

ORIGINAL RESEARCH ARTICLE

Neuro-linguistic programming for postoperative pain management: A randomized controlled trial

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Nursel Alp Dal¹, Kerime D. Beydağ² and Aysel Doğan^{3*}

Munzur University Faculty of Health Sciences, Department of Midwifery, Tunceli, Türkiye¹, Yalova University Faculty of Health Sciences, Department of Nursing, Yalova, Türkiye², Toros University, Faculty of Health Sciences, Department of Surgical Nursing, Mersin, Türkiye³

***For Correspondence:** Email: aysel.dogan@toros.edu.tr ; Phone: +90 549 589 69 59

Abstract

Effective control of pain after cesarean delivery is essential, as poorly managed postoperative pain is a common complication that can impair maternal recovery and early infant care. This prospective, randomized, single-blind controlled trial, conducted in the postpartum unit of Kocaeli University Hospital, Kocaeli, Türkiye, between March 2021 and June 2022, compared the effect of a single neuro-linguistic programming (NLP) session added to standard postoperative care against standard care alone. Seventy-six consenting women were randomized in equal numbers to the intervention (standard care plus NLP) or control (standard care only) group. The primary outcome was pain intensity, measured with the Visual Analogue Scale (VAS) before and after the intervention period. Mean follow-up pain scores were significantly lower in the intervention group (2.37 ± 1.792) than in the control group (6.68 ± 2.068 ; $p < 0.001$), while baseline pain scores and maternal demographic and obstetric characteristics did not differ significantly between groups. Adding a single NLP session to standard postoperative care effectively reduced pain after cesarean delivery, supporting its use as a non-pharmacological adjunct in postoperative nursing and midwifery practice. (*Afr J Reprod Health* 2026; 30 [18]:112-120).

Keywords : Cesarean, Delivery, Complementary therapies, Nurse, Pain, Surgery

Résumé

Une prise en charge efficace de la douleur après une césarienne est essentielle, car une douleur postopératoire mal gérée constitue une complication fréquente susceptible de nuire au rétablissement de la mère et aux premiers soins prodigués au nourrisson. Cet essai prospectif, randomisé, contrôlé en simple aveugle, mené dans l'unité post-partum de l'hôpital universitaire de Kocaeli, à Kocaeli, en Turquie, entre mars 2021 et juin 2022, a comparé l'effet d'une seule séance de programmation neurolinguistique (PNL) ajoutée aux soins postopératoires standard à celui des soins standard seuls. Soixante-seize femmes ayant donné leur consentement ont été randomisées en nombre égal dans le groupe d'intervention (soins standard plus PNL) ou dans le groupe témoin (soins standard uniquement). Le critère d'évaluation principal était l'intensité de la douleur, mesurée à l'aide de l'échelle visuelle analogique (EVA) avant et après la période d'intervention. Les scores moyens de douleur observés lors du suivi étaient significativement plus faibles dans le groupe d'intervention ($2,37 \pm 1,792$) que dans le groupe témoin ($6,68 \pm 2,068$; $p < 0,001$), tandis que les scores de douleur initiaux ainsi que les caractéristiques démographiques et obstétricales des mères ne présentaient pas de différence significative entre les groupes. L'ajout d'une seule séance de PNL aux soins postopératoires standard a permis de réduire efficacement la douleur après une césarienne, ce qui plaide en faveur de son utilisation comme complément non pharmacologique dans la pratique infirmière et obstétricale postopératoire. (*Afr J Reprod Health* 2026; 30 [18]: 112-120).

Keywords: Accouchement, Césarienne, Chirurgie, Douleur, Infirmière, Thérapies complémentaires.

Introduction

Worldwide, cesarean section is one of the most frequently performed major abdominal operations in women, and it is not without complications: bleeding, infection, delayed return of function, and

postoperative pain all number among the risks that accompany major surgery of this kind.¹⁻³ Pain is particularly persistent among these complications, present throughout the first postoperative day and most severe within the first six hours.⁴⁻⁶ Prevalence estimates vary but are consistently high — one

report placed the proportion of women still in pain between the first and third day after cesarean birth at 54.9%,⁴ while El-Ansary and Gamel, and separately Karlström et al. (2007), each recorded pain in 78% of mothers, rated as moderate to severe in the latter study.^{2,7}

For midwives and nurses, keeping this pain under control is a central responsibility: doing so both prevents complications linked to unrelieved pain and protects the mother's comfort and her ability to begin caring for her newborn.² Left unaddressed, postoperative pain drains mothers physically and emotionally, interferes with breastfeeding, and can leave them too depleted to meet either their own needs or their infant's.^{2,6,8} Any strategy for controlling this pain, however, has to reckon with the fact that pharmacological agents can cross into breast milk and affect the infant as well as the mother — a consideration that lends particular weight to non-pharmacological adjuncts.^{9,10}

One such adjunct is neuro-linguistic programming (NLP), a technique that works by helping individuals replace unhelpful patterns of thought with more adaptive, positive ones, so that cognitive and physiological responses come into closer alignment.^{11,12} It belongs to a broader family of body-mind therapies that address postoperative pain indirectly, through the emotional factors that color how pain is perceived, rather than through the underlying tissue injury itself.¹¹ An NLP session typically begins with the practitioner drawing out the person's account of a distressing event, attending closely to the words used, body language, and eye movements that accompany it, and noting where these channels agree or diverge — a process that exposes both the original experience and the emotional residue it has left behind. The technique then works through whichever sensory channel — visual, auditory, or kinesthetic — dominates the person's processing of that experience, aiming to convert its negative charge into something more positive.^{12,14} Supporting evidence spans several conditions: a meta-analysis linked NLP to improvement in phobias, post-traumatic stress, anxiety, depression, and sleep disturbance,¹⁵ and in a clinical trial among patients recovering from open-heart surgery, NLP reduced pain and increased comfort.¹¹

What remains untested, however, is whether a single NLP sub-modality session can

influence pain after cesarean delivery — a question this prospective, randomized, single-blind trial was designed to answer. Two hypotheses followed from this aim:

H₀: The NLP sub-modality technique does not significantly reduce pain after cesarean delivery.

H₁: The NLP sub-modality technique significantly reduces pain after cesarean delivery.

Figure 1 sets out the conceptual framework that guided the trial, contrasting an experimental arm — standard postoperative care plus a single NLP session — against a control arm receiving standard care alone, with pain in both arms reassessed using the VAS afterward.

Methods

Study design

Women who underwent cesarean delivery and were subsequently admitted to the postpartum unit of the maternity and pediatrics clinic at Kocaeli University Hospital, in Kocaeli, north-western Türkiye, were enrolled in this prospective, randomized, single-blind controlled trial between March 1, 2021, and June 1, 2022. A priori calculation with G*Power software indicated that 38 participants per arm (76 in total) would yield 99.9% power, assuming an alpha of 0.05 and an effect size of 2.22.¹⁶

Participants

Women delivering by cesarean section at the hospital during the study period made up the eligible population, and their progress through the trial — enrollment, allocation, follow-up, and analysis — was tracked in line with the CONSORT 2025 guidelines, as illustrated in Figure 2.¹⁷ No participant was lost to follow-up: all 76 women randomized (38 per arm) completed the study.

To allocate participants, a sequence of single-digit values (1 or 2) was generated in advance with the Random Integer Generator tool on Random.org and sealed inside opaque envelopes; the next envelope in sequence was opened as each woman was enrolled, and her group followed from the number it contained.

This sequence, along with the resulting group assignments, was generated and held by a statistician independent of the research team, and participants had no knowledge of the other group's

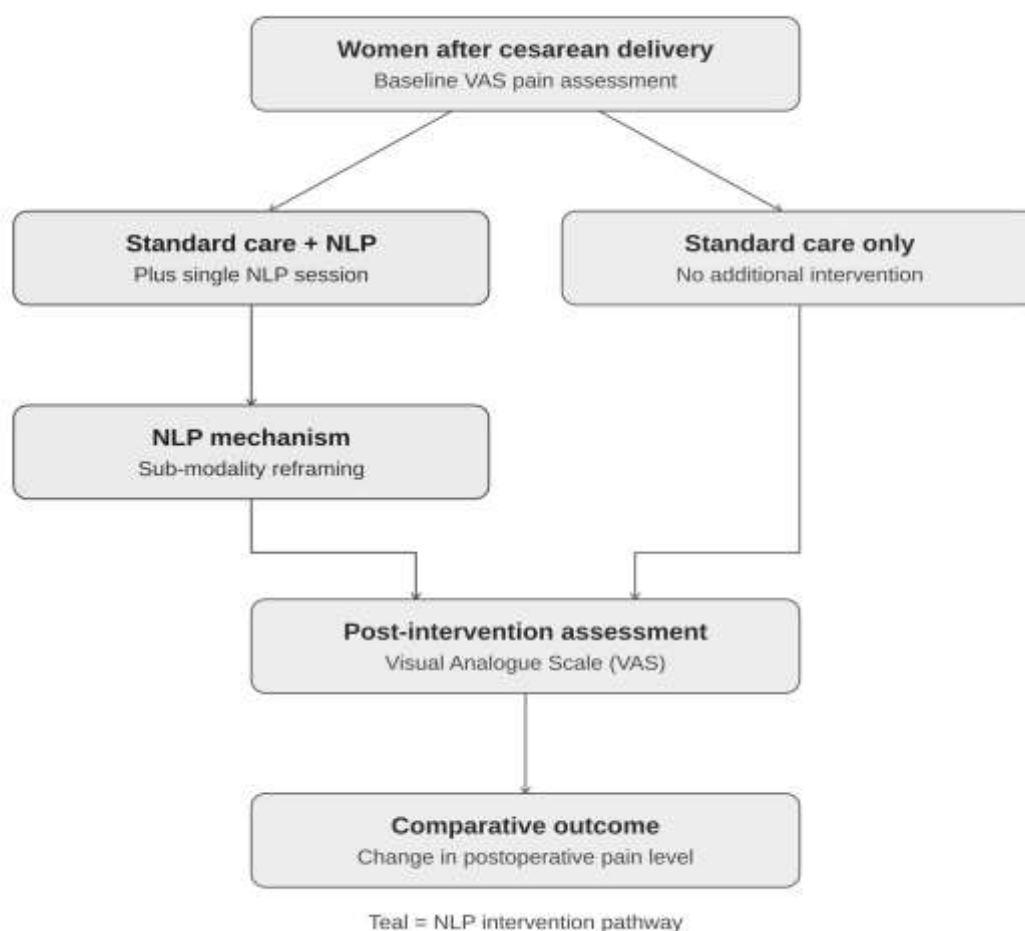


Figure 1: Conceptual framework of the study

existence or composition. The researcher administering the intervention could not be kept blind to allocation, however, since she was also the certified NLP practitioner delivering the technique and therefore had to know which participants were assigned to receive it; the trial was consequently single-blind rather than double-blind. To guard against evaluator bias introduced by this arrangement, outcome data were analyzed by a separate statistician with no knowledge of group allocation. Each participant was also housed in her own room — private or shared with another woman in the same arm — spacious enough for comfortable movement, which prevented any exchange of information between women assigned to different groups.

Inclusion criteria: a woman qualified for the study if this was her first cesarean delivery, she could be assessed between 6 and 24 hours postpartum, she

gave written informed consent, she was not using patient-controlled analgesia, she had no source of postpartum pain besides the cesarean incision itself, and she was able to communicate in Turkish.

Exclusion criteria: women were excluded for withdrawing from the study, for verbal communication difficulties, for hearing or visual impairment, or for a pre-existing psychiatric diagnosis.

Data collection: experimental group (NLP sub-modality technique)

Every woman who agreed to participate did so after giving written informed consent following delivery, and — whatever her group assignment — continued to receive the hospital's standard pharmacological analgesia and routine nursing and midwifery care for the full study period, none of which was altered

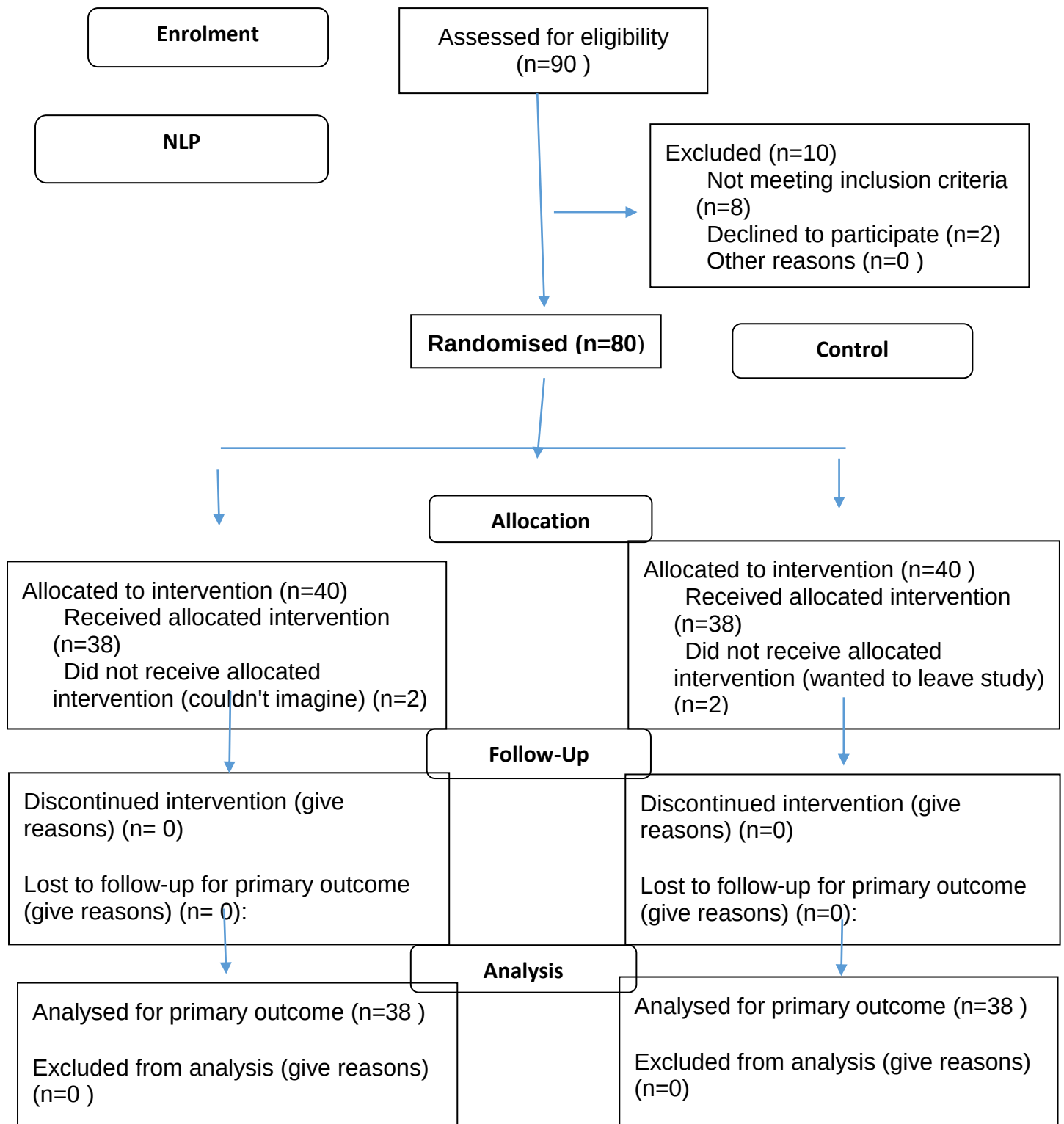


Figure 1: CONSORT 2025 flow diagram

Flow diagram of the progress through the phases of a randomised trial of two groups (that is, enrolment, intervention allocation, follow-up, and data analysis)

or withheld for research purposes. The only addition for the experimental group was a single NLP session layered onto this unchanged standard of care.

Baseline pain was rated on the VAS once consent was obtained, after which participants completed a 20-minute NLP session built around the sub-modalities of the visual, auditory, and kinesthetic channels, using guided imagery to help shift the emotional tone attached to these sensory experiences. As outlined earlier, the practitioner first drew out the participant's account of the problematic event along with its accompanying words, body language, and gaze, checking for congruence among them to surface both the original experience and its lasting emotional effect; reinforcing whichever channel proved dominant then allowed its negative charge to be reworked into something more positive.¹¹⁻¹⁴ Every session was led by a certified NLP practitioner, and the VAS was re-administered immediately afterward.

Control group (routine follow-up)

Control-group participants followed the same initial steps — written informed consent after delivery, then a baseline VAS rating — before receiving standard pharmacological analgesia and routine nursing and midwifery care identical to that given the experimental group, without any non-pharmacological addition. Twenty minutes later, matching the interval used for the experimental arm, the VAS was administered again.

Data collection instruments

A demographic questionnaire and the VAS together supplied the study data.

Demographic questionnaire: Built on the existing literature, the questionnaire captured participants' demographic profile and details of their cesarean delivery.^{2,8,11}

Visual Analogue Scale (VAS): Introduced by Hayes and Patterson in 1921 and adapted by Zealley and Aitken in 1969 for rating mood, the VAS has since become a standard tool for quantifying subjective symptoms including pain, most often presented as a horizontal rather than vertical line in studies of pain populations.¹⁸ In its usual form, a 10-cm line runs between two opposing descriptors, such as "no pain at all" at one end and "unbearable pain" at the other; the respondent marks

the point that best reflects her pain, and the distance of that mark from the "no pain" end, measured in centimeters, gives the score. Scores of 0 indicate no pain, 1–4 mild pain, 5–6 moderate pain, and 7–10 severe pain.¹⁹

Data analysis

IBM SPSS Statistics, version 26, was used for all analyses. Categorical data were expressed as frequencies and percentages and continuous data as means and standard deviations; because the Kolmogorov-Smirnov test showed the continuous variables to be normally distributed, parametric tests were used throughout. Categorical associations were tested with chi-square, between-group differences in continuous variables with the independent-samples t-test, and within-group change over time with the paired-samples t-test, while ANCOVA compared follow-up pain scores between groups after controlling for baseline values. Significance was set at $p < 0.05$ for all tests.

Ethical considerations

Approval for this trial came from the Scientific Research and Publication Ethics Committee of İstanbul Okan University (date: 23 December 2020; number: 130); it was carried out in line with the Declaration of Helsinki and registered with ClinicalTrials.gov (identifier: NCT05033405). Before any data were collected, permission was granted by the hospital, and every participant gave both written and verbal informed consent.

Results

Baseline comparisons between the experimental and control groups revealed no significant differences in age, education, time since delivery, anesthesia type, cesarean type, satisfaction with the cesarean experience, or the reason for surgery ($p > 0.05$ throughout), indicating that randomization had produced two well-matched groups (Table 1). Baseline VAS scores, at 5.76 ± 2.006 for the control group and 6.55 ± 1.704 for the NLP group, were statistically indistinguishable ($p = 0.068$; Table 2). This changed markedly by follow-up: the control group's score rose to 6.68 ± 2.068 while the NLP group's fell to 2.37 ± 1.792 , a significant between-group difference favoring NLP ($p < 0.001$), matched

Table 1: Participants' characteristics by control and NLP groups

	Control (n=38)		NLP Applied (n=38)		Total (n=76)		Chi-square	p
	n	%	n	%	n	%		
Age group							0.474	0.491
19–29	21	55.3	18	47.4	39	51.3		
30–42	17	44.7	20	52.6	37	48.7		
Education							0.944	0.301
Primary school	13	34.2	13	34.2	26	47.4		
High school	11	28.9	13	34.2	24	31.5		
University and above	14	36.9	12	31.6	26	21.1		
Time after childbirth							2.581	0.108
6–12 hours	16	42.1	23	60.5	39	51.3		
13–24 hours	22	57.9	15	39.5	37	48.7		
Type of anesthesia							0.000	1.000
General	2	5.3	2	5.3	4	5.3		
Regional	36	94.7	36	94.7	72	94.7		
Type of cesarean section							0.322	0.210
Planned	18	47.4	20	52.6	42	55.3		
Emergency	20	52.6	18	47.4	34	44.7		
Satisfaction with cesarean section							0.220	0.896
Satisfied	22	57.9	24	63.2	46	60.5		
Dissatisfied	8	21.1	7	18.4	15	19.7		
Undecided	8	21.1	7	18.4	15	19.7		
Reasons for cesarean section							5.317	0.150
Repeat cesarean	16	42.1	24	63.2	40	52.6		
Nonprogressive labor	9	23.7	7	18.4	16	21.1		
Fear of childbirth	2	5.3	3	7.9	5	6.6		
Other	11	28.9	4	10.5	15	19.7		

p: statistical significance level <0.05.

Table 2: Intra- and inter-group differences in mean pain scores at baseline and follow-up

	Control (n=38)		NLP applied (n=38)		Intergroup differences	
	Mean	SD	Mean	SD	t ^a	p
Pain score at baseline	5.76	2.006	6.55	1.704	-1.849	0.068
Pain score at follow-up	6.68	2.068	2.37	1.792	9.722	0.000*
Within-group difference (t ^b ; p)	-5.547; 0.000*		16.037; 0.000*			

t^a: independent-samples t-test; t^b: paired-samples t-test; *p<0.05.

Table 3: Between-group differences in adjusted pain scores controlling for baseline values (ANCOVA)

	Control (n=38)		NLP applied (n=38)		F	P
	Mean	SD	Mean	SD		
VAS (adjusted)	6.68	0.21	2.06	0.21	264.421	0.000*

*p<0.05.

by significant within-group change in each arm — upward for controls, downward for the NLP group (both p<0.001). An ANCOVA controlling for baseline scores confirmed this result (Table 3): with the assumptions of homogeneity of regression slopes (F=3.321, p=0.073) and homogeneity of variance (F=2.700, p=0.105) both met, the adjusted

mean follow-up score remained significantly lower for the NLP group (2.06) than for the control group (6.68; F=264.421, p<0.001).

Discussion

Cesarean section is chosen over vaginal delivery precisely when vaginal birth would pose a greater

risk of death or disability to mother or infant, making it a potentially life-saving intervention — yet it carries its own postpartum morbidity, pain not least among them, with the capacity to disrupt a mother's daily life. Several approaches exist for bringing this pain under control; pharmacological analgesia is the default, but its side-effect profile for mother and infant alike is exactly why non-pharmacological adjuncts merit attention.^{6,20} An important finding of the present study was that postoperative pain levels were initially high in both the intervention and control groups. This finding is consistent with the well-established evidence that cesarean section is associated with substantial postoperative pain despite routine analgesic management, highlighting the ongoing need for effective adjunctive non-pharmacological interventions. Given this clinical background, the more pronounced reduction in pain observed in the NLP group suggests that NLP may provide additional benefits when used in conjunction with standard postoperative care.

This study asked whether a single NLP sub-modality session could shift pain after cesarean delivery, tracking VAS scores in both arms and comparing the changes statistically. The answer was affirmative: pain fell significantly in the NLP arm even as it rose in the control arm over the same period, from 5.76 ± 2.006 to 6.68 ± 2.068 among controls and from 6.55 ± 1.704 down to 2.37 ± 1.792 among NLP recipients. Similar benefit has been reported elsewhere.^{21,22} Doğan and Sarıtaş (2021), for instance, found reduced pain among patients recovering from open-heart surgery who received NLP,¹¹ and Bowers (1995) reported comparable relief for acute pain among chiropractic patients.²³ Prochazka and Bolstad's case series adds further texture: one patient's stair-climbing fear, rooted in chronic leg pain, resolved after an NLP-based phobia intervention, and another gained two weeks of relief from persistent post-surgical abdominal pain after a single session.²⁴ Walker (2021) documented a related case involving chronic post-traumatic pain after a motorbike accident.²⁵ These findings suggest that increasing nurses' knowledge and awareness regarding the use of NLP techniques in postoperative pain management may be beneficial. In this context, offering training programs and professional development opportunities focused on NLP techniques could

support nurses in applying these techniques in clinical practice.

Two independent analyses — the t-test and the ANCOVA — arrived at the same conclusion, and the ANCOVA result held even after baseline differences were accounted for, which argues that the NLP technique itself, rather than any pre-existing imbalance between groups, drove the improvement. Such a result fits the proposed mechanism of NLP: engaging a person's representational systems at a largely subconscious level is thought to reshape how pain is experienced and to build a stronger sense of control over it.^{11,21,22} Although these findings support the potential effectiveness of NLP in reducing postoperative pain, further adequately powered multicenter randomized controlled trials incorporating objective outcome measures and longer follow-up are needed before its routine integration into postoperative care can be recommended.

NLP's reach extends well beyond pain management. As neuro-linguistic psychotherapy, it has been associated with gains in perceived quality of life and reductions in depression, anxiety, stress, fear, and general discomfort, alongside pain itself.^{12-14,25,26} The reported benefits of NLP on psychological outcomes—including reductions in anxiety, stress, fear, and emotional distress—provide a reasonable theoretical framework for interpreting the current findings. Since psychological distress is closely associated with an increased perception of postoperative pain, improvements in these areas may indirectly contribute to pain reduction. However, since these variables were not measured in the current study, future randomized trials should include psychological and behavioral outcomes to clarify the mechanisms through which NLP exerts its effects.

Limitations and strengths of the study

Two features of this trial temper its findings: it took place at a single hospital, and it enrolled only women having their first cesarean delivery. Working in its favor, however, is the uniformity of incision type across participants, which narrows the variability in surgical stimulus for pain. Because a mother recovering from cesarean surgery must also care for her newborn, relieving her pain carries a

double benefit — for her own health and for the relationship she is building with her infant. A three-arm design comparing NLP with standard care would sharpen future estimates of its relative effect, and longer follow-up could reveal whether NLP helps keep acute postoperative pain from becoming chronic. In future studies, pain intensity, anxiety, stress, pain-related catastrophizing, self-efficacy, and quality of life should be assessed simultaneously to determine whether these factors play a mediating role in the relationship between NLP and postoperative pain outcomes.

Conclusion

Women in both groups experienced severe postoperative pain following cesarean section. However, the addition of NLP to standard postoperative care led to a statistically significant greater reduction in pain intensity, suggesting that NLP may be an effective adjunctive nonpharmacological intervention. To confirm these findings and assess their generalizability across different clinical settings, multicenter randomized controlled trials with sufficient sample sizes are needed.

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Conflict of interest

None.

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Authors' contributions

Nursel Alp Dal (NAD), Kerime Derya Beydağ (KDB), Aysel Doğan (AD).

Study conception and design: NAD, KDB, AD; data collection: KDB, AD; data analysis and interpretation: NAD; drafting of the article: NAD, KDB, AD; critical revision of the article: NAD, KDB, AD.

Data availability

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. Following the publication of the article, the study's registration information and publishable results will be available in the ClinicalTrials.gov database under registration number NCT05033405

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