Associating Outcomes After Hip Arthroscopy With Patient Resilience

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Background: Higher patient resilience has been shown to be associated with improved patient-reported outcome measures (PROMs) at 6 months after hip arthroscopy.

Purpose: To examine the relationship between patient resilience and PROMs at minimum 2 years after hip arthroscopy.

Study Design: Cross-sectional study; Level of evidence, 3.

Methods: Included were 89 patients (mean age, 36.9 years; mean follow-up, 4.6 years). Patient demographics, surgical details, and preoperative International Hip Outcome Tool-12 (iHOT-12) and visual analog scale (VAS) pain scores were collected retrospectively. Postoperative variables were collected via a survey and included the Brief Resilience Scale (BRS), Patient Activation Measure–13 (PAM-13), Pain Self-efficacy Questionnaire–2 (PSEQ-2), VAS satisfaction, and postoperative iHOT-12, and VAS pain scores. Based on the number of standard deviations from the mean BRS score, patients were stratified as having low resilience (LR; n = 18), normal resilience (NR; n = 48), and high resilience (HR; n = 23). Differences in PROMs were compared between the groups, and a multivariate regression analysis was performed to assess the relationship between pre- to postoperative change (Δ) in PROMs and patient resilience.

Results: There were significantly more smokers in the LR group compared with the NR and HR groups ($P = .033$). Compared with the NR and HR groups, patients in the LR group had significantly more labral repairs ($P = .006$), significantly worse postoperative iHOT-12, VAS pain, VAS satisfaction, PAM-13, and PSEQ-2 scores ($P < .001$ for all), and significantly lower ΔVAS pain and ΔiHOT-12 scores ($P = .01$ and .032, respectively). Regression analysis showed significant associations between ΔVAS pain and NR (β = -22.50 [95% CI, -38.81 to -6.19]; $P = .008$) as well as HR (β = -28.31 [95% CI, -46.96 to -9.67; $P = .004$) and between ΔiHOT-12 and NR (β = 18.94 [95% CI, 6.33 to 31.55]; $P = .004$) as well as HR (β = 20.63 [95% CI, 6.21 to 35.05]; $P = .006$). Male sex was a significant predictor of ΔiHOT-12 (β = -15.05 [95% CI, -25.42 to -4.69]; $P = .006$).

Conclusion: The study results indicate that lower postoperative resilience scores were associated with significantly worse PROM scores, including pain and satisfaction, at 2 years after hip arthroscopy.

Keywords: hip arthroscopy; resilience, satisfaction

Hip arthroscopy is a minimally invasive procedure that can reduce pain and improve mobility in the hip joint.[21] It has been indicated for a wide range of conditions, such as labral tears, femoroacetabular impingement, loose bodies, and synovial pathology.[23,33] Over the past decade the number of hip arthroscopy procedures has increased drastically as advances in instrumentation and surgical techniques have allowed for better access to the hip joint.[9,15] When performed for the optimally indicated patient, hip arthroscopy has been shown to lead to high patient satisfaction and good short-term postoperative functional outcome scores.[15,30] Despite its increase in use, data outlining which patients are more likely to receive long-term benefit from the procedure are limited.

Most orthopaedic studies have examined the physical factors of patients that are associated with worse postoperative functional outcomes following hip arthroscopy, such as older patient age, comorbidities, sex, degenerative joint disease, and smoking status.[34] It has also been shown that tobacco use, body mass index (BMI), and age play a significant role in outcomes following hip arthroscopy.[16,28] Historically, however, nonphysical patient characteristics such as psychological and emotional state have been disregarded as a potential factor than can affect postoperative outcomes. Recent data have shown the link between emotional and physical health must be considered as well, with multiple studies demonstrating that depression is associated with increased rates of hip pathology and worse recovery following hip arthroscopy.[11,24,32] In orthopaedics, psychometric traits have been shown to correlate positively with postoperative functional outcomes, and developing a thorough understanding and appreciation of these factors has the potential to help orthopaedic surgeons predict how patients will do following hip arthroscopy beyond the conventional physical factors of

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consideration.[25] To date, a number of studies have demonstrated that patients' mental health and other psychometric traits play a critical role in outcomes after various orthopaedic procedures.[6,7,19,24,28,33]

Resilience is a trait that has been increasingly investigated as a measure for predicting postoperative recovery.[25] Resilience is the ability for patients to endure and recover from stressful life events, such as surgery, and it arises as a normative adaptive functional trait to persevere through the challenges of life.[2,22,31] Resilience is becoming more recognized as a psychometric patient trait that correlates positively with patient outcomes, such as overall health, coping, social relations, suicide risk, and quality of life, as well as negatively with physical symptoms, depression, and anxiety.[31,34] As such, patients with lower resilience scores have been shown to seek out health care more so than their higher resilience counterparts.[8,34]

Previous studies on knee and shoulder arthroscopy demonstrated that patients with higher resilience scores had superior preoperative and postoperative functional outcome scores compared with their lower resilience counterparts.[1,4,7,10,29] Resilience therefore may prove to be a useful way to stratify patients and predict positive outcomes for patients undergoing musculoskeletal procedures. A recent study showed patients with higher resilience scores had better patient-reported outcome measures (PROMs) compared with lower resilience individuals, as well as quicker return to activity and decreased rates of depression and anxiety in the short term at 6-month follow-up following hip arthroscopy.[30] However, to our knowledge, there are no studies to date that have shown whether this association can be seen with hip arthroscopy patients long term at a minimum 2-year follow-up.

The purpose of this study was to explore the relationship of the self-reported psychometric trait of resilience with long-term PROM scores in hip arthroscopy patients to determine factors that correlate with increased patient quality of life. We hypothesized that higher scores of postoperative resilience would correlate with better long-term postoperative functional outcomes. We also hypothesized that these postoperative scores would correlate with health-related quality of life as measured by several other well-tested instruments.

METHODS

Demographic Characteristics

All patients who underwent hip arthroscopy at our institution between March 2014 and March 2019 were identified. A total of 427 patients underwent an arthroscopic hip procedure during this time period, 114 of whom had a minimum 2-year follow-up and were included in our group to be contacted. Patients included in the study had undergone hip arthroscopy for a variety of reasons, including femoroacetabular impingement, labral tears, and internal snapping hip (coxa saltans). Exclusion criteria consisted of patients <18 years of age, those with <2-year follow-up, presence of severe degenerative joint disease of the hip (defined by <2 mm of joint space on standard pelvic radiographs), and those with a previous total hip arthroplasty. Institutional review board approval was received for the study protocol, and all participants provided written informed consent.

Surgery

Three sports medicine fellowship–trained orthopaedic surgeons (including J.S.) at a single institution performed the hip arthroscopies included in this study. Procedures performed included acetabuloplasty (n = 67), femoroplasty (n = 47), labral repairs (n = 50), synovectomy (n = 14), capsular closure (n = 89), and revision surgery (n = 5). Notably, the revision cases were counted a single time, as this was the first instance in which the surgeon participating in this study operated on the patient.

Preoperative Data and Postoperative Survey

Baseline demographic data, surgical details, and preoperative visual analog scale (VAS) pain (0-100 scale) and International Hip Outcome Tool-12 (iHOT-12) scores were recorded from the patient records.[26] A 35-question postoperative survey was sent to all patients using an online survey distribution tool (REDCap; Vanderbilt University). Included in the survey was the Brief Resilience Scale (BRS), a 6-item Likert scoring scale that has been identified as an accurate and reliable method of measuring a patient's level of resilience,[31,34] as well as the Pain Self-efficacy Questionnaire–2 (PSEQ-2), a 2-item form that addresses the patient's ability to cope with one's current amount of pain, and the Patient Activation Measure–13 (PAM-13), which assesses a patient's knowledge, skills, and confidence in managing his or her own health care.[3,13] Last, the postoperative survey included VAS pain and VAS satisfaction (0-100 scale) and the iHOT-12.[26]

Statistical Analysis

Based on the number of standard deviations away from the mean BRS score, the patients were stratified as having

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high (HR), normal (NR), or low (LR) resilience. BRS scores overall ranged from 1.83 to 4.83, with a mean ± SD score of 3.74 ± 0.80. The LR group consisted of patients whose scores were >1 SD below the mean (n = 18), the NR group consisted of patients with scores that were ≤1 SD of the mean (n = 48), and the HR group consisted of patients with scores >1 SD above the mean (n = 23). This stratification was performed similarly to previous studies performed by Tokish et al.[34]

After this stratification, a set of descriptive statistics was analyzed based on the groups into which each patient fell. Continuous data were recorded as means and standard deviations, and categorical data were recorded as absolute values (percentages). Normality for continuous data was assessed via Shapiro-Wilk test. Depending on its normality, the analysis of variance or Kruskal-Wallis test was used to compare continuous data among the 3 study groups, while the chi-square or Fisher exact test was used to compare categorical data. In cases where the continuous variables produced significant findings, Bonferroni corrections were performed.

Multivariate regression analyses were performed to assess the relationship between pre- to postoperative change (Δ) in PROM scores (VAS pain, VAS satisfaction, iHOT-12, PAM-13, and PSEQ-2) and patient resilience as determined by BRS score breakdown, with the LR group as the reference variable. The model was also adjusted for age, BMI, and sex. PROMs involving physical outcomes were combined to form a Physical Component Summary (PCS) score (derived from the PCS of the standardized 12-item Short Form Health Survey [SF-12]), and PROMs involving mental outcomes were combined to create a Mental Component Summary (MCS) score (derived from the PCS of the SF-12); thus ΔPCS, ΔMCS, ΔVAS pain, and ΔiHOT-12 were the dependent variables. Significance was determined at $P < .05$. All statistical analyses were performed using R Studio (Posit, Version 4.1.2).

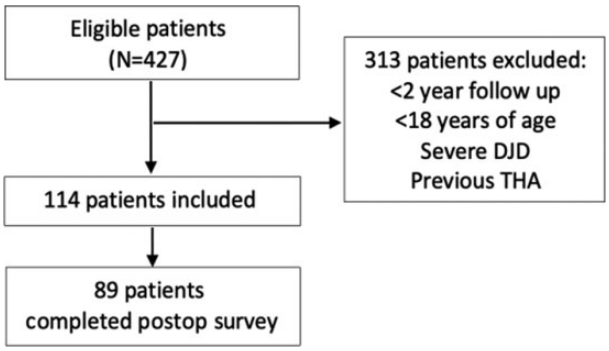

Figure 1. STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) flow diagram for the included patients. DJD, degenerative joint disease; postop, postoperative; THA, total hip arthroplasty.

RESULTS

Surveys were sent postoperatively to 114 patients via email, from which 59 responses were received. An additional 30 patients were able to be contacted to complete the survey via the telephone, to provide an overall sample size of 89 patients and a 78% response rate for our survey (Figure 1).

Baseline Preoperative Data

There were no significant differences between the LR, NR, and HR groups based on age, sex, BMI, workers' compensation status, or average follow-up (Table 1). There were significantly more tobacco users in the LR group compared with the NR and HR groups, as all the patients who were tobacco users (2 patients) included in our study self-identified as LR individuals ($P = .033$).

TABLE 1
Patient Demographics Stratified by Resilience Group[a]

	All Patients (N = 89)	LR Group (n = 18)	NR Group (n = 48)	HR Group (n = 23)	*P*
BRS score	3.74 ± 0.80	2.55 ± 0.30	3.73 ± 0.36	4.70 ± 0.26	**<.001**
Age at surgery, y	36.9 ± 12.0	34.9 ± 10.3	35.8 ± 12.1	40.8 ± 12.6	.184
Sex					.658
Female	56 (62.9)	13 (72.2)	29 (60.4)	14 (60.9)	
Male	33 (37.1)	5 (27.8)	19 (39.6)	9 (39.1)	
BMI	25.3 ± 4.2	25.6 ± 4.7	24.6 ± 3.9	26.4 ± 4.4	.160
Smoker					**.033**
No	84 (97.7)	14 (87.5)	47 (100.0)	23 (100.0)	
Yes	2 (2.3)	2 (12.5)	0 (0.0)	0 (0.0)	
Workers' compensation					.404
No	83 (95.4)	17 (94.4)	46 (97.9)	20 (90.9)	
Yes	4 (4.6)	1 (5.6)	1 (2.1)	2 (9.1)	
Follow-up time, d	1681 ± 355	1819 ± 285	1620 ± 357	1701 ± 379	**.045**
Follow-up time, y	4.60 ± 0.97	4.98 ± 0.78	4.44 ± 0.98	4.66 ± 1.04	**.044**

[a]Data are presented as mean ± SD or n (%). Boldface *P* values indicate statistically significant difference between resilience groups ($P < .05$). BMI, body mass index; BRS, Brief Resilience Scale; HR, high resilience; LR, low resilience; NR, normal resilience.

Surgical Details

There was no significant difference between the LR, NR, and HR groups based on the laterality, revision procedures, capsular closures performed, or number of acetabuloplasties, femoroplasties, or synovectomies (Table 2). However, there were significantly more labral repairs performed in the LR group compared with the NR and HR groups ($P = .006$). In addition, there were more right sided procedures performed in the LR group compared with the NR and HR groups ($P = .043$). Less synovectomies were performed in the LR group compared with the NR and HR groups ($P = .043$).

PROM Scores

There were no significant differences between the LR, NR, and HR groups in preoperative VAS pain or iHOT-12 scores. Although the data did not reach significance, patients in the LR group had increased preoperative VAS pain scores and decreased preoperative iHOT-12 scores compared with those in the NR and HR groups (Table 3).

Postoperatively, the LR group scored significantly worse than the NR and HR groups with regard to VAS pain, VAS satisfaction, iHOT-12, PAM-13, and PSEQ-2 ($P < .001$ for all) (Table 3).

TABLE 2
Surgical Details Stratified by Resilience Group[a]

	All Patients (N = 89)	LR Group (n = 18)	NR Group (n = 48)	HR Group (n = 23)	*P*
Laterality					**.043**
Left	38 (42.7)	3 (16.7)	24 (50.0)	11 (47.8)	
Right	51 (57.3)	15 (83.3)	24 (50.0)	12 (52.2)	
Acetabuloplasty					.204
No	22 (24.7)	2 (11.1)	12 (25.0)	8 (34.8)	
Yes	67 (75.3)	16 (88.9)	36 (75.0)	15 (65.2)	
Labral repair					**.006**
No	39 (43.8)	2 (11.1)	24 (50.0)	13 (56.5)	
Yes	50 (56.2)	16 (88.9)	24 (50.0)	10 (43.5)	
Femoroplasty					.257
No	28 (37.3)	3 (25.0)	20 (45.5)	5 (26.3)	
Yes	47 (62.7)	9 (75.0)	24 (54.5)	14 (73.7)	
Synovectomy					**.043**
No	46 (76.7)	3 (60.0)	33 (86.8)	10 (58.8)	
Yes	14 (23.3)	2 (40.0)	5 (13.2)	7 (41.2)	
Capsular closure: yes	89 (100)	18 (100)	48 (100)	23 (100)	
Revision					>.999
No	84 (94.4)	17 (94.4)	45 (93.8)	22 (95.7)	
Yes	5 (5.62)	1 (5.56)	3 (6.25)	1 (4.35)	

[a]Data are presented as n (%). Boldface *P* values indicate statistically significant difference between resilience groups ($P < .05$). HR, high resilience; LR, low resilience; NR, normal resilience.

TABLE 3
Comparison of Preoperative and Postoperative PROM Scores Between Groups[a]

	All Patients (N = 89)	LR Group (n = 18)	NR Group (n = 48)	HR Group (n = 23)	*P*
Preoperative					
VAS pain	57.6 ± 21.2	59.5 ± 13.5	57.9 ± 22.4	55.6 ± 24.0	.837
iHOT-12	31.5 ± 17.6	26.0 ± 8.99	32.5 ± 16.8	33.8 ± 23.6	.330
Postoperative					
VAS pain	22.1 ± 24.0	43.1 ± 24.6	18.7 ± 22.7	12.7 ± 15.8	**<.001**
iHOT-12	73.0 ± 22.1	53.9 ± 18.5	77.4 ± 19.4	78.8 ± 22.3	**<.001**
VAS satisfaction	79.7 ± 26.3	55.5 ± 31.8	86.1 ± 19.8	85.3 ± 23.5	**<.001**
PAM-13	44.0 ± 5.92	37.7 ± 4.92	44.1 ± 5.07	48.7 ± 3.30	**<.001**
PSEQ-2	9.92 ± 2.02	7.78 ± 1.26	10.2 ± 1.64	11.0 ± 2.06	**<.001**

[a]Data are presented as mean ± SD. Boldface *P* values indicate statistically significant difference between resilience groups ($P < .05$). HR, high resilience; iHOT-12, 12-item International Hip Outcome Tool; LR, low resilience; NR, normal resilience; PAM-13, Patient Activation Measure–13; PROM, patient-reported outcome measure; PSEQ-2, Pain Self-efficacy Questionnaire–2; VAS, visual analog scale.

Pre- to Postoperative Changes in PROM Scores

The HR group had a significantly greater ΔVAS pain scores compared with the LR and NR groups ($P = .01$) (Table 4). A similar result was seen on the iHOT-12, with the HR and NR groups having significantly greater improvements in preoperative to postoperative functional outcome scores ($P = .032$).

Results of Regression Analyses

The results of the regression analyses are shown in Table 5. There were no significant associations between ΔPCS or ΔMCS scores and resilience, age, BMI, or sex. A significant association was found between ΔVAS pain and NR (β = -22.50 [95% CI, -38.81 to -6.19]; $P = .008$) as well as HR (β = -28.31 [95% CI, -46.96 to -9.67; $P = .004$). Similarly, a significant association was found between ΔiHOT-12 and NR (β = 18.94 [95% CI, 6.33 to 31.55]; $P = .004$) as well as HR (β = 20.63 [95% CI, 6.21 to 35.05]; $P = .006$). In addition, male sex was found to be a significant predictor of ΔiHOT-12 (β = -15.05 [95% CI, -25.42 to -4.69]; $P = .006$).

TABLE 4
Comparison of Pre- to Postoperative Change in VAS Pain and iHOT-12 Scores Between Groups[a]

	All Patients (N = 89)	LR Group (n = 18)	NR Group (n = 48)	HR Group (n = 23)	*P*
ΔVAS pain score	-35.52	-16.49	-39.13	-42.89	**.010**
ΔiHOT-12 score	41.3	27.9	45.3	44.1	**.032**

[a]Bolded values indicate statistical significance. HR, high resilience; iHOT-12, 12-item International Hip Outcome Tool; LR, low resilience; NR, normal resilience; VAS, visual analog scale.

DISCUSSION

To our knowledge, this is the first study of its kind to address the association of postoperative resilience scores with PROMs, including postoperative pain and satisfaction, at a minimum of 2-year follow-up after hip arthroscopy. Notably, there were no differences between patient resilience groups regarding preoperative VAS pain or iHOT-12 scores. This contrasts with other studies in the orthopaedic literature, which have found a significant association between resilience scores and preoperative pain and functional scores.[7,29] The results of this study were also striking in the magnitude of suboptimal postoperative pain scores, satisfaction values, and other PROMs in the LR cohort compared with the NR and HR cohorts ($P < .001$ for all scores). These results are in line with previously reported outcomes for patients with low resilience undergoing fracture surgery, total knee arthroplasty, total shoulder arthroplasty, and knee arthroscopy.[4,18,19,34]

A similar study on patient resilience and hip arthroscopy reported outcomes at 6 months to 1 year postoperatively.[30] The data in the current study incorporated results at a minimum of 2 years postoperatively. Our findings are in line with previously reported outcomes related to suboptimal outcomes in low-resilience patients. It is also important to recognize the significant difference in smoking status between the study cohorts, with the LR group having more smokers than the NR or HR groups ($P = .03$). These 2 patient characteristics have the potential to act synergistically in a negative manner in these patients postoperatively. The potential association between tobacco use and

TABLE 5
Results of Regression Analysis Using Change in PROM Scores as the Dependent Outcome[a]

	ΔPCS[b]		ΔMCS[c]		ΔVAS Pain		ΔiHOT-12	
Predictor	β (95% CI)	*P*	β (95% CI)	*P*	β (95% CI)	*P*	β (95% CI)	*P*
Resilience								
LR	Reference		Reference		Reference		Reference	
NR	6.05 (-0.21 to 12.31)	.062	5.13 (-1.89 to 12.16)	.156	-22.50 (-38.81 to -6.19)	**.008**	18.94 (6.33 to 31.55)	**.004**
HR	6.68 (-0.48 to 13.84)	.071	5.37 (-2.67 to 13.40)	.194	-28.31 (-46.96 to -9.67)	**.004**	20.63 (6.21 to 35.05)	**.006**
Age	-0.13 (-0.35 to 0.09)	.252	0.23 (-0.02 to 0.47)	.070	0.004 (-0.54 to 0.55)	.989	-0.18 (-0.62 to 0.26)	.427
BMI	-0.36 (-0.96 to 0.24)	.248	-0.23 (-0.90 to 0.45)	.514	1.14 (-0.44 to 2.72)	.160	-1.15 (-2.37 to 0.07)	.069
Sex	-1.38 (-6.45 to 3.69)	.595	-0.28 (-5.98 to 5.41)	.922	8.38 (-4.81 to 21.57)	.217	-15.05 (-25.42 to -4.69)	**.006**

[a]Bolded values indicate statistical significance. BMI, body mass index; HR, high resilience; iHOT-12, 12-item International Hip Outcome Tool; LR, low resilience; MCS, Mental Component Summary; NR, normal resilience; PCS, Physical Component Summary; PROM, patient-reported outcome measure; VAS, visual analog scale.
[b]PROMs involving a physical component were derived from the PCS of the standardized 12-item Short Form Health Survey.
[c]PROMs involving a mental component were derived from the MCS of the standardized 12-item Short Form Health Survey.

low resiliency and its impact on patient-reported outcomes is an area for future investigation.

Understanding and identifying patient resilience and the negative effect that low resilience has on postoperative outcomes is only a piece of the puzzle. Considering patient resilience and resilience-based interventions may improve patient outcomes in addition to postoperative mental health. There is a push to integrate behavioral health into health care delivery systems, with a belief that integrated care models may help to improve results, to decrease health care utilization, and to lower health care costs.[12,17,25] The implications this has for informed consent and educating patients on expectations cannot be understated; however, the additional question becomes this: in patients with known low resilience, is there a way to help improve this preoperatively? Although many studies have demonstrated the effect that low resilience can have on postoperative outcomes in the orthopaedic patient, few have touched on ways to improve this, if resilience is, in fact, a modifiable trait.

In previous studies it has been suggested that intervening preoperatively may be reasonable if low resilience is identified.[5,14] Importantly, however, there is initial information to show that resilience may be a stable patient characteristic not affected by adversity.[20] Some interventions that have been proposed as having the potential to improve patient resilience include psychoeducation, cognitive behavioral therapy, and physical therapy or occupational therapy with providers trained in these areas.[18,25,36] Studies have demonstrated these modalities are effective in improving patients' postoperative pain, depression, and pain anxiety following fracture surgery.[35] Intervening and improving patients' mental health and psychological well-being may improve physical, mental, and social functioning, which, could ultimately result in decreased complication rates and fewer readmissions.[27] Whether patients' resilience can be modified is yet to be determined; however, resilience-focused preoperative optimization has demonstrated improved psychological health, which shows the potential for similar intervention to improve patient-reported outcomes.[6] Further investigation is warranted to determine whether the same effect can be realized in patients undergoing hip arthroscopy.

Limitations

This study is not without limitations. First is its retrospective nature and the inherent disadvantages associated with this type of investigation. Administration of the BRS postoperatively is suboptimal when compared with preoperative administration, as postoperative state may affect one's response to the questionnaire. Also, the administration of the BRS score in the postoperative setting could have been confounded by patients' postoperative function, which is directly measured by the PROMs. Therefore, it is not possible to say, based on our study, whether BRS scores, if collected preoperatively, would have been predictive of better or worse outcomes. In addition, this study was undertaken utilizing patients from a single institution, so inferences on other practices may not be valid. In addition, with this being a survey-based study, it has the potential to have nonresponse bias, although we did have an overall response rate of 78%, which is considered acceptable based on previously published survey-based studies. Although the authors were able to identify a correlation with low resiliency and tobacco use, a multivariate regression was unable to be run due to the small number of smokers (2 patients). This has the potential of confounding negative outcomes in patients with documented low resiliency who also use tobacco. Finally, the BRS has not been validated to be utilized as a telephone questionnaire despite its internal consistency and reliability in other studies. Administration of this questionnaire through telephone conversation has the potential to bias results.

CONCLUSION

The study findings showed that patients with lower postoperative resilience scores had significantly decreased postoperative PROMs, including increased pain and less satisfaction, and worse pre- to postoperative improvement in PROMs at 2 years after hip arthroscopy as compared with their higher resilience counterparts based on BRS scores. Future investigation is needed to demonstrate the effect, if any, that preoperative resilience scores have on predicting patient improvement and reported outcomes.

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