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Transtheoretical Model-based Motivational Interviewing Improves Psychological Resilience and Self-management in Patients Undergoing Finger Replantation

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Abstract [**Objectives**] To explore the effects of motivational interviewing intervention based on the transtheoretical model (TTM) on psychological resilience and self-management in patients undergoing finger reimplantation after amputation. [**Methods**] The patients with finger replantation due to fractures admitted from October 2024 to June 2025 were divided into either the control group or the observation group according to the random number table method, with 40 cases in each group. The control group received conventional perioperative care, while the observation group underwent motivational interviewing based on TTM framework on the basis of the control group. The psychological resilience and self-management levels of the two patient groups were then compared following their respective care interventions. [**Results**] The psychological resilience and self-management scores of the patients were significantly higher than those of the control group after the intervention, with the difference being statistically significant ($P<0.05$). [**Conclusions**] Motivational interviewing based on the TTM can effectively improve the psychological resilience and self-management in patients undergoing severed finger reimplantation, while effectively reducing the occurrence of vascular crisis.

Key words Finger replantation, Psychological resilience, Self-management, Transtheoretical model (TTM), Motivational interviewing

1 Introduction

Finger replantation is a microsurgical procedure that reconnects the blood vessels, nerves, and tissues of an amputated digit to restore circulation[1]. The survival of a replanted finger depends critically on the patency of vascular anastomoses and effective postoperative care[2]. A vascular crisis—defined as the acute arterial or venous compromise of a replanted digit—is one of the most severe complications and may easily lead to replantation failure. Numerous factors contribute to vascular crisis, including patient smoking, improper limb positioning, unmanaged pain, and constipation. Conversely, high-quality self-management and attentive care can mitigate these risks. Psychological resilience has been found to play a predictive role in vascular outcomes[3]: patients with higher resilience experience significantly fewer vascular complications, while those with lower resilience are more susceptible to anxiety and depressive stress responses that may trigger a crisis. Given the critical role of both mental state and behavior in surgical success, effective interventions to boost resilience and promote self-care are essential.

2 Materials and methods

2.1 Study population This randomized controlled trial enrolled 80 patients who underwent single-digit replantation at a tertiary hospital in Shiyan, Hubei, from October 2024 to June 2025. Inclusion criteria were as follows: age between 18 and 60 years, unilateral finger amputation requiring replantation within 24 h, basic literacy and communication ability, and provision of written informed consent. Exclusion criteria included amputation of more than three digits, diagnosed anxiety or depression, current or prior use of anxiolytics or antidepressants, previous psychotherapy for stress or depression, or cognitive impairment. Patients were randomly assigned (computer-generated random table) to either the control group ($n=40$) or the observation (TTM-MI) group ($n=40$). The two groups were comparable in terms of age, sex, and baseline clinical characteristics ($P>0.05$).

2.2 Interventions

2.2.1 Control group. Patients received standard perioperative nursing care, which included routine admission education, relaxation guidance, explanations of surgical procedures and potential risks, and instructions for postoperative precautions. Nurses closely monitored the replanted finger's temperature and color, provided guidance on nutrition and bowel management to prevent constipation, and instructed patients on basic finger positioning and rehabilitation exercises.

2.2.2 TTM-MI group. In addition to the standard care described above, patients in the observation group received motivational interviewing interventions based on the transtheoretical model (TTM). This multi-stage intervention was delivered as follows. (i) Precontemplation (admission): At this stage, patients typically had no clear intention to engage in intensive self-care. Nurses used motivational interviewing to explore individual patient factors and formulate a personalized health education plan. (ii) Contemplation (pre-surgery, <6 h ischemia): Nurses employed MI techniques (active listening, empathy, and unconditional positive regard) to address patients' doubts and fears. Patients were encouraged to express their concerns about the surgery. Through

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gentle guidance, nurses helped patients understand the importance of timely operation, potential complications, and the role of their cooperation. This helped patients understand the necessity of the procedure and commit to it, thereby minimizing ischemia time. (iii) Preparation (within 8 h post-surgery): Nurses assessed each patient's readiness to learn and identified their educational needs. They provided specific teaching on critical self-care elements, including strict smoking cessation, prolonged bed rest, limb elevation, management of negative emotions, and effective pain control. The goal was to ensure that patients understood how these factors affect vascular integrity and that they could follow nursing instructions meticulously. Emphasis was placed on preventing vascular crisis through vigilant self-care, and patients were encouraged to maintain a calm and positive mindset. (iv) Action (post-surgery to discharge): During hospitalization, nurses guided interviews toward the management of emotions and the identification of any hindrance to self-care. Staff closely monitored patient adherence to care measures and responded promptly to any issues. For example, nurses encouraged proper limb positioning, ensured adequate analgesia, reminded patients to avoid smoking, and encouraged dietary compliance. These measures aimed to ensure that patients strictly followed all postoperative care routines strictly to reduce the risk of vascular crisis. (v) Maintenance (1 – 3 months after discharge): After discharge, patients entered the maintenance phase. During follow-up interviews, emphasis was placed on tracking the patient's progress, addressing any doubts, and providing motivation. Nurses reinforced the necessity of consistently adhering to self-management tasks (*e. g.*, exercise regimens and psychosocial coping strategies). Patients were expected to maintain healthy behaviors, manage any symptoms of depression or anxiety, and follow their home rehabilitation program on a daily basis.

2.3 Outcome measures

2.3.1 Psychological resilience. Resilience was assessed using the Connor-Davidson Resilience Scale (CD-RISC), a well-validated measure consisting of 25 items across three scales: optimism, strength, and tenacity. Each item was rated on a 4-point scale, with a topmost total score of 100; a higher score indicates greater resilience[4].

2.3.2 Self-management skill. The Adult Health Self-Management Skill Rating Scale (AHSMSRS) was used to measure self-management[5]. The AHSMSRS consists of 38 items categorized into behavioral, cognitive, and environmental domains, each rated on a scale from 1 to 5. The maximum score on this scale is 190, and higher scores indicate greater levels.

2.3.3 Vascular crisis. The incidence of postoperative vascular crisis was recorded for each patient. Clinical criteria were used to identify the crisis: an arterial crisis was indicated by sudden fingertip pallor, absence of capillary refill, cooling of the digit, and a flaccid fingertip; a venous crisis was indicated by progressive cyanosis of the finger, fluctuating capillary refill time, decreased temperature, tense swelling of the finger, and dark venous bleeding upon pinprick that later became bright. Any occurrence of arterial or venous compromise was classified as a vascular crisis event[6]. Assessments of resilience and self-management were conducted upon admission (baseline) and at discharge (post-intervention). The occurrence of vascular crisis was monitored throughout the hospital stay.

2.4 Statistical analysis Data were analyzed using SPSS 19.0. Continuous variables are presented as mean ± standard deviation (*SD*). Inter-group comparisons of continuous data were performed using independent-samples *t*-tests. Categorical data (*e. g.*, incidence of vascular crisis) were compared using the *chi*-square test. A two-tailed *P*-value of less than 0.05 was considered statistically significant.

3 Results and analysis

3.1 Psychological resilience Both groups showed significant increases in CD-RISC scores from baseline to discharge. The mean post-intervention CD-RISC score was significantly higher in the TTM-MI group compared to the control group [(86.73 ± 9.78) *vs.* (72.49 ± 9.11), $P < 0.001$]. Table 1 summarizes the pre- and post-intervention resilience scores. These results indicate that although standard care alone improved resilience, the addition of TTM-based motivational interviewing yielded a markedly greater improvement ($P < 0.05$).

Table 1 CD-RISC scores before and after intervention in the two groups (mean ± *SD*, $n = 40$)

Group	CD-RISC	
	Pre-intervention	Post-intervention
Control	53.48 ± 7.43	72.49 ± 9.11
Observation	54.15 ± 8.17	86.73 ± 9.78
t	0.368	7.686
P	0.714	< 0.001

3.2 Self-management After the intervention, AHSMSRS scores improved in both groups. The TTM-MI group achieved a significantly higher post-intervention score than the control group [(131.48 ± 10.13) *vs.* (116.97 ± 9.04), $P < 0.005$]. Table 2 presents the pre- and post-intervention self-management scores. The greater increase observed in the TTM-MI group suggests that motivational interviewing based on the TTM effectively enhanced patients' self-management abilities beyond those achieved with standard care alone ($P < 0.05$).

Table 2 AHSMSRS scores before and after intervention in the two groups (mean ± *SD*, $n = 40$)

Group	AHSMSRS		*t*	*P*
	Pre-intervention	Post-intervention		
Control	86.36 ± 6.49	116.97 ± 9.04	14.91	< 0.001
Observation	84.39 ± 6.72	131.48 ± 10.13	22.03	< 0.001
t	1.11	2.930		
P	0.27	< 0.005		

3.3 Vascular crisis During the hospitalization period, 2 patients (5.0%) in the TTM-MI group experienced a vascular crisis, compared with 9 patients (22.5%) in the control group. This

difference was statistically significant ($\chi^2 = 5.455$, $P < 0.05$), indicating a lower rate of vascular compromise in the group that received TTM-based motivational interviewing.

4 Discussion

Finger replantation is a complex but highly beneficial procedure that can restore function and improve the quality of life for patients with amputated digits[7]. However, the success of the surgery is not determined solely in the operating room; postoperative care is critical. Vascular crisis—involving acute arterial or venous failure—is the most serious complication after replantation and directly threatens the survival of the finger[8]. For example, studies indicate that vascular compromise often occurs within the first 48 h post-surgery, and failure to manage it promptly can lead to replantation failure. Factors such as anxiety (which can trigger sympathetic vasospasm), extreme temperature exposure, improper limb positioning, and smoking have all been implicated in precipitating a vascular crisis. As such, comprehensive nursing interventions that promote proper self-care and mitigate patient stress are essential for improving outcomes.

The TTM provides a useful framework for delivering such interventions. By identifying the patient's stage of readiness to change, healthcare providers can tailor motivational interviewing to promote progressive behavior change. Motivational interviewing, which emphasizes patient-centered dialogue, can help patients recognize the importance of healthy behaviors and empower them to follow through[9]. In our study, implementing TTM-based MI from admission through follow-up significantly enhanced both psychological resilience and self-management in the observation group[10]. Patients receiving TTM-MI showed substantially higher CD-RISC and AHSMSRS scores than controls, indicating that they felt more capable of coping with stress and were more actively engaged in their own care.

This improved mental and behavioral engagement likely contributed to the lower incidence of vascular crisis observed in the TTM-MI group[11]. Structured interviews and continuous support may have helped patients overcome fears, maintain optimism, and adhere closely to postoperative instructions (*e.g.*, abstaining from smoking, proper limb elevation, and pain control), all of which reduce the risk of vascular issues. These findings align with the general principle that psychological state and self-efficacy influence surgical recovery; higher resilience and improved self-care can help buffer against complications[12].

While standard nursing care can lead to some improvements, our results suggest that adding a TTM-based motivational interviewing program yields significantly better outcomes. This individualized, stage-appropriate counseling not only educates patients but also motivates them to take an active role in their recovery. As a result, patients in the observation group were better prepared to manage pain and stress and adhered more rigorously to care regimens, leading to improved overall recovery outcomes[13].

In conclusion, TTM-based motivational interviewing appears to be an effective nursing intervention for patients undergoing finger replantation. By enhancing psychological resilience and promoting self-management, it helps patients cope with the challenges of recovery and may decrease the risk of serious complications, such as vascular crisis. These results support the integration of stage-based motivational interviewing into the postoperative care of digit replantation, potentially improving replantation success rates and patient satisfaction.

5 Conclusions

TTM-based motivational interviewing markedly improves psychological resilience and self-management skills in patients undergoing finger replantation. This targeted intervention is associated with a lower incidence of postoperative vascular crisis. Incorporating TTM-based motivational interviewing into postoperative nursing care may enhance digit survival and functional recovery by empowering patients and minimizing the risk of complications.

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