

Can the Enhanced Transtheoretical Model Intervention (ETMI) Impact the Attitudes and Beliefs Regarding Low Back Pain of Family Medicine Residents

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ABSTRACT **Background:** Low back pain has been the leading cause for disability worldwide for several decades, and clinical guidelines for its management clearly emphasize a multifactorial approach. Yet, current guidelines are still not well implemented by clinicians. **Objectives:** To explore the attitudes of family medicine residents regarding low back pain and to determine whether they positively correlate with their treatment approaches. To test if these attitudes can be affected by the Enhanced Transtheoretical Model Intervention (ETMI), a guideline-based workshop. **Methods:** Participants completed an online questionnaire regarding their attitudes toward low back pain and clinical habits, after which they attended an online ETMI educational workshop. One month later all participants were asked to complete the questionnaire a second time. Statistical analysis was conducted to explore the attitudes of the residents and clinical approaches, as well as any associations between them, as well as possible differences pre- and post-intervention. **Results:** The participants exhibited highly psychologically oriented attitudes. Correlations between the attitudes and treatment did not show consistent coherency. Results regarding the participants clinical approaches were revealed to have two distinct and opposed inclinations: biomedically and biopsychosocially. Last, results for the re-activation subscale were significantly higher post-intervention. **Conclusions:** Family medicine residents seem to be highly psychologically oriented regarding low back pain; however, they do not necessarily treat their patients accordingly. Their clinical choices seem to follow two different approaches: guideline-consistent and non-guideline-consistent. An ETMI guideline-based workshop may sway their attitudes toward re-activation of patients. Further research is needed to determine whether similar results would arise in larger physician populations.

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KEY WORDS: clinical guidelines, Enhanced Transtheoretical Model Intervention (ETMI), low back pain, family medicine residents

Low back pain (LBP) has been shown to be the most prevalent cause of disability globally, affecting all age groups, and to be a burden on the economy [1-3]. Most treatments offered to patients with LBP are redundant and ineffective, cause unnecessary expenses, and may even have an adverse effect [4,5]. Two models that represent the main approaches toward the treatment of patients are the biomedical model and the biopsychosocial model [6,7]. The biomedical model is inherently based on the assumption that all ailments and disabilities have an underlying source in the form of a harmed or damaged tissue, and thus, the source should be sought, revealed, and treated through a diagnostic process. The biopsychosocial model, however, considers psychological and social factors (i.e., relationships, anxiety and depression, employment status) when offering consultation to a patient [6,7].

To date, research has shown no, or weak, correlation between structural spinal damage and disabling chronic or non-specific LBP, which constitutes the vast majority of all cases. However, the evidence does suggest a strong association between psychosocial factors and the chronic disability accompanying LBP [4,8], thus reinforcing the need for a biopsychosocial approach. Correspondingly, current clinical guidelines for the management of non-specific LBP highlight reassurance, return to normal activities, encouragement of physical activity, and acknowledgment of psychosocial factors as part of a total intervention plan [9]. However, there is a discrepancy between evidence and practice, and the recommendations are not well implemented [10]. Research has shown that primary care clinicians still have a tendency to prescribe medication extensively, refer their patients to imaging and unnecessary procedures and consultation, and recommend rest and limitation of activity levels. Some of the barriers for the implementation of the clinical guidelines are clinicians' difficulty to change their treatment habits, the gap between therapists and patients' perceptions, and beliefs about the current recommendations. Other barriers include patients' expectations to receive a specific diagnosis and medical treatment as well as a lack of institutional support [10,11].

Practitioner attitudes and therapeutic approaches toward LBP and its treatment have been shown to affect the treatment process and its outcomes [4]. Few studies have been conducted to investigate the nature of that relation. Studies have found that clinicians who were more inclined to a biomedical approach would recommend more sick leave, rest, and restriction of physical activity and would overall adhere less to the clinical guidelines, compared to those who exhibited a more biopsychosocial approach [12,13]. Furthermore, practitioners who were inclined to fear avoidance were shown to pass the sentiment to their patients.

Little is known about the attitudes of primary care practitioners in Israel. One cross-sectional study pinpointed some of the limitations in the implementation of the clinical guidelines by physicians in Israel [14]. The results suggest that age might be a relevant factor to clinician beliefs: physicians over 50 years of age were found to hold attitudes and beliefs less consistent with clinical guidelines when compared with those of their younger peers. Nevertheless, a thorough and in-depth investigation of practitioner attitudes and the ways in which they affect the treatment process has not been conducted. Shedding light on this matter could help design interventions that address therapist views, which in turn would be beneficial for the implementation of the clinical guidelines for the treatment and management of LBP.

Accordingly, the Enhanced Transtheoretical Model Intervention (ETMI) aspires to address this problem [15]. ETMI, which corresponds to the latest clinical guidelines, represents a new direction toward solutions and provides proof of concept for the intervention [15,16]. The ETMI method focuses on educating practitioners on ways to reassure the patients, empower them to cope with their LBP, increase physical activity, and improve their self-efficacy. ETMI has proven that training practitioners to include behavioral change techniques in their practice is feasible within a short time frame (a 2-day workshop) and results in considerable improvements in patients with chronic low back pain [15]. ETMI is based on behavior-change principles, which are designed to target obstacles to physical activity by addressing self-efficacy and fear avoidance. The intervention was tested in a pragmatic controlled clinical trial and was found to be effective in the management of chronic LBP (CLBP) [15,16].

Consequently, the aims of this study were to explore the attitudes of family medicine residents toward LBP and its treatment, to investigate the ways in which they correlate with their clinical approaches, and to test the influence of a single training session on LBP clinical guidelines and the ETMI approach on their attitudes.

PATIENTS AND METHODS

POPULATION

Medical doctors performing their general practice residencies as part of Clalit Health Services, Dan/Petah Tikva region, participated in the study through convenience sampling.

OUTCOME MEASURES

The Attitude to Back Pain Scale in Musculoskeletal Practitioners (ABS-mp) questionnaire consists of 19 items using a 1–7 Likert-type scale, providing six different independent subscales, which are categorized into two sections labeled *Personal Interaction* and *Treatment Orientation* [17].

The Personal Interaction section consists of four subscales:

- Limitations on sessions: Four items exploring practitioner policy toward limiting the sessions per episode of care (min-max = 4–28, where 28 = support unlimited sessions).
- Psychological: Four items measuring practitioner's willingness to explore their patients' psychological issues (min-max = 4–28, where 28 = support psychological approaches).
- Connection to the healthcare system: Three items measuring attitudes toward the healthcare system and its available services (min-max = 3–21, where 21 = feel connected).
- Confidence and concern: Two items measuring practitioner confidence and concern about treatment and clinical limitations in themselves and others (min-max = 2–14, where 14 = confident).

The Treatment Orientation section consists of two subscales:

- Re-activation: Three items exploring attitudes toward a return to work, daily activity, and increasing mobility (min-max = 3–21, where 21 = support re-activation).
- Biomedical: Three items concerning advice to restrict activities and to be vigilant, and the belief that back pain has a structural cause (min-max = 3–21, where 21 = support biomedical approach).

Confirmatory factor analysis (CFA) showed the model tested presented a goodfit and chi-square goodness of fit $(145) = 264.159$ for the model was statistically significant ($P < 0.001$). Furthermore, the questionnaire was recently translated and culturally adjusted by our research group in accordance with academic procedures. The test-retest reliability of the Hebrew ABS-mp was excellent (ICC = 0.906). For convergent validity, the ABS-mp's biomedical subscale and the HC-PAIRS's total score were moderately correlated (0.535).

In addition to the ABS-mp questionnaire, participants were asked about their treatment habits when offering consultation to patients with acute and chronic LBP.

STUDY PROCEDURE

All subjects in the study participated in an hour and a half online lecture in which they were taught about the latest clinical guidelines and the principles of ETMI. Shortly before, they were asked to answer the questionnaire in its online form. One month after the workshop, participants were asked to answer the online survey a second time.

Intervention: lecture content

An hour and a half online lecture focusing on the current clinical guidelines for the management of non-specific LBP and

the Enhanced Transtheoretical Model Intervention (ETMI). The lecture was conducted by authors NBA, the developer of ETMI, and RG, a family doctor and clinic director for Clalit Health Services. The session included case studies emphasizing the significance of self-management of symptoms, reassurance, maintenance of daily routine and adherence to physical activity, and avoidance of unnecessary medical testing and interventions.

SAMPLE SIZE

The sample size was calculated with G*Power 3.1.9.4 using the *t*-test family to detect the difference between two dependent means (matched pairs). The input parameters were as follows: for a one-tailed test, assuming a medium effect size of 0.5, $\alpha = 0.05$ and $\beta = 0.95$, the total sample size recommended was 45 participants.

DATA ANALYSIS

Statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 25 (SPSS, IBM Corp, Armonk, NY, USA). $P < 0.05$ was considered significant.

Descriptive statistics tools were used to reveal the type and form of distribution of the outcomes. Quantitative and qualitative variables are presented as mean \pm standard deviation and percent (%), respectively. Correlations between the different variables were investigated through Pearson correlation coefficient for normally distributed variables and Spearman’s rank correlation coefficient for those that did not normally distribute. Comparison between practitioner attitudes before and after the interventions were conducted through paired sample *t*-test for variables that distributed normally, and Wilcoxon signed-rank test for variables that did not.

ETHICS

The study was approved by the ethics committee of the school of health sciences at Ariel University (number AU-HEA-NBA-20200917). The questionnaires were answered anonymously. Each participant was assigned a serial number to allow within-subject comparison. Data were not used for any purpose other than this particular study and access to it was and will be held solely by the primary researchers.

RESULTS

RESPONSE AND DEMOGRAPHICS

Thirty-one medical doctors in their family medicine residency successfully completed the online questionnaire. They included 19 women and 12 men, mean age was 34.6 years and ranged between 28 and 47 years. Participant seniority as physicians at the time ranged such that 19.4% (n=6) had less than 1 year of experience, 29% (n=9) less than 2 years, 25% (n=8) 3–4 years, 22.6% (n=7) 5–10 years, and 3.2% (n= 1) 10–20 years. In the

second, post-intervention stage, 65% (n=20) of all participants completed the questionnaire [Table 1].

ATTITUDES TOWARD BACK PAIN

Table 1. Descriptive characteristics of participants

Variable	All practitioners
Sex n (%)	
Female	19 (61.3)
Age, years	
	34.6
Seniority, n (%)	
< 1 year	6 (19.4)
< 2 years	9 (29.0)
3–4 year	8 (25.8)
5–10 years	7 (22.6)
10–20 years	1 (3.2)
20–40 years	0 (0.0)

Residents received high scores in the psychological subscale (23.58 \pm 3.354, range 15–28), which implicated they considered psychosocial issues to a high degree. This rate was in accordance with Valjakka et al. [18], who established distinct categories for the psychological subscale among physicians, representing low, moderate and high consideration of psychosocial issues [Table 2].

Table 2. Participant scores in ABS-mp questionnaire before and after intervention

Item	Before \pm SD	After \pm SD	P value
ABS-mp total score			
Psychological subscale	23.58 \pm 3.354	23.50 \pm 2.782	> 0.05
Connection to healthcare system subscale	12.19 \pm 2.104	12.15 \pm 1.631	> 0.05
Confidence and concern subscale	9.58 \pm 1.858	9.20 \pm 1.609	> 0.05
Limitations on sessions subscale	19.06 \pm 3.098	18.75 \pm 3.226	> 0.05
Re-activation subscale	15.68 \pm 2.358	17.5 \pm 2.306	< 0.001
Biomedical subscale	9.81 \pm 3.321	9.35 \pm 2.621	> 0.05

ABS-mp = Attitude to Back Pain Scale in Musculoskeletal Practitioners, SD = standard deviation

CORRELATIONS BETWEEN ATTITUDES AND TREATMENT APPROACHES

When asked about patients with acute LBP, resident biomedical subscale scores significantly correlated with prescription of antidepressant (0.433, $P < 0.05$) and anti-epileptic drugs (0.376, $P < 0.05$), referral to bone-scan examination (0.375, $P < 0.375$), and referral to pain clinic consultation (0.382, $P < 0.05$). Fur-

thermore, scores in the same subscale significantly and inversely correlated with patient reassurance ($-0.419, P < 0.05$). For the psychological subscale, scores significantly correlated with physical examination ($0.401, P < 0.05$) and referral to magnetic resonance imaging (MRI) ($0.455, P < 0.05$). In contrast, scores in the confidence and concern subscale significantly and inversely correlated with referral to MRI ($-0.398, P < 0.05$), as well as to pain clinic consultation ($-0.493, P < 0.01$). The connection to healthcare system subscale significantly correlated with referral to alternative care ($0.374, P < 0.05$).

When asked about patients with chronic LBP, scores in the connection to healthcare system subscale significantly correlated with referral to MRI ($0.367, P < 0.05$) and to the emergency room ($0.402, P < 0.05$). Re-activation subscale significantly and inversely correlated with prescription of analgesics ($-0.408, P < 0.05$). Biomedical subscale significantly correlated with prescription of non-steroidal anti-inflammatory drugs ($0.453, P < 0.05$) and referral to bone scan imaging ($0.364, P < 0.05$). Limitation on sessions subscale significantly correlated with recommendation of physical activity ($0.403, P < 0.05$).

CORRELATIONS WITHIN TREATMENT APPROACHES

A principal component analysis was conducted on the 19 items related to the therapeutic approaches, that is, outside of the ABS-mp questionnaire, with rotation method of Varimax with Kaiser Normalization. This analysis was conducted on each scenario (acute and chronic) separately. The Kaiser–Meyer–Olkin measure verified the sampling adequacy for the analysis, for the acute scenario $KMO = 0.304$, and for the chronic $KMO = 0.533$. Two factors were extracted both in the acute and chronic therapeutic approaches accounting for 31.11% and 39.58% of total variance, respectively.

The two components in the acute scenario were as follows:

- Referral to electromyography, MRI, computed tomography (CT), bone-scan, antidepressants, pain clinic, dry-needling, and X-ray
- Physical activity, reassurance, physical therapy, analgesic drugs, and alternative care [Table 3].

The two components in the chronic scenario were:

- Referral to CT and bone-scan, prescription of opiates, referral to MRI, emergency room, pain clinic, X-ray, electromyography, prescription of analgesic drugs and referral to physical therapy
- Prescription of cannabis, referral to alternative care, reassurance, prescription of anti-epileptic medication, reassurance and prescription of antidepressants [Table 4]

PRE- AND POST-INTERVENTION

As to the intervention that the participants had undergone, a significant positive difference was found in the post-intervention outcome of the re-activation subscale (1.82 points increase, $P < 0.001$).

Table 3. Main components in the acute patient scenario

Component 1	Loading	Component 2	Loading
Electromyography referral	0.736	Physical activity	0.786
MRI	0.628	Reassurance	0.769
CT	0.600	Physical therapy	0.574
Bone-scan	0.576	Analgesic medication	0.517
Antidepressants	0.539	Alternative care	0.439
Pain-clinic	0.501		
Dry needling	0.472		
X-ray	0.419		

CT = computed tomography, MRI = magnetic resonance imaging

Table 4. Main components in the chronic patient scenario

Component 1	Loading	Component 2	Loading
CT	0.710	Cannabis	0.662
Bone-scan	0.702	Alternative care	0.661
Opiates	0.689	Reassurance	0.646
MRI	0.671	Anti-epileptic drugs	0.638
Emergency room	0.670	Physical activity	0.579
Pain-clinic	0.653	Anti-depressants	0.572
X-ray	0.646		
Electromyography	0.634		
Analgesic	0.564		
Physical therapy	0.459		

CT = computed tomography, MRI = magnetic resonance imaging

This increase was greater than the standard error of measurement for this subscale [19] [see Table 2].

DISCUSSION

The aim of this study was to explore the attitudes of medical doctors toward back pain and particularly to measurably assess how psychosocially inclined they are. As to the question at hand, according to the results in this study, it appears that general medicine residents in Clalit Health Services highly support psychological approaches when consulting patients with low back pain.

Current clinical guidelines reflect a biopsychosocial approach as opposed to a biomedical approach. Participant answers to the questions regarding treatment choices were considered in this study as reflective of both approaches, as two poles of the scale. The resident exhibition of high psychological orientation did not necessarily hold when asked about treatment approaches. The statistical analysis revealed inconsistencies, especially in the acute patient scenario. For example, higher scores in the psychological

subscale positively correlated with referral to MRI and physical examination, which do not reflect psychosocial approaches and are not congruent with current clinical guidelines. Evidence suggests that this incoherence is, at least in part, due to perceived pressure from patients to receive referrals for imaging and fear of medicolegal liability issues [10,20]. This notion might be reinforced by the fact that the confidence and concern subscale inversely correlated with MRI referral, implying that despite the absence of red flags, residents still feel insecure about their consultation. The biomedical scale positively correlated with antidepressants and anti-epileptic drugs. This finding is in line with the assumption that a more biomedical approach is in contrast with current clinical guidelines, as they are both explicitly not recommended for the treatment and management of LBP [21].

In the chronic patient scenario, treatment approaches were more consistent with resident attitudes, as the re-activation subscale inversely correlated with prescription of analgesics, and the biomedical subscale positively correlated with prescriptions for non-steroidal anti-inflammatory drugs and referral to bone scan imaging. A surprising finding was a positive correlation between limitation on sessions and physical activity, meaning that those who recommend physical activity are also prone to unlimited sessions. Evidence suggests that patients with several chronic non-communicable diseases tend to exhibit high rates of adherence to physical activity for at least 3 months [22]. However, it might be speculated that clinicians believe that patients are not likely to adhere to physical activity recommendations and may need frequent follow-up sessions and supervision.

When focusing merely on findings regarding resident treatment approaches, a statistical analysis of the findings revealed a clear distinction between guideline- and biopsychosocial-oriented, and non-guideline- and biomedical-oriented ones.

The intervention that was conducted in this study seems to have been successful in positively and significantly affecting the attitudes of residents as manifested in the re-activation subscale. Re-activation and physical activity are pillars in the reduction of pain and disability in patients with LBP; thus, this particular result calls for further and larger scale research to explore whether similar informative interventions would positively affect more varied populations of physicians and musculoskeletal practitioners when compared to a control group. Additional research is also necessary to gain a deeper understanding of the correlations and whether these would be repeated in larger sample. Moreover, since the sample in this study was relatively homogeneous in terms of age and clinical experience, such associations as that between age and guideline-consistent attitudes could not be demonstrated [14]. A study involving a more diverse population could shed light on possible associations between demographic characteristics and attitudes.

Last, it is worth noting that, to the best of our knowledge, cutoff points for physician populations have been only determined for the psychological subscale [18]. Therefore, further

research on a large scale would be beneficial in setting cutoff points for all subscales in the questionnaire, specifically for medical doctors.

LIMITATIONS

The study did not include a control group; hence, making it difficult to infer causality between the intervention and any change in attitudes. In addition, the measuring tool is based on self-report, and therefore may be limited in reflecting the true positions and choices of the participants. Moreover, the sample was homogeneous in terms of demographic characteristics; therefore, a possible relationship between them and attitudes or approaches could not be revealed. Last, there might have been a lack of representation of psychologically specific treatments, which would have resulted in greater consistency between the resident attitudes and clinical approaches. Further research should focus on the attitudes and clinical approaches of larger and more diverse physician populations. In addition, mixed-methods studies could shed light on the underlying causes of certain treatment choices made by physicians, particularly when they are not consistent with their attitudes.

CONCLUSIONS

Family medicine residents in Israel possess highly psychologically oriented attitudes; however, these attitudes are not consistently reflected in their clinical choices. The clinical choices seem to distribute distinctively into two opposed guideline and non-guideline consistent approaches. An ETMI guideline-based workshop on the management of low back pain might be effective in positively changing family residents attitudes toward re-activation of patients with low back pain.

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Capsule

SARS-CoV-2 antigen exposure history shapes phenotypes and specificity of memory CD8⁺ T cells

Minervina et al. utilized major histocompatibility complex multimers with single-cell RNA sequencing to profile SARS-CoV-2-responsive T cells *ex vivo* from humans with one, two or three antigen exposures, including vaccination, primary infection and breakthrough infection. Exposure order determined the distribution between spike-specific and non-spike-specific responses, with vaccination after infection leading to expansion of spike-specific T cells and differentiation to CCR7-CD45RA⁺ effectors. In contrast, individuals after breakthrough infection mount vigorous non-spike-specific responses. Analysis of over 4,000

epitope-specific T cell antigen receptor (TCR) sequences demonstrates that all exposures elicit diverse repertoires characterized by shared TCR motifs, confirmed by monoclonal TCR characterization, with no evidence for repertoire narrowing from repeated exposure. These findings suggest that breakthrough infections diversify the T cell memory repertoire and current vaccination protocols continue to expand and differentiate spike-specific memory.

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Capsule

Neoantigen quality predicts immunoediting in survivors of pancreatic cancer

Łuksza and co-authors investigated how 70 human pancreatic cancers evolved over 10 years. The authors found that, despite having more time to accumulate mutations, rare long-term survivors of pancreatic cancer who have stronger T cell activity in primary tumors develop genetically fewer heterogeneous recurrent tumors with fewer immunogenic mutations (neoantigens). To quantify whether immunoediting underlies these observations, we infer that a neoantigen is immunogenic (high-quality) by two features: non-selfness based on neoantigen similarity to known antigens and selfness based on the antigenic

distance required for a neoantigen to differentially bind to the MHC or activate a T cell compared with its wild-type peptide. Using these features, the authors estimated cancer clone fitness as the aggregate cost of T cells recognizing high-quality neoantigens offset by gains from oncogenic mutations. With this model, the authors predicted the clonal evolution of tumors to reveal that long-term survivors of pancreatic cancer develop recurrent tumors with fewer high-quality neoantigens.

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