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The Role of Psychosocial Screening in Patient Selection for Spine Surgery: A Review

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ABSTRACT

Background: The purpose of this review is to provide a brief history of previous attempts at developing patient screening tools and to further examine the definitions of these psychological concepts, relevance to clinical outcomes, and implications for spine surgeons during preoperative patient assessments.

Methods: A literature review was performed by 2 independent researchers to identify original manuscripts related to spine surgery and novel psychological concepts. The history of presurgical psychology screening was also studied, and definitions of frequently utilized metrics were detailed.

Results: Seven manuscripts were identified that utilized psychological metrics for preoperative risk assessments and correlated outcomes with these scores. The metrics most frequently used in the literature included resilience, patient activation, grit, and self-efficacy.

Discussion: Current literature favors resilience and patient activation as important metrics for preoperative patient screening. Available studies demonstrate significant associations between these character traits and patient outcomes. Further research is warranted to investigate the roles of preoperative psychological screening to optimize patient selection in spine surgery.

Clinical Relevance: The purpose of this review is to provide clinicians with a reference for available psychosocial screening tools and their relevance to patient selection. This review also serves to guide future research directions given the importance of this topic.

Level of Evidence: 4.

Other and Special Categories

Keywords: minimally invasive surgery, spine surgery, psychology, grit, resilience, patient activation, psychosocial screening

INTRODUCTION

One of the most important challenges that spine surgeons encounter is the appropriate selection of surgical patients. Research efforts have been directed toward identifying psychological factors that can predict patient outcomes following surgery. Early attempts employed full psychological screening profiles meant to identify high-risk personality traits for patients with organic vs functional low back pain.[1–4] Hanvik was the first to utilize the Minnesota Multiphasic Personality Inventory (MMPI) and identified hypochondriasis and hysteria as personality traits frequently observed in patients with functional low back pain.[1] These personality traits combined to form a conversion-V personality type and became an area of focus until challenged by studies demonstrating significant obstacles with utilizing this tool to predict outcomes.[3,4] A more nuanced approach to predicting outcomes arose following the development of the biopsychosocial theory of pain.[5,6] In addition to underlying pathology, it is well studied that worker's compensation,[7,8] working status at the time of surgery,[9] social support,[10] education level,[11] and other social factors are predictive of surgical outcomes. Outcomes of interest are typically patient-focused, such as pain, disability, and work capacity.[5]

Significant efforts continue to be underway to develop a preoperative screening tool that can predict which patients are most likely to succeed following spine surgery, but there remains no widely accepted measure.[12,12–16] A promising new area of research focuses on resilience and grit of orthopedic surgical candidates.[17] Interestingly, studies have demonstrated that these traits can be improved through guided therapy, which could allow physicians to intervene preoperatively if they are found to improve surgical outcomes, such as adherence to physical therapy and health-related quality of life.[18] The purpose of this review is to provide a brief history of previous attempts at developing patient screening tools and to further examine the definitions of these psychological concepts, relevance to clinical outcomes, and implications for spine surgeons during preoperative patient assessments.

PREVIOUS EFFORTS IN PATIENT SELECTION IN SPINE SURGERY

The intersection of psychology, societal factors, and underlying pathology presents a unique challenge for clinicians in determining whether a patient is a good surgical candidate. Given this complexity, there has been an attempt to develop presurgical psychological screening (PPS) score cards that can simplify the process of patient selection for the physician.[19] Epker and Block's review of screening tools details the importance of personality/emotional, cognitive/behavioral, and environmental/historical factors that must be accounted for in any clinically meaningful screening tool.[19]

The early screening tool developed by Finneson and Cooper specifically for lumbar discectomy made use of biopsychosocial-type questions to determine which patients may benefit the most from surgery.[16] In addition to physical examination and radiographic findings, their survey asked whether patients had "poor psychological backgrounds," "secondary gain," and a "history of previous lawsuits."[16] Interestingly, the authors report that their score card could predict which patients would benefit most from surgery in the near term but failed to be predictive 5 years postoperatively.[16] Spengler et al also attempted to simplify patient selection for lumbar discectomy by utilizing neurological signs, sciatic tension signs, MMPI scores, and lumbar myelography or computed tomography data.[20] After applying their scorecard to 84 patients, they determined that they could predict 40% of outcome variability, and 26% was due to psychological profile, leaving them to conclude that patients with scores less than 50/100 should not be considered for surgery.[20]

More recent attempts at creating a PPS include a scorecard created by Block et al in 2001, which utilized semistructured interviews.[13] Questions included medical risk factors as well as psychological risk factors, including family reinforcement of pain, marital satisfaction, coping mechanisms, and MMPI scores. Furthermore, social risk factors such as pending litigation, job satisfaction, and substance abuse were included. Interestingly, their score card was 82.8% accurate in predicting good outcomes and 83% accurate in predicting poor outcomes.[13] After performing post hoc analysis, they determined that psychological testing alone could predict 78.4% of patient outcomes, with the psychological interview only adding an additional 5% and medical risk factors contributing 1% toward prognosis.[13]

There continues to be significant research toward developing a clinically relevant tool for identifying which patients are likely to benefit most from undergoing spine surgery.[15] The PPS discussed previously is not routinely used in clinical practice mainly due to the challenges associated with conducting psychological interviews and uncertainty of long-term predictive abilities of these metrics. Although PPS seems promising, long-term follow-up with objective functional outcome measures is required before routinely implementing such a tool into clinical practice.[13] With further investigation of novel parameters, such as grit and resilience, PPS can continue to be refined for clinical use.

PSYCHOSOCIAL METRICS

Psychological concepts such as resilience, self-efficacy, and grit are distinct and complex with many social, cultural, and biological factors interacting to determine an individual's response to a stressful experience such as surgery.[21,22] The defined personality trait of grit is somewhat new,[22] and there has been some variability in the reporting of resilience in the literature, with no universally agreed upon definition.[23,24] As such, it is important to examine the most up-to-date definitions and use of these concepts.

DEFINITIONS

Resilience

The American Psychological Association defines resilience as "the process and outcome of successfully adapting to difficult or challenging life experiences, especially through mental, emotional, and behavioral flexibility and adjustment to external and internal demands."[25]

Additionally, a recent literature review proposed an expansion of the definition to include "the ability to maintain the persistence of one's orientation toward existential purposes."[23] Resilience is beneficial in the face of major life difficulties and is associated with positive interpersonal relationships and social competence[26] as well as lower overall health care utilization and improved self-rated health.[27] Resilience is common in the general population and allows individuals to continue functioning in other areas of their life despite hindrance from a major stressor.[28] Additionally, resilience has been shown to be a dynamic process that is capable of increasing or decreasing in response to a stressful situation.[29] Resilience may be conditioned through therapy,[30] and targeted interventions are capable of building resilience in pain management,[31] although the source of resilience may be changed over time and situation.[26,32] Some of the confusion regarding the definition of resilience may result from the interplay between resilience and other psychological factors. For example, positive mental health

has been associated with high resilience in older adults,[33] and high self-efficacy is correlated with increased resilience behaviors in victims of spinal cord injury.[34]

Patient Activation

Related to the psychosocial construct of resilience is the model of patient activation, which was created by Hibbard et al in recognition of the vital role patient's play in managing their health. Patient activation comprises 4 domains: (1) believing the patient's role is important, (2) having the confidence and knowledge necessary to take action, (3) actually taking action to maintain and improve one's health, and (4) staying the course even under stress.[35] Patient activation has been recognized as a potent indicator of health outcomes in chronic disease and has specific potential in spinal surgery.[36]

Grit

Grit is a personality trait defined as an individual's perseverance and passion for achieving long-term goals in spite of failures and plateaus of progress.[37] It was developed and continues to be studied as a measured trait to account for the difference in success among high-achieving individuals independent of talent and intelligence.[22,38] Grit has been associated with individuals who seek happiness from engagement and meaning rather than the pursuit of pleasure.[39] However, the validity of grit as an independent trait has been called into question, with recent research suggesting that the perseverance aspect of grit plays a far greater role in predicting success than consistency or passion[40] and that there is construct overlap with the trait of self-control.[41]

Self-Efficacy

Self-efficacy "is an individual's subjective perception of his or her capability to perform in a given setting or to attain desired results."[42] Bandura originally described self-efficacy as the belief that one carries out specific behaviors under specific circumstances.[43] Self-efficacy may be able to influence behaviors, activity level, and achievements.[44]

MEASUREMENTS

Resilience

Given the complex nature of resilience, a reliable measurement of this psychological construct is difficult to achieve. There are more than 15 measures of resilience currently used in the published literature. The 3 highest psychometrically rated scales are the 6-item Brief Resilience Scale (BRS),[45] the 25-item Connor-Davidson Resilience Scale (CD-RISC),[46] and the 37-item Resilience Scale for adults (RSA),[47] all of which were developed originally for use in adult populations. While top-rated among available measurements, these scales were described as being of only "moderate" quality.[48]

The BRS considers resilience in its most basic definition—"the ability to bounce back from stress." It is the only scale that does not investigate the availability of any resources or characteristics known to facilitate resilience and focuses exclusively on personal agency.[45] The BRS has good internal consistency, interpretability, and construct validity, and it is the shortest assessment commonly used.[48]

The CD-RISC is a widely used scale in published literature and has been translated into more than 25 languages.[46] The CD-RISC has 5 factors: (1) personal competence, high standards, and tenacity; (2) trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; (3) positive acceptance of change and secure relationships; (4) control; and (5) spiritual influences. In a recent study of patients rehabilitating from spinal cord injury, the abbreviated 10-item CD-RISC showed the highest reliability, validity, and practicality of available CD-RISC scales.[49] A broad criticism of the available resilience scales is a focus on individual over environmental factors in assessing resilience.[50]

The RSA thoroughly examines the interpersonal (eg, family connections and social support) and intrapersonal (eg, personal strength, social competence, and structured style factors), contributing to an individual's resilience. The RSA has recently demonstrated high validity and consistency in the prediction of depression and anxiety in the face of stressful life events.[51] Otlans et al report that the RSA, CD-RISC, CD-RISC-10, and BRS have been used in the literature regarding resilience in orthopedic patients[17] (see summary of relevant measurement tools in Table 1).

Patient Activation

The measure of patient activation, which is focused on the engagement and self-confidence that patients have in their care, captures many of the characteristics of the concept of resilience. It measures a patient's willingness to work with a physician to overcome illness as well as their ability to follow through on treatment plans in the face of the stress. Such properties are highly valuable in the assessment of psychological fitness for spinal surgery.[36] The 22-item patient activation measure (PAM-22) and subsequent PAM-13 were developed to conceptualize and measure this property and have both been proven to be valid and reliable.[35,54]

Table 1. Summary of measurement tools for psychosocial traits.

Measurement Tool	Number of Items	Internal Consistency (Cronbach's α)	Test-Retest Reliability (r Value)	Validity
Brief Resilience Scale[45,48]	6	0.7–0.95	0.69	Construct
Connor-Davidson Resilience Scale-10[49]	10	0.86	0.87	Construct
Resilience Scale for Adults	37	0.9	0.84	Construct
Pain self-efficacy questionnaire[52]	10	0.92	0.73	Construct
Short Grit Scale[53]	8	0.73–0.83	0.68	Criterion
Patient activation measure-13[35]	22	0.87	0.85	Criterion

Grit

Grit is commonly measured using the 12-item Grit Scale[22] or the revised 8-item Short Grit Scale (Grit-S),[53] both of which demonstrated sufficient psychometric properties in diverse samples in their development. The use of the Grit Scale is somewhat controversial due to its overlap with concepts of perseverance and self-control. In a recent psychometric evaluation of the Grit-S performed by Gonzalez et al, the Grit-S was found to focus more on consistency of interest rather than perseverance, limiting its assessment of the original definition of grit, as well as finding no difference between the grit subscales compared with the total score.[41] A 5-item Grit Scale was adapted from the Grit-S, focusing primarily on the questions relating to perseverance. The scale displayed high psychometric properties and was found to be a good predictor of academic and career outcomes.[55]

Self-Efficacy

As self-efficacy is a widely researched construct, there are many metrics available for a range of conditions. Of 14 scales assessed in a systematic review, no current scales assessing self-efficacy were suited to musculoskeletal rehabilitation.[56] In the current review evaluating spinal surgery and self-efficacy, the pain self-efficacy questionnaire (PSEQ) was the most widely used. The PSEQ is a 10-item questionnaire that assesses the confidence that people with ongoing pain have in performing activities with pain.[52]

SPINE SURGERY AND RESILIENCE, PATIENT ACTIVATION, GRIT, AND SELF-EFFICACY

Resilience in patients undergoing spinal surgery for a non–spinal cord injury has been an understudied area, considering the complexity of spine pathology and surgical sequelae.[17] In terms of presurgical evaluation, Ahmed et al sampled 195 patients undergoing evaluation for back and neck pain at an orthopedic spine clinic and were surveyed for resilience (BRS), pain self-efficacy (PSEQ), and disability (Neck Disability Index and Oswestry Disability Index). The study revealed independent associations of low resilience and pain self-efficacy scores with greater functional disability in patients with low back and neck pain.[57] To build upon this finding, a prospective study of 248 patients undergoing laminectomy had patients complete resilience (BRS) and pain self-efficacy (PSEQ) surveys at 6 weeks and 12 months postoperatively.[58] Patients were assessed for physical function, pain interference, social participation, and disability at both time points, revealing a significant association between resilience and all listed outcomes as well as an association between pain self-efficacy and disability at 12 months. Interestingly, pain self-efficacy was a greater predictor of lower patient-reported lifestyle measures at 6 weeks than resilience, a finding paralleled in the previous study by Ahmed et al.[57,58] These results, while limited by the number of studies, are a promising indication for the use of resilience and pain self-efficacy metrics in patient selection for spinal surgery.

Patient activation has been more directly investigated in the context of patient selection for spinal surgery. In a prospective study, 65 patients undergoing lumbar spine surgery were preoperatively assessed for level of patient activation using PAM-13 and subsequently evaluated at 12 and 24 months following surgery for functional disability and mental health. A high level of patient activation was significantly associated with improved functional improvement and engagement in physical therapy after surgery but not with improved mental health.[59,60] Block et al expanded upon these findings in a larger study of 581 patients who underwent spinal surgery or spinal cord stimulator implantation.[61] Again, higher levels of preoperative patient activation were associated with improved levels of pain and functional disability. Analyses also revealed that while low baseline levels of patient activation were associated with negative psychosocial risk factors, patient activation mediated the association between these negative risk factors and poorer surgical outcomes.[61] Thus, patients with otherwise concerning psychosocial qualities, such as

depression and negative affect, may have better outcomes in spinal surgery than otherwise expected if they also possess a high level of patient activation. In contrast, a recent retrospective study of patient activation in 64 patients undergoing anterior cervical discectomy and fusion revealed conflicting results.[62] Patients were grouped based on preoperative PAM-10 scores and surveyed for pain and functional disability at 6 weeks, 3 months, 6 months, and 12 months. The results demonstrated no association between patient activation and any measure of postoperative recovery.[62] While this finding somewhat limits the indication of patient activation scores for assessment in neck surgery, this is a retrospective study with a relatively small sample size and is the only published study focusing on patient activation and neck surgery.[62] Patient activation has potential as a tool for preoperative assessment of spinal surgery due to positive correlations to outcomes in large samples. Given the relatively few studies done in this space, further prospective studies on the effect of patient activation on elective spinal surgery are called for.

The psychosocial trait of grit has also been studied in a limited fashion in spine surgery. Mok et al retrospectively assessed grit (Grit-S) and self-control (Self-Scoring Self-Control Scale) in a sample of 69 patients who underwent elective spinal surgery. Patient-reported outcome measures were completed, and patients were subsequently grouped by whether they had achieved significant improvements in functional disability. No significant difference in either grit or self-control was found.[63] This study is the only study performed to our knowledge that focused on the effect of grit on spinal surgery outcomes. It is limited by its retrospective nature and lack of multiple or uniform follow-up periods for patient subgroups. Considering the prior research discussed on the effect of grit on predicting performance, this is still a worthwhile metric to consider in the area of spinal surgery.

Self-efficacy, while intuitively promising as a predictor of outcomes in spinal surgery, has been studied in a very limited fashion. A randomized control trial studying the effect of postoperative physical therapy in surgically corrected cervical radiculopathy found that self-efficacy scores (Swedish Self-Efficacy Scale) did not differ between those who did and did not receive the intervention.[64] While self-efficacy improved in both groups from preoperative assessment, self-efficacy was not studied as a modifier of functional outcomes, so conclusions regarding its effect on patient recovery are limited.

DISCUSSION

Resilience, patient activation, grit, and self-efficacy all have potential to predict success following spine surgery. Current evidence favors resilience and patient activation as the strongest metrics for use in preoperative evaluation for spine pathology. Resilience, while complex, has been well studied and may be assessed on a personal level in short scales, such as the BRS and the CD-RISC-10, which have strong predictive evidence in orthopedic surgical outcomes.[17] If a surgeon wishes to capture a broader picture of a patient's resilience, including external social and cultural factors, the longer form RSA may be better suited.[48,51] Patient activation, while including aspects of resilience, is a unique measure that is specific to the health care setting and may offer more practical insight for an individual patient. The PAM-13 has been the most used survey and has demonstrated successful correlation with patient outcomes.[35]

Accurate collection of these measures may present challenges, with 1 recent study reporting significant changes in patient-reported outcome measurement information system scores between the preoperative visit and the day of surgery.[65] This finding indicates a need to standardize collection of data at a set time point before surgery, though more research is needed to determine the ideal time of assessment of character traits. To optimize the collection rates for patient-reported outcomes (PROs), clinics should increase physician training in PRO platforms, engage administrative support, and consider appointing a physician primary contact for a PRO program.[66] Prior experience in collecting patient outcomes has also been associated with higher collection rates.[66]

Many of the psychological traits discussed in this review have been studied in greater detail in other orthopedic subspecialties as well as other chronic medical conditions.[67] The results from these studies have been promising, as Otlans et al report in their review of resilience in orthopedic patients, though the area of research is new and lacks many long-term, prospective studies.[17] For example, Lim et al demonstrated that patients with hip fractures having higher preoperative resilience measured by CD-RISC-10 have improvements in physical function postoperatively unrelated to general mental health scores.[68] As another example, Tokish et al showed that higher postoperative resilience measured by BRS was significantly associated with improvements in American Shoulder and Elbow Surgeons and Penn scores in patients undergoing total shoulder arthroplasty.[67] There are numerous other studies with

Table 2. Summary of psychosocial screening.

Article	Study Design	Psychosocial Scales Used	Population	Number of Patients	Time From Injury or Follow-Up Period	Preoperative Collection	Level of Evidence[a]	Key Findings
Ahmed et al (2019)[57]	Cross-sectional survey	BRS, PSEQ	Low back pain, neck pain	195	NA	NA	IV	Independent negative associations of resilience and pain self-efficacy scores with ODI and NDI in patients with low back and neck pain
Coronado et al (2021)[58]	Retrospective cohort	BRS, PSEQ	Laminectomy	248	6 wk and 12 mo	No	III	Association with resilience and physical function, pain interference, social participation, and disability at both time points; association with pain self-efficacy and disability at 12 mo
Mok et al (2021)[63]	Retrospective medical record review, abstract	Short Grit Scale, Self-Scoring Self-Control Scale	ACDF, MI-D, MI-TLIF	69	6 mo for ACDF, 2 wk for MI-D, and 6 wk for MI-TLIF	No	III	No significant difference in either grit or self-control and ODI and NDI scores
Wibault et al (2017)[69]	Randomized controlled trial	Swedish version of the Self-Efficacy Scale	ACDF, PCF	202	6 mo	Yes	I	Self-efficacy improved in patients exposed to physical therapy and those not exposed to physical therapy postoperatively; however, self-efficacy was not studied as a modifier of functional outcomes
Block et al (2019)[61]	Prospective cohort	PAM-13	Spinal surgery, spinal cord stimulation	581	mean 180 d (SD 79.1)	Yes	II	Patient activation mediated the association between negative risk factors and pain and disability
Skolasky et al (2011)[60]	Prospective cohort	PAM-13	Lumbar fusion	65	12 and 24 mo	Yes	II	Positive association with patient activation and functional improvement and engagement in physical therapy after surgery
Patel et al (2019)[62]	Retrospective cohort	PAM-10	ACDF	64	6 wk, 3 mo, 6 mo, and 12 mo	Yes	III	No association between patient activation and any measure of postoperative recovery

Abbreviations: ACDF, anterior cervical discectomy and fusion; BRS, Brief Resilience Scale; MI-D, minimally invasive lumbar decompression; MI-TLIF, minimally invasive transforaminal lumbar interbody fusion; NA, not available; NDI, Neck Disability Index; ODI, Oswestry Disability Index; PAM, patient activation measure; PCF, posterior cervical fusion; PSEQ, pain self-efficacy questionnaire.

[a]Level of evidence based upon the *Journal for Bone and Joint Surgery* criteria and focused on the psychosocial outcome of interest.[70]

similar results; however, complex spine pathology requiring surgical intervention can often result in a prolonged recovery process with long-term implications that may differ from other orthopedic procedures. As such, the role of resilience may play a greater role in spine surgery and may be well suited as an area of study for preoperative risk stratification.

This review highlights the need for high-quality research in this area as well as a potential opportunity to improve patient outcomes through appropriate selection and targeted interventions. Future research should collect psychological data preoperatively, with validated measures as mentioned in this article. To definitively investigate the role of these traits in spine surgery, long-term studies with a large patient population are required. The research reviewed in this article on resilience, patient activation, grit, and self-efficacy in spine surgery only spans 7 articles, as shown in Table 2, 5 of which have been published since 2019. Follow-up has been mostly short term, and few studies have collected data preoperatively. Importantly, resilience can be improved with validated interventions focusing on a mixture of cognitive behavioral therapy and mindfulness.[18] The recent excitement surrounding these psychological metrics and their potential to identify preoperative risk factors that can be intervened upon provides support for the continued study of this emerging field.

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