace therapy ***Significant decrease in percent rated as normal compared to baseline (p<0.001)*** Normal: 18%* Abnormal: 82%* 2 months post-brace therapy

				If rated (1) or (2c), patients completed brace therapy without modification. If rated (2a) or (2b), patients received additional relaxation training. If rated (2d), patients' teachers received advice on improving school environment for patient. *1 month post-brace therapy*: Patients re-tested. If rated (1) or (2c), treatment did not change. If rated (2a), (2b), or (2d), treatment changed from full-time to part-time brace therapy. *2 months post-brace therapy*: Patients re-assessed.			***Significant increase in percent rated as normal after modifications made at 1 month (p<0.001)*** Normal: 68%* Abnormal: 32% **Key Takeaway** In patients with AIS, tailoring their brace therapy based on their personality pattern may improve emotional outcomes.
Zhu et al 2021a, 2021b [25, 26] (China) *Data were only extracted from 2021a because it has a larger sample size than 2021b*	Prospective cohort study Study dates NR	Aged ≥ 10 years at time of brace treatment; spinal curvature 25° to 40°; Risser stage 0 to 2; no prior treatment.	**Total** N = 28 analyzed (30 enrolled) Mean (SD) age = 12.4 (1.5) years % female = 82%* Brace = Chêneau brace	**Brace prescription + real-time brace compliance monitoring + counselling:** patients prescribed brace (23 hrs. per day) with force sensor; patients uploaded their compliance ≥ 1 daily to a mobile *WeChat Mini Program* that showed compliance data and had an interface to communicate with providers; compliance data linked to a cloud-based storage system and website for providers to review compliance data; providers offered recommendations and counselling to patients (patients could communicate as needed via *WeChat Mini Program*; if no contact, provider followed up at least every 3 months).	**No comparison group.**	**Primary** Quantity of brace compliance (measured time/prescribed time [23 hrs] via force sensor) at 3 and 6 months. Quality of brace compliance (measured force/ baseline force via force sensor) at 3 and 6 months. **Secondary** Satisfaction with monitoring system (very satisfied, somewhat satisfied, somewhat dissatisfied, or very dissatisfied) at 6 months.	**Primary** (6 months vs. 3 months) **Quantity of compliance** ***Proportion (SD) compliant: 70.3% (6.4%) vs. 52.3% (10.8%) (p=0.000).*** ***Mean (SD) daily wear: 16.1 (1.4) vs. 12.0 (2.4) (p=0.000).*** **Quality of compliance** ***Proportion (SD) compliant: 80.5% (19.6%) vs. 49.1% (10.4%) (p=0.000).*** **Secondary** 96.4% very or somewhat satisfied with monitoring system. **Key Takeaway** Real-time compliance monitoring and counselling

							may improve quantity *and* quality of brace compliance over time in patients with AIS.

*Calculated using data from paper.

AIS = Adolescent Idiopathic Scoliosis; Hrs. = Hours; NR = Not Reported; SD = Standard Deviation; TSLO = Thoracic Lumbar Sacral Orthosis; USA = United States of America.

Supplementary Table 2. Effectiveness of psychosocial interventions in pediatric patients with scoliosis undergoing **spinal surgery**

General		Sample Characteristics		Study Groups		Outcomes	
Study (Country)	**Study Design & Dates**	**Selection Criteria**	**Sample Size, Age, % Female**	**Intervention Group**	**Comparison Group**	**Outcome Measure(s)**	**Result(s) & Key Takeaway**
Chan et al 2017 [27] (Malaysia)	Prospective cohort study September 2015 to June 2016	Diagnosis of AIS; undergoing posterior spinal fusion; no psychological disorders, non-idiopathic scoliosis, metabolic bone disease, or undergoing revision surgery.	**Total** N = 107 analyzed Mean (SD) age = NR % female = NR Mean (SD) curve size = NR **Intervention group** N = 74 recruited & analyzed Mean (SD) age = 15.8 (4.6) years % female = 88%* Mean (SD) curve size = 65.5° (15.9°) **Control group (2010 audit)** N = 33 analyzed Mean (SD) age = NR % female = NR Mean (SD) curve size = NR	**Accelerated recovery protocol:** patients received pre-operative regime (e.g., scoliosis support group; aerobic exercise regime); pre-operative day of surgery counseling (e.g., counseling on post-op pain management); intra-operative strategies to shorten surgical time (e.g., dual attending surgeon); accelerated post-operative rehabilitation; and pain management regime.	**2010 Audit:** patients who received traditional care pathway before accelerated recovery protocol was implemented (e.g., single surgeon, pain management via patient-controlled analgesia or morphine).	**Primary** Length of stay (LOS)	**Primary** (study vs. audit) Mean (SD) LOS: 70.8 (10.3) hrs. vs. 125.4 (58.4) hrs. Found protocol was feasible without increasing complication or readmission rates **Key Finding** An accelerated recovery protocol can be successfully implemented and has the potential to reduce length of hospital stay for patients with AIS.
Charette et al 2015 [28] (Canada)	2-arm, parallel-group randomized trial March 2010 to June 2011	Aged 11 to 20 years; undergoing spinal fusion for idiopathic scoliosis; understood/spoke French; had computer or DVD player at home; no moderate to severe cognitive deficit.	**Total** N = 40 randomized & analyzed Mean (SD) age = 15 (2.15) years % female = 82.5%* **Intervention group** N = 20 randomized & analyzed Mean (SD) age = 15.50 (2.07) years % female = 90%* **Control group** N = 20 randomized & analyzed Mean (SD) age = 14.50 (2.16) years	**Guided imagery, relaxation, and education intervention + usual care:** patients were given DVD on post-operative pain management with demonstrations of guided imagery and relaxation exercises (nurse showed DVD 1-day pre-operatively and at discharge; nurse followed up 2 weeks post-discharge to reinforce technique); patients instructed to practice exercises ≥ 3 times per week for ≥ 2 weeks.	**Usual care:** patients received standard care (including analgesics, regular physiotherapy care, and 1-month follow-up outpatient visit).	**Primary** Pain intensity (French-BPI) at discharge, 2 weeks post-discharge, and 1-month post-discharge. **Secondary** Anxiety (French-STAI-Y), pain-related coping strategies (French-PPCI), and resumption of regular daily activities (French-BPI) at discharge	**Primary** (intervention vs. comparison) ***Significantly lower average pain at all timepoints (moderate to large effect sizes: discharge, d = 0.22, p=0.004; 2-weeks post-operative, d = 0.51, p=0.001; 1-month post-operative, 0.42, p=0.007).*** **Secondary** No significant between-group differences on most outcomes before or after adjustment; *some significant improvements*

			% female = 75%*			and 1-month post-discharge (BPI also administered at 2 weeks post-discharge).	*in resumption of daily activities (e.g. sleeping, eating, walking) at 2-weeks post-discharge.* **Key Takeaway** Guided imagery and relaxation exercises can improve post-spinal fusion pain in patients with AIS.
LaMontagne et al 2003a, 2003b [29,30] (USA) *Data were only extracted from 2003a because 2003b is a re-analysis of this study*	4-arm, parallel-group randomized trial Study dates NR	Aged 11 to 18 years; scheduled for major spinal surgery for idiopathic scoliosis; no previous spinal surgery; no learning or developmental problems; English-speaking (adolescent and parent).	**Total** N = 109 analyzed for anxiety & 89 for pain (113 randomized) Mean (range) age = 13.9 (11 to 18) years % female = 81% **Intervention group 1** N = 27 analyzed for anxiety & 22 for pain Mean (SD) age = 13.89 (1.89) % female = NR **Intervention group 2** N = 27 analyzed for anxiety & 24 for pain Mean (SD) age = 13.93 (1.77) % female = NR **Intervention group 3** N = 30 analyzed for anxiety & 24 for pain Mean (SD) age = 14.10 (1.73) % female = NR **Control group** N = 25 analyzed for anxiety & 19 for pain Mean (SD) age = 13.56 (1.76) years % female = NR	**Group 1: Coping training:** patients watched short videotape teaching coping strategies for managing post-operative pain (e.g., deep breathing, imagery, positive-self-talk) day before surgery; patients practiced coping skills with researcher after videotape. **Group 2: Concrete-objective information teaching:** patients watched short videotape teaching objective information about procedural and sensory information related to the spinal surgery (e.g., ambulation, bone graft discomfort, IV fluids). **Group 3: Coping training + concrete-objective information teaching:** patients received interventions outlined for Groups 1 and 2.	**Usual care, including standard information about surgery** (e.g., length of surgery, post-operative routines, hospital environment).	**Primary** Anxiety (STAI-child/adolescent version) at 2 days post-operatively. Pain intensity (VAS) at 2 and 4 days post-operatively.	**Primary** **Anxiety** No significant between-group differences. **Pain** Significant *within-group* reductions in pain from 2 to 4 days post-operatively in Groups 2, 3, and control. Subgroup analyses showed (1) coping training & concrete-objective information were significantly more effective in reducing post-operative anxiety in highly anxious pre-operative patients and (2) interventions including coping intervention were significantly more effective in reducing post-operative anxiety and pain in patients under 14 years. **Key Takeaway** Cognitive-behavioral interventions to reduce anxiety and pain in post-spinal surgery for AIS should be tailored to their age and pre-operative anxiety; interventions with

							coping training may be particularly helpful for younger adolescents & interventions with coping and information training may be helpful for those with high pre-operative anxiety.
LaMontagne et al 2004 [31] (USA)	Continuation of above RCT		**Total** N = 88 analyzed (113 randomized) Mean (SD) age = 13.9 (1.79) years % female = 78% **Intervention group 1** N = 25 analyzed Mean (SD) age = NR % female = NR **Intervention group 2** N = 23 analyzed Mean (SD) age = NR % female = NR **Intervention group 3** N = 21 analyzed Mean (SD) age = NR % female = NR **Control group** N = 19 analyzed Mean (SD) age = NR % female = NR	*Above interventions + post-surgery booster videos at 3 and 6 months post-surgery* **Group 1: Coping training:** patients watched short booster videotape teaching coping strategies (e.g., problem solving, contact with friends). **Group 2: Concrete-objective information teaching:** patients watched short booster videotape teaching objective information about post-procedural information (e.g., body mechanics, incisional discomfort, stretching exercises, wound healing). **Group 3: Coping training + concrete-objective information teaching:** patients received interventions outlined for Groups 1 and 2.	**Usual care, including standard information about post-surgery** (e.g., post-operative activity restrictions, clinical visits, radiographs).	**Primary** Usual activities (YRS scale – Activities, Social Activities, Academic Performance Scales) at 1, 3, 6, and 9 months post-surgery.	**Primary** *Activities:* general trend of reduced usual activities post-discharge, with gradual resumption of activities in all groups; concrete objective information was most effective for helping patients return to usual activities from 3 to 6 months; no age effects. *Social activities:* same general trend as above; scores at 9 months remained below pre-operative levels; significantly higher social scores over post-operative period in Group 3 & control for patients aged 11 to 14 years. *Academic performance:* not influenced by intervention. **Key Takeaway** Concrete objective information may be particularly helpful in helping patients with AIS resume normal activities in the medium term (3 to 6 months).

Nelson, Adamek & Kleiber 2017 [32] (USA)	2-arm, parallel-group randomized trial Study dates NR	Diagnosis of AIS; aged 10 to 19 years; scheduled for spinal fusion surgery; spoke English; no hearing deficit.	**Total** N = 41 analyzed (44 randomized) Mean (SD) age = NR % female = 90%* **Intervention group** N = 19 analyzed (20 randomized) Median (range) age = 14 (10 to 19) years % female = 95%* **Control group** N = 22 analyzed (24 randomized) Median (range) age = 14 (11 to 15) years % female = 86%*	**Pre-operative music-assisted relaxation training + post-operative music therapy:** patients viewed a short video explaining and demonstrating music-assisted relaxation during pre-operative visit and received 1 music therapy session on day 2 post-operatively with music therapist; parents received educational video on typical post-surgical behaviour and ways to help their child.	**Post-operative music therapy only:** patients did not view music-assisted relaxation video; received 1 music therapy session on day 2 post-operatively with music therapist.	**Primary** Self-reported pain and anxiety (rating scale from 0 to 10, higher scores indicate greater pain or anxiety) before and after music therapy session. **Secondary** Observed "relaxed" or "distressed" behaviors during music therapy session.	**Primary** **Pain and anxiety** No significant between-group differences (p=0.521 and p=0.855 respectively); significant within-group improvements. **Secondary** No significant between-group differences. **Key Takeaway** Music therapy might offer a means of improving pain and anxiety post-spinal fusion in patients with AIS; further studies are needed to come its effectiveness with usual care.
Rhodes et al 2015 [33] (USA)	2-arm, parallel-group randomized trial May 2010 to November 2011	Diagnosis of AIS; aged 11 to 21 years; planned for posterior spinal fusion; spoke English; no developmental delays or neurological conditions.	**Total** N = 65 randomized & analyzed Mean (range) age = 14.2 (10.8 to 19.6) years % female = 65%* **Intervention group** N = 26 analyzed (30 randomized, as treated analysis) Mean (SD) age = 14.27 (2.34) years % female = 73% **Control group** N = 39 analyzed (35 randomized, as treated analysis) Mean (SD) age = 14.23 (1.88) years % female = 59%	**Pre-operative Education and Orientation for Scoliosis Surgery (PEOSS) intervention + usual care:** patients received structured education and orientation program, including tour of relevant locations in hospital and explanation of the care that they would receive.	**Usual care:** (e.g., patients attended pre-operative visit to discuss risks, benefits, and alternatives to posterior spinal fusion).	**Primary** Anxiety (STAI-children) 2 days post-operatively and at discharge. **Secondary** Caregiver anxiety (STAI), length of stay, morphine equivalent use, and patient and caregiver satisfaction (scale 0 to 4, higher scores indicate greater satisfaction).	**Primary** (intervention vs. comparison) Significantly higher state anxiety in post-operative period (p=0.024); no other significant between-group differences. **Secondary** ***Significantly higher patient satisfaction (mean 3.75 vs. 3.51, p=0.0005).*** Caregiver anxiety, length of stay, morphine equivalent use, caregiver satisfaction: no significant between-group differences. **Key Takeaway** Pre-operative education (e.g., hospital tour and explanation of care

							provided) may increase satisfaction after post-spinal fusion in patients with AIS, but might increase anxiety in the short-term.
Ying & Fu 2020 [34] (China)	2-arm, parallel-group trial August 2017 to July 2019	Diagnosis of AIS; admitted for scoliosis surgical correction; able to tolerate surgery; able to cooperate with treatment and nursing; no additional compromising diseases; no allergies to drugs; no poor treatment compliance; not transferred for First People's Hospital in Wenling.	**Total** N = 64 randomized & analyzed Mean (SD) age = NR % female = 64.06%* **Intervention group** Total = 34 randomized & analyzed Mean (SD) age = 12.62 (5.65) years % female = 64.71% **Control group** Total = 30 randomized & analyzed Mean (SD) age = 13.27 (5.72) years % female = 63.33%	**Rosenthal effect-based nursing:** nurses trained to evaluate patients' mental wellbeing; nurses provided health education training to patients' family members and collaborated with family members to offer patient care; nurses instructed families to monitor patients' mental wellbeing; nurses encouraged patients through rehabilitation program; nurses placed funny pictures and posters on wards to improve patients' wellbeing.	**Routine nursing care:** (e.g., nurses monitored vital signs, offered simple health education, assisted with rehabilitation).	**Primary** Depression (HAM-D), anxiety (HAM-A) at discharge. Pain (VAS) 1, 3, and 7 days post-operatively. Satisfaction with nursing (nursing satisfaction questionnaire) at discharge. Quality of life (100-point system) 3 months post-discharge.	**Primary** (intervention vs. control) ***Significantly lower depression and anxiety & pain (3 and 7 days post-operatively only) (p<0.01).*** ***Significantly higher nursing satisfaction and quality of life (p<0.05).*** **Key Takeaway** Rosenthal effect-based nursing can improve mental health outcomes and pain in patients with AIS.

*Calculated using data from paper.

AIS = Adolescent Idiopathic Scoliosis; BPI = Brief Pain Inventory; HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Depression Rating Scale; IV = intravenous; NR = Not Reported; PPCI = Pediatric Pain Coping Inventory; RCT = Randomized Controlled Trial; SD = Standard Deviation; STAI = State-Trait Anxiety Inventory; USA = United States of America; VAS = Visual Analog Scale; YSR = Competence Scale of the Youth Self-Report and Profile.

Supplementary Table 3. Effectiveness of psychosocial interventions for pediatric patients with scoliosis **(general)**

General		Sample Characteristics		Study Groups		Outcomes	
Study (Country)	**Study Design & Dates**	**Selection Criteria**	**Sample Size, Age, % Female**	**Intervention Group**	**Comparison Group**	**Outcome Measure(s)**	**Result(s) & Key Takeaway**
Hinrichsen, Revenson & Shinn 1985 [35] (USA)	Cross-sectional study 1980	Intervention group: former or current dues-paying member of self-help clubs of Scoliosis Association, Inc.; completed survey (adolescent subgroup). Control: sought information about scoliosis self-hep groups to Scoliosis Association, Inc.; completed survey (adolescent subgroup).	**Total** N = 237 analyzed (283 enrolled) Mean (SD) age = NR % female = NR **Intervention group** Total = 140 enrolled (number analyzed 94) Mean (SD) age = 15.3 (NR) years % female = 91.5% **Control group** Total = 143 enrolled (number analyzed 143) Mean (SD) age = 14.6 (NR) years % female = 83.2%	**Self-help group:** members of self-help organization (Scoliosis Association) who attended ≥ 1 scoliosis club meeting aimed to reduce emotional upset, enhance physical and personal self-esteem, and improve communication with parents.	**Control:** individuals who sought information about scoliosis self-help clubs in response to a magazine article.	**Primary** Psychosocial adjustment outcomes (25-item, 4-point response scale) and satisfaction with club.	**Primary** **Psychosocial adjustment** No significant between-group differences for most outcomes (e.g., psychosomatic symptoms, self-esteem); control group had significantly more positive family environments ($p<0.05$). **Satisfaction with club** 61% reported being satisfied or very satisfied with the self-help groups. 40% reported enjoying club meetings a lot of very much. **Key Takeaway** The majority of patients with AIS appear to be satisfied with attending self-help groups, however the psychosocial benefit of these self-help groups was not evident in this study.

AIS = Adolescent Idiopathic Scoliosis; NR = Not Reported; SD = Standard Deviation; USA = United States of America.

Supplementary Table 4. Quality Assessments of Randomized Controlled Trials using Cochrane Risk of Bias Tool

Study	Selection Bias		Performance Bias	Detection Bias	Attrition Bias	Reporting Bias	Level of Evidence*
	Random sequence generation	Allocation concealment	Participant and clinician blinding	Outcome assessor blinding	Incomplete outcome data	Selective outcome reporting	
Charette et al 2016 [28]	low	low	high	high	low	low	Level 2
Karol et al 2016 [23]	unclear	unclear	high	unclear	some	some	Level 2
LaMontagne et al 2003a, 2003b, 2004 [29,30,31]	low	unclear	high	high	high	high	Level 2
Nelson, Adamek & Kleiber 2017 [32]	unclear	unclear	high	high	some	low	Level 2
Rhodes et al 2015 [33]	low	unclear	some	low	high	high	Level 2
Ying & Fu 2020 [34]	unclear	unclear	high	high	low	high	Level 2

*Column from the Centre for Evidence-Based Medicine: http://www.cebm.net.
Ratings: Level I = high-quality RCT; Level 2 = lesser-quality RCT (rated as lesser-quality due to methodological and/or reporting limitations depicted in Table).

Supplementary Table 5. Quality Assessments of Non-Randomized Studies using MINORS

	Chan et al 2017 [27]	**Hinrichsen, Revenson & Shinn 1985 [35]**	**Matsunaga et al 2005 [24]**	**Zhu et al 2021a, 2021b [25,26]**
Clearly stated aim	yes	yes	yes	yes
Inclusion of consecutive patients	unclear	yes for intervention group, no for comparison group	unclear	unclear
Prospective data collection	yes	not applicable	yes	yes
Appropriate endpoints for aim of study	yes	yes	yes	yes
Unbiased assessment of study endpoint	unclear	unclear	unclear	yes
< 5% loss to follow up	yes	no**	unclear	no
Prospective calculation of sample size	yes	unclear	unclear	unclear
Level of evidence*	Level 2	Level 3	Level 2	Level 2

* Column from the Centre for Evidence-Based Medicine: http://www.cebm.net.
Ratings: Level I = high-quality RCT; Level 2 = lesser-quality RCT or prospective comparative study; Level 3 = retrospective comparative study.
** Due to low response rate.
MINORS = Methodological Index for Non-Randomized Studies.