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Comparison of the Effectiveness of Logotherapy and Group Compassion-Focused Therapy on Distress Tolerance in Patients Undergoing Knee Joint Surgery with a Three-Month Follow-Up

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ABSTRACT

Purpose: The present study aimed to compare the effectiveness of logotherapy and group compassion-focused therapy on distress tolerance among patients undergoing knee joint surgery with a three-month follow-up period.

Methods and Materials: This study employed a quantitative quasi-experimental design using a pretest–posttest and follow-up format with a non-equivalent control group. The statistical population included all patients undergoing knee joint surgery who referred to treatment clinics in Semnan during the second half of 2024. Based on G*Power analysis, 45 participants were selected through convenience sampling and randomly assigned to three groups: logotherapy (n = 15), compassion-focused therapy (n = 15), and control (n = 15). Data were collected using the Distress Tolerance Scale developed by Simmons and Gaher (2005). The experimental groups participated in eight weekly sessions of logotherapy based on the approach of Viktor Frankl (1978) and compassion-focused therapy based on the model of Kristin Neff and Christopher Germer (2016). Data were analyzed using repeated measures analysis of covariance and Bonferroni post hoc tests in SPSS-26.

Findings: The findings revealed that both logotherapy and group compassion-focused therapy significantly improved distress tolerance compared with the control group at posttest and follow-up stages ($p < .05$). Analysis of covariance demonstrated a significant effect of group membership on distress tolerance at posttest ($F = 72.03$, $p < .001$, $\eta^2 = .735$) and follow-up ($F = 71.116$, $p < .001$, $\eta^2 = .752$). Bonferroni post hoc comparisons further indicated that the logotherapy group achieved significantly higher distress tolerance scores than the compassion-focused therapy and control groups, while the compassion-focused therapy group also outperformed the control group. The intervention effects remained stable during the three-month follow-up period.

Conclusion: The findings suggest that both logotherapy and compassion-focused therapy are effective psychological interventions for improving distress tolerance among patients undergoing knee joint surgery.

Keywords: Logotherapy, group compassion-focused therapy, distress tolerance, knee joint.

1. Introduction

Knee joint disorders and the increasing prevalence of knee replacement surgeries have become major public health concerns worldwide due to population aging, sedentary lifestyles, obesity, and degenerative musculoskeletal diseases. Patients undergoing knee joint surgery frequently experience substantial physical limitations, chronic pain, postoperative complications, emotional distress, and disruptions in daily functioning that negatively affect their psychological well-being and quality of life (Hess et al., 2022). Although advances in orthopedic surgery and rehabilitation technologies have significantly improved surgical outcomes, psychological adaptation after surgery remains a critical determinant of recovery, rehabilitation adherence, and long-term health outcomes (Prill et al., 2021). Contemporary rehabilitation approaches increasingly emphasize the integration of psychological interventions alongside medical and physical rehabilitation programs to improve both physical and emotional functioning among surgical patients (Zhu et al., 2024). In this context, distress tolerance has emerged as a particularly important psychological construct associated with adaptation to pain, stress, emotional discomfort, and postoperative recovery.

Distress tolerance refers to an individual's perceived or actual capacity to withstand negative emotional states and psychologically challenging experiences without becoming overwhelmed or engaging in maladaptive coping behaviors. Individuals with low distress tolerance are more likely to experience heightened emotional dysregulation, avoidance behaviors, catastrophizing, anxiety, depression, and impaired coping abilities when facing stressful medical conditions or painful experiences (Brem et al., 2018). In patients with physical injuries and chronic pain conditions, distress tolerance has been shown to play a mediating role between emotional symptoms and maladaptive pain appraisals, suggesting that individuals who cannot effectively tolerate distress are more vulnerable to psychological suffering and exaggerated perceptions of pain (Hruschak et al., 2021). Similarly, recent studies have demonstrated that distress tolerance is strongly associated with psychological resilience, self-regulation, emotional adaptation, and mental health outcomes across various clinical and non-clinical populations (Walton et al., 2024). Consequently, improving distress tolerance may contribute substantially to better psychological adjustment and

postoperative recovery among patients undergoing knee surgery.

Patients recovering from knee joint surgery often encounter persistent pain, restricted mobility, dependence on caregivers, fear of reinjury, uncertainty regarding recovery, and temporary or prolonged reductions in independence. Such challenges may generate intense emotional distress and diminish patients' ability to tolerate uncomfortable physical and psychological experiences. Recent rehabilitation research has emphasized that psychological variables such as self-care capacity, coping strategies, emotional regulation, and psychological flexibility significantly influence rehabilitation outcomes after orthopedic surgeries (Yokochi et al., 2024; Zhu et al., 2024). Despite advances in physical rehabilitation protocols, many patients continue to struggle with emotional distress, anxiety, hopelessness, and reduced psychological adjustment following surgery. Therefore, there is an increasing need for therapeutic approaches that specifically target emotional adaptation and distress tolerance during postoperative rehabilitation.

Among contemporary psychological interventions, compassion-focused therapy has gained considerable attention due to its effectiveness in improving emotional regulation, reducing self-criticism, and enhancing psychological resilience. Compassion-focused therapy, primarily developed by Paul Gilbert and further expanded through mindful self-compassion interventions by Kristin Neff and Christopher Germer, emphasizes kindness toward oneself, recognition of common humanity, and mindful acceptance of suffering (Neff & Germer, 2016). This therapeutic approach seeks to help individuals regulate difficult emotions by replacing self-judgment and shame with compassion, warmth, and emotional acceptance. Research has consistently demonstrated that self-compassion is associated with reduced anxiety, lower depression levels, improved emotional regulation, greater resilience, and higher distress tolerance (Kotera et al., 2022). Self-compassionate individuals are generally better able to cope with adversity because they approach suffering with acceptance rather than avoidance or self-criticism.

Recent empirical evidence further supports the effectiveness of compassion-focused interventions in enhancing distress tolerance and emotional functioning. For example, compassion-focused art therapy has been shown to significantly improve distress tolerance among adolescents from dysfunctional families (Saidi et al., 2024). Similarly, self-compassion has been identified as a major predictor of distress tolerance among mothers of children with physical-



motor disabilities, indicating that compassionate self-relating may strengthen emotional endurance under stressful circumstances (Nouri Ghaleh Alikhani et al., 2025). In clinical populations, compassion-focused therapy has also demonstrated significant effectiveness in reducing psychological distress and improving affect regulation (Millard et al., 2023). Moreover, qualitative investigations have shown that compassion-based interventions help individuals manage fears, emotional resistance, shame, and self-critical thought patterns more effectively (Steindl et al., 2023). These findings suggest that compassion-focused interventions may provide valuable psychological resources for patients coping with the emotional burden of knee surgery and rehabilitation.

Another therapeutic approach that may substantially improve psychological adaptation among medical patients is logotherapy, developed by Viktor Frankl. Logotherapy is grounded in the existential principle that the primary motivational force in humans is the search for meaning in life. According to this perspective, individuals are capable of enduring suffering and adversity more effectively when they perceive meaning and purpose in their experiences. Logotherapy emphasizes personal responsibility, freedom of choice, value discovery, and meaning-making even in the presence of pain, illness, and existential crises (Plaza Leutar, 2021). This therapeutic orientation is particularly relevant for patients facing major medical procedures because surgery and physical disability often provoke existential concerns related to dependence, identity, vulnerability, and loss of control.

Meaning-centered therapeutic approaches have demonstrated considerable effectiveness across diverse clinical populations. Meaning-centered group psychotherapy has been found to improve psychological well-being, existential adjustment, and emotional functioning among patients with advanced cancer (Breitbart et al., 2018). Meaning-centered interventions have also shown positive effects on anxiety and depression in patients undergoing surgery (Van der Cingel, 2015). Furthermore, meaning-centered therapy has demonstrated efficacy in improving coping abilities and reducing psychological suffering among individuals with chronic pain conditions (Martín-Asuero et al., 2020). These findings indicate that helping individuals discover meaning in suffering may increase their ability to tolerate distress and maintain psychological resilience during challenging life circumstances.

Additional evidence supports the applicability of logotherapy in populations experiencing emotional hardship and adjustment difficulties. Research conducted among older adults living in nursing homes demonstrated that logotherapy significantly improved distress tolerance and hope for life (Bayanfar et al., 2021). Similarly, logotherapy-based interventions have been used successfully to enhance self-acceptance among vulnerable and disadvantaged populations (Fajel et al., 2024). Existential and meaning-centered interventions may therefore be particularly valuable for patients recovering from knee joint surgery, as such individuals often struggle with emotional uncertainty, temporary disability, and concerns regarding future functioning and independence.

In recent years, comparative investigations examining different therapeutic approaches have become increasingly important in identifying the most effective psychological interventions for medical populations. Existing evidence suggests that both meaning-centered therapy and compassion-focused therapy can improve psychological outcomes among patients experiencing physical illness, emotional distress, or chronic pain (Vos et al., 2022). Nevertheless, despite the growing body of literature supporting these interventions individually, relatively few studies have directly compared their effectiveness in improving distress tolerance among orthopedic surgery patients. This gap is important because the mechanisms underlying these interventions differ substantially. Compassion-focused therapy primarily enhances emotional regulation through self-kindness, emotional acceptance, and reduction of self-criticism, whereas logotherapy strengthens psychological resilience through meaning-making, existential awareness, and purposeful engagement with suffering. Understanding which therapeutic framework exerts greater influence on distress tolerance may help clinicians select more effective interventions tailored to the psychological needs of postoperative patients.

Furthermore, contemporary psychological models increasingly recognize that emotional adaptation after surgery depends not only on pain reduction but also on cognitive appraisal processes, emotional regulation capacities, interpersonal functioning, and existential meaning systems (Agin-Liebes et al., 2024). Patients with higher distress tolerance are generally more capable of adhering to rehabilitation programs, engaging in self-care activities, maintaining hope, and coping adaptively with postoperative discomfort (Walton et al., 2024). Consequently, interventions that enhance distress tolerance

may indirectly contribute to improved rehabilitation outcomes, faster recovery, and better quality of life among surgical patients.

Despite the promising findings reported in previous literature, several limitations remain evident. First, many studies examining compassion-focused therapy or logotherapy have focused on general clinical populations rather than individuals undergoing orthopedic surgery. Second, most investigations have concentrated on outcomes such as anxiety, depression, or quality of life, while fewer studies have specifically examined distress tolerance as a primary therapeutic target. Third, comparative studies investigating the relative effectiveness of compassion-focused therapy and logotherapy remain limited, particularly in Middle Eastern and Iranian clinical contexts. Given the psychological vulnerability of patients recovering from knee joint surgery and the increasing emphasis on holistic rehabilitation approaches, further research comparing these interventions appears necessary.

Accordingly, the present study aimed to compare the effectiveness of logotherapy and group compassion-focused therapy on distress tolerance among patients undergoing knee joint surgery with a three-month follow-up period.

2. Methods and Materials

2.1. Study Design and Participants

The present study was an applied research project and, in terms of data collection, employed a quantitative quasi-experimental design with a pretest–posttest and follow-up format alongside a non-equivalent control group. The statistical population consisted of all patients undergoing knee joint surgery who referred to treatment clinics in the city of Semnan during the second half of 2024. A total of 87 patients constituted the study population. Based on the output of G*Power software, which was used to determine sample size and conduct statistical power analysis, 45 participants were selected through convenience sampling. Participants were randomly assigned into three groups, including the first experimental group receiving logotherapy ($n = 15$), the second experimental group receiving compassion-focused therapy ($n = 15$), and a control group ($n = 15$). In addition, three extra participants were initially considered to compensate for potential attrition during the intervention process. The required sample size was estimated according to similar previous studies by considering an effect size of 0.40, a confidence level of 0.95, statistical power of 0.80, and an attrition rate of 10%,

resulting in 15 participants per group. Furthermore, based on attrition rates reported in earlier investigations, the possibility of losing up to five participants in each group was anticipated; therefore, the final sample size of 45 participants was considered appropriate for the present study. The control group did not receive any psychological intervention during the study period. Inclusion criteria included undergoing knee joint surgery, providing informed consent, willingness to participate, absence of severe psychological disorders, and having at least basic literacy skills. Exclusion criteria consisted of irregular participation in intervention sessions, inadequate cooperation during the training process, and absence from more than two sessions.

2.2. Measures

Distress tolerance was assessed using the Distress Tolerance Scale (DTS) developed by Simmons and Gaher in 2005. The DTS is a self-report instrument designed to measure individuals' perceived ability to tolerate emotional distress. The questionnaire consists of 14 items and four subscales, including Tolerance (items 1, 3, and 5), Absorption (items 2 and 4), Appraisal (items 6, 7, 9, 10, 11, and 12), and Regulation (items 8, 13, and 14). Responses are rated on a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). Higher scores indicate greater levels of distress tolerance. Simmons and Gaher (2005) confirmed the construct and content validity of the scale and reported Cronbach's alpha coefficients of 0.72, 0.82, and 0.70 for the subscales, with an overall reliability coefficient of 0.82 for the total scale. In Iran, construct and convergent validity of the questionnaire were confirmed by Alavi et al. (2011), who reported Cronbach's alpha coefficients of 0.72, 0.75, 0.78, and 0.68 for the subscales and 0.81 for the total scale. In the present study, the reliability of the instrument was calculated using Cronbach's alpha and yielded a coefficient of 0.79, indicating satisfactory internal consistency.

2.3. Interventions

The compassion-focused therapy intervention was implemented based on the protocol developed by Kristin Neff and Christopher Germer (2016) across eight weekly group sessions. The first session focused on introducing participants to the concept of self-compassion, its importance, and its psychological benefits, accompanied by deep breathing and relaxation exercises. The second session addressed the identification of the inner critic and its

negative psychological consequences, while participants practiced compassionate self-writing exercises. In the third session, self-kindness and compassion were strengthened through guided meditation and imagery techniques involving a compassionate friend perspective. The fourth session emphasized acceptance and awareness of difficult emotions using acceptance-based meditation exercises and reflective writing about distressing personal experiences. The fifth session focused on emotional regulation strategies through mindfulness, breathing exercises, and compassionate coping techniques for stress and anxiety. The sixth session aimed to improve compassionate interpersonal relationships through communication exercises and compassionate letter writing directed toward friends or family members. In the seventh session, participants learned strategies for maintaining self-compassion in daily life and developed individualized plans for continued compassionate practice. The final session reviewed previously learned concepts and skills, evaluated psychological changes and improvements in distress tolerance, and encouraged participants to continue practicing self-compassion techniques following the completion of the intervention.

The logotherapy intervention was conducted according to the therapeutic principles proposed by Viktor Frankl (1978) in eight weekly group sessions. The first session introduced the fundamental concepts of logotherapy, emphasizing the importance of meaning in life and helping participants identify personal sources of meaning. During the second session, participants explored their personal values and life goals through reflective and writing exercises. The third session focused on coping with existential and meaning-related crises through meditation, reflective exercises, and group discussions regarding personal experiences of adversity. The fourth session addressed the concepts of freedom and personal responsibility, encouraging participants to accept responsibility for their decisions and life choices. In the fifth session, participants explored ways to discover meaning in suffering and difficult experiences through reflective writing and group sharing of personal narratives. The sixth session emphasized meaning within interpersonal relationships and social connections, with

exercises aimed at strengthening meaningful communication and relationships. The seventh session focused on maintaining and enhancing meaning in everyday life through practical exercises and discussions regarding challenges and successes in sustaining purposeful living. The final session reviewed all therapeutic concepts and skills acquired during the intervention, assessed participants' psychological and spiritual changes, and provided strategies for preserving meaning and psychological resilience in future life experiences.

2.4. Data Analysis

Data analysis was conducted using SPSS version 26. Descriptive statistics, including means and standard deviations, were initially calculated to summarize participant characteristics and study variables. To examine the effects of the independent variable (type of intervention) on the dependent variable (distress tolerance) across pretest, posttest, and follow-up stages, repeated measures analysis of covariance (ANCOVA) was employed. Assumptions related to normality, homogeneity of variances, and sphericity were assessed prior to inferential analyses. In cases where significant between-group differences were identified, Bonferroni post hoc tests were applied to determine the precise differences among the study groups across different measurement stages. Statistical significance was considered at the $p < .05$ level throughout the analyses.

3. Findings and Results

The demographic findings indicated that 11.0% of the participants were between 30 and 40 years of age, 42.1% were between 41 and 50 years old, and 46.9% were between 51 and 60 years old. Regarding gender distribution, the results demonstrated that in the compassion-focused therapy group, 22.2% of participants were female and 11.1% were male, whereas in the other two groups the number of male and female participants was equal. In terms of educational level, most participants across all three groups held a bachelor's degree.

Table 1

Descriptive Statistics for Distress Tolerance Across Pretest, Posttest, and Follow-Up Stages

Variable	Group	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Follow-Up Mean	Follow-Up SD
Distress Tolerance	Logotherapy	19.02	2.78	34.79	3.31	34.11	3.22
	Compassion-Focused Therapy	18.98	2.71	31.16	3.30	31.23	3.01
	Control	18.36	2.69	19.06	3.52	19.98	3.48

The descriptive findings presented in Table 1 indicate that the mean scores of distress tolerance increased substantially from pretest to posttest and follow-up in both intervention groups. The logotherapy group demonstrated the greatest improvement, with the mean score increasing from 19.02 at pretest to 34.79 at posttest and remaining relatively stable at 34.11 during follow-up. Similarly, the compassion-focused therapy group showed improvement from 18.98 at pretest to 31.16 at posttest and 31.23 at follow-up. In contrast, the control group exhibited only slight changes across the three measurement stages. These findings suggest that both therapeutic interventions were effective in enhancing distress tolerance, with logotherapy showing comparatively greater effectiveness.

Before conducting the inferential analyses, the assumptions of homogeneity of variances and homogeneity of regression slopes were examined. Levene’s test results demonstrated that the assumption of equality of variances was satisfied for distress tolerance at both posttest ($F = 0.05, p = .94$) and follow-up ($F = 0.55, p = .58$). Furthermore, the results of the homogeneity of regression slopes test were non-significant at posttest ($F = 2.90, p = .06$) and follow-up ($F = 2.88, p = .07$), indicating that the assumption of regression slope homogeneity was met. Therefore, the use of analysis of covariance was considered appropriate for testing the study hypotheses.

Table 2

Analysis of Covariance Results for Comparing the Effects of Logotherapy and Compassion-Focused Therapy on Distress Tolerance

Stage	Source	Sum of Squares	df	Mean Square	F	p	Eta Squared
Posttest	Corrected Model	6.793	3	2.26	55.739	.000	.805
	Intercept	0.007	1	0.007	0.116	.737	.004
	Pretest	1.972	1	1.972	32.360	.000	.545
	Group	4.573	2	2.286	72.030	.000	.735
	Error	1.645	41	0.04			
Follow-Up	Corrected Model	7.12	3	2.37	56.411	.000	.810
	Intercept	0.068	1	0.068	0.123	.753	.006
	Pretest	1.885	1	1.885	33.112	.000	.571
	Group	5.421	2	2.71	71.116	.000	.752
	Error	1.756	41	0.04			

The results presented in Table 2 revealed a significant effect of group membership on distress tolerance at both posttest and follow-up stages. At posttest, the effect of group was statistically significant ($F = 72.03, p < .001, \eta^2 = .735$), indicating that the interventions accounted for a substantial proportion of variance in distress tolerance scores. Similarly,

at the follow-up stage, a significant group effect was observed ($F = 71.116, p < .001, \eta^2 = .752$). The large effect sizes suggest that both interventions had strong and persistent effects on improving distress tolerance among patients undergoing knee joint surgery.

**Table 3***Bonferroni Post Hoc Test Results for Distress Tolerance*

Stage	Group Comparison	Mean Difference	Standard Error	p
Posttest	Logotherapy vs. Compassion-Focused Therapy	-3.68	0.39	.000
	Logotherapy vs. Control	-6.14	0.31	.000
	Compassion-Focused Therapy vs. Control	-3.97	0.28	.000
Follow-Up	Logotherapy vs. Compassion-Focused Therapy	-3.63	0.76	.000
	Logotherapy vs. Control	-6.11	0.54	.000
	Compassion-Focused Therapy vs. Control	-3.02	0.59	.000

The Bonferroni post hoc comparisons demonstrated significant differences between all study groups at both posttest and follow-up stages. Specifically, the logotherapy group showed significantly higher distress tolerance scores compared to both the compassion-focused therapy and control groups. Additionally, the compassion-focused therapy group demonstrated significantly better outcomes than the control group. The persistence of these differences during the follow-up phase indicates the durability of the intervention effects over time. Overall, the findings suggest that although both interventions were effective in improving distress tolerance, logotherapy produced greater therapeutic benefits than compassion-focused therapy among patients undergoing knee joint surgery. Therefore, the study hypothesis regarding the existence of differences between the effectiveness of logotherapy and group compassion-focused therapy on distress tolerance was confirmed.

4. Discussion and Conclusion

The present study aimed to compare the effectiveness of logotherapy and group compassion-focused therapy on distress tolerance among patients undergoing knee joint surgery with a three-month follow-up period. The findings demonstrated that both interventions significantly improved distress tolerance in comparison with the control group, and these therapeutic effects remained stable during the follow-up stage. Furthermore, the results indicated that logotherapy produced greater improvements in distress tolerance than compassion-focused therapy. These findings highlight the importance of integrating psychological interventions into orthopedic rehabilitation programs and suggest that addressing emotional and existential dimensions of recovery can substantially improve psychological adaptation in patients undergoing knee joint surgery.

The effectiveness of compassion-focused therapy in improving distress tolerance is consistent with previous research demonstrating that self-compassion and compassion-based interventions play an important role in

emotional regulation and resilience. The findings align with the results reported by (Saidi et al., 2024), who found that compassion-focused art therapy significantly improved distress tolerance among female adolescents from dysfunctional families. Similarly, the current findings support the study by (Nouri Ghaleh Alikhani et al., 2025), which demonstrated that self-compassion was a significant predictor of distress tolerance among mothers of children with physical-motor disabilities. The convergence of these findings suggests that self-compassion may function as a protective psychological factor across diverse populations facing chronic stress, emotional burden, and caregiving or rehabilitation challenges.

One possible explanation for the effectiveness of compassion-focused therapy is that patients recovering from knee surgery often experience heightened vulnerability, self-criticism, fear of dependency, frustration regarding physical limitations, and anxiety about recovery outcomes. Compassion-focused interventions help individuals respond to these emotional experiences with acceptance, kindness, and emotional balance rather than avoidance or harsh self-judgment. Through mindfulness exercises, compassionate imagery, and emotional regulation techniques, participants gradually learn to tolerate distressing emotions without becoming overwhelmed. According to the framework proposed by (Neff & Germer, 2016), self-compassion facilitates emotional resilience by promoting mindful awareness of suffering while reducing self-critical and catastrophic cognitive patterns. Such mechanisms may have enabled participants in the present study to manage postoperative pain, rehabilitation difficulties, and emotional distress more adaptively.

The findings are also consistent with broader literature emphasizing the relationship between self-compassion and psychological well-being. Previous investigations have demonstrated that self-compassion is positively associated with resilience, engagement, emotional regulation, and mental health outcomes (Kotera et al., 2022). Moreover,

meta-analytic evidence has confirmed the effectiveness of compassion-focused therapy across clinical populations experiencing anxiety, depression, shame, and emotional dysregulation (Millard et al., 2023). The present findings extend this literature by demonstrating that compassion-focused therapy can also be beneficial for orthopedic surgery patients who experience distress associated with pain, physical impairment, and temporary dependence on others.

The therapeutic effects observed in the present study may additionally be interpreted in light of emotional regulation theory. Patients with low distress tolerance often perceive emotional discomfort as intolerable and engage in maladaptive coping strategies such as withdrawal, avoidance, catastrophizing, or hopelessness. Compassion-focused interventions reduce emotional reactivity by strengthening self-soothing capacities and activating affiliative emotional systems. As noted by (Steindl et al., 2023), compassion-focused therapy is particularly effective in addressing fears, blocks, and resistance toward self-kindness and emotional acceptance. Consequently, participants may have become more capable of regulating emotional discomfort and tolerating the psychological demands associated with postoperative rehabilitation.

The findings regarding the effectiveness of logotherapy are similarly consistent with previous theoretical and empirical literature. The current results support the findings reported by (Bayanfar et al., 2021), who found that logotherapy significantly improved distress tolerance and hope for life among older adults residing in nursing homes. They also align with the study conducted by (Martín-Asuero et al., 2020), which demonstrated that meaning-centered therapy improved psychological adaptation among individuals with chronic pain. Furthermore, the findings are congruent with research showing that meaning-centered interventions effectively improve psychological well-being and reduce emotional distress among medical patients (Breitbart et al., 2018; Van der Cingel, 2015). The consistency of these findings across different clinical contexts suggests that meaning-centered approaches may be particularly valuable for individuals confronting suffering, physical limitations, or existential uncertainty.

The superior effectiveness of logotherapy compared with compassion-focused therapy may be explained through several psychological mechanisms. Knee joint surgery often confronts patients with existential concerns regarding autonomy, aging, identity, productivity, and future functioning. Physical pain and temporary disability may lead individuals to question their sense of purpose, independence,

and personal value. Logotherapy directly addresses these existential dimensions by helping individuals reinterpret suffering within a broader framework of meaning and personal growth. According to the existential perspective of Viktor Frankl, suffering becomes psychologically tolerable when individuals can attribute meaning to their experiences. Patients who develop a sense of meaning and purpose during recovery may therefore perceive postoperative difficulties as temporary and meaningful challenges rather than unbearable burdens.

Meaning-centered interventions may also improve distress tolerance by enhancing cognitive flexibility and reducing feelings of helplessness. Participants in the logotherapy group were encouraged to identify personal values, life goals, and meaningful relationships while reflecting on their capacity for choice and responsibility despite physical limitations. These therapeutic processes may have increased participants' psychological endurance and resilience when facing pain and rehabilitation demands. The findings support the theoretical assumptions described by (Plaza Leutar, 2021), who emphasized that logotherapy strengthens psychological functioning by promoting existential awareness, value-based living, and purpose-oriented coping.

Another important explanation for the superiority of logotherapy relates to the nature of distress experienced by orthopedic surgery patients. Emotional distress in such populations is not limited to anxiety or emotional dysregulation but often includes existential concerns about physical decline, loss of mobility, dependency, and uncertainty regarding the future. While compassion-focused therapy primarily targets emotional regulation and self-kindness, logotherapy addresses deeper existential dimensions of suffering. Therefore, patients recovering from knee surgery may have benefited more strongly from interventions that helped them reconstruct meaning and preserve a sense of purpose during recovery. This interpretation is consistent with findings reported by (Vos et al., 2022), who showed that both meaning-centered therapy and compassion-focused therapy improved psychological outcomes among knee surgery patients, although meaning-centered interventions produced somewhat stronger effects on adaptation-related variables.

The persistence of treatment effects during the follow-up stage further suggests that both interventions generated relatively stable psychological changes rather than temporary emotional improvements. The maintenance of gains may indicate that participants internalized therapeutic

skills and continued applying them after the intervention ended. In compassion-focused therapy, participants learned emotional regulation and self-soothing strategies that could be generalized to everyday stressors. In logotherapy, participants may have developed enduring cognitive frameworks for understanding suffering and maintaining hope during recovery. The durability of treatment effects supports the growing recognition that psychological interventions can produce sustained improvements in adaptation among medical populations.

The present findings may also be interpreted within the broader context of postoperative rehabilitation research. Modern rehabilitation models increasingly emphasize holistic care approaches that integrate psychological, emotional, and social dimensions alongside physical treatment protocols (Prill et al., 2021). Studies on self-care and postoperative rehabilitation indicate that psychological adjustment significantly influences rehabilitation adherence, mobility outcomes, and quality of life after joint surgery (Yokochi et al., 2024; Zhu et al., 2024). Distress tolerance may therefore function as an important mediator between psychological interventions and successful rehabilitation outcomes. Patients with greater emotional tolerance are more likely to engage actively in physiotherapy, cope effectively with pain, and maintain motivation throughout the recovery process.

The findings additionally support contemporary positive psychology perspectives emphasizing resilience, meaning, compassion, and adaptive coping as central components of mental health (Kotera et al., 2022). Both interventions in the present study focused on strengthening psychological resources rather than merely reducing symptoms. This strengths-based orientation may explain why participants demonstrated sustained improvements in distress tolerance. Moreover, the findings correspond with emerging evidence suggesting that meaning-making and self-compassion are essential protective factors in coping with adversity and chronic stress (Agin-Liebes et al., 2024; Walton et al., 2024).

Despite the promising findings, the present study should be interpreted within the context of several methodological considerations. The sample was limited to patients attending treatment clinics in one city, which may restrict the generalizability of the findings to broader populations. Additionally, the use of self-report measures may have increased the possibility of response bias and social desirability effects. Nevertheless, the study contributes meaningfully to the literature by directly comparing two important psychological interventions in a clinical

orthopedic population and by demonstrating the long-term benefits of both interventions on distress tolerance.

One of the main limitations of the present study was the relatively small sample size and the use of convenience sampling, which may limit the generalizability of the findings to other populations and medical settings. Another limitation was reliance on self-report questionnaires, which are susceptible to subjective interpretation and response bias. In addition, variables such as severity of postoperative pain, duration of rehabilitation, socioeconomic status, and family support were not controlled and may have influenced participants' psychological responses. The absence of longer-term follow-up assessments also limited evaluation of the enduring effects of the interventions beyond three months.

Future studies are recommended to investigate the effectiveness of logotherapy and compassion-focused therapy in larger and more diverse samples of orthopedic patients across different geographical and cultural settings. Researchers may also compare these interventions with other third-wave psychological approaches such as acceptance and commitment therapy or mindfulness-based interventions. Examining additional psychological outcomes including anxiety, depression, quality of life, rehabilitation adherence, and pain perception may provide a more comprehensive understanding of the therapeutic mechanisms involved. Furthermore, longitudinal studies with extended follow-up periods are needed to evaluate the long-term sustainability of treatment effects.

From a practical perspective, the findings of the present study suggest that integrating psychological interventions into orthopedic rehabilitation programs may significantly improve patients' emotional adjustment and coping abilities following knee joint surgery. Healthcare professionals, including psychologists, rehabilitation specialists, and orthopedic clinicians, may benefit from incorporating structured logotherapy and compassion-focused therapy programs into postoperative care services. Training rehabilitation staff in psychologically informed care approaches may also help patients manage emotional distress more effectively during recovery. Given the stronger effects observed for logotherapy, meaning-centered interventions may be particularly beneficial for patients experiencing existential concerns, hopelessness, or difficulties adapting to temporary physical limitations after surgery.

Authors' Contributions



All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the study and participated in the research with informed consent.

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