

Effect of Vibration Anesthesia on Injection-Related Pain: A Prospective Crossover Study [Letter]

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Dear editor

We read with interest the article by Martinez et al, entitled "Effect of Vibration Anesthesia on Injection-Related Pain: A Prospective Crossover Study".¹ We wish to raise several methodological concerns.

First, the crossover design raises concerns regarding potential order and period effects. All participants received the control condition before the intervention, with no randomization of treatment sequence. Given that participant blinding was not feasible and pain intensity was assessed using a subjective self-reported outcome, potential expectancy effects cannot be excluded. Besides, the adequacy of the 5-minute interval separating the two conditions is uncertain, as residual nociceptive sensitization or carryover effects cannot be excluded.² No formal assessment of carryover or period effects was reported, contrary to standard crossover trial methodology.³ Additionally, pain ratings are susceptible to habituation, expectation, and learning effects across repeated procedures. Relevant crossover trial reporting guidelines and methodological literature should be considered in this context.⁴

Second, despite recruiting participants with self-reported needle fear, the study used no validated instrument to assess baseline or procedural anxiety. Because pain perception is modulated by cognitive and emotional states as well as descending inhibitory pathways,^{5,6} the observed pain reduction cannot be attributed specifically to attenuation of nociceptive processing without controlling for anxiety. Future studies incorporating psychological covariates may provide a more comprehensive understanding of the observed effects.

Third, caution may be warranted when interpreting the subgroup findings regarding needle gauge. The authors suggested that the greater pain reduction observed with 25G needles compared with 30G needles may indicate a stronger analgesic effect in more painful procedures. However, these conclusions were derived from separate analyses of two small subgroups ($n = 10$ each). Subgroup conclusions should rely on interaction testing rather than separate within-subgroup P values.⁷ In the absence of such analyses, conclusions regarding differential efficacy across needle sizes should be considered exploratory. We also note a minor inconsistency in the reported effect sizes. For the overall intramuscular analysis ($n = 20$), $W = 3$ yields an expected rank-biserial correlation of approximately -0.97 under standard formulas; in the 30G subgroup ($W = 2$, $n = 10$), the expected r is approximately -0.93 rather than the reported -0.89 . These discrepancies suggest that zero-difference pairs were excluded, reducing the effective sample size. The numerical impact is modest, but explicit reporting of this decision would aid reproducibility. Specifically, detailing how zero differences and tied ranks were handled will enhance transparency, and ensure the reproducibility of these robust effect sizes. Additionally, we noted a data reporting anomaly in the baseline characteristics. The mean height in Table 1 (308 inches) is clearly erroneous. Back-calculating from the provided weight (157.5 lb) and BMI (26 kg/m²) dictates a true mean height of approximately 1.657 m (65.24 inches). Furthermore, the reported standard deviation of 18.9 inches suggests an implausibly wide distribution of adult stature. These discrepancies suggest the possibility of reporting or transcription errors and warrant further clarification.

Fourth, the near-uniform treatment response observed in the study deserves careful consideration. The Wilcoxon result for subcutaneous injections implied that every participant reported lower pain under the intervention condition. Such complete directional concordance is uncommon in clinical pain studies and limits the evaluation of interindividual variability in treatment response. Although this finding may reflect a genuine benefit in a highly selected population with needle aversion, the small and relatively homogeneous sample limits assessment of response variability and generalizability.⁸ Replication in larger and more diverse cohorts would help establish the robustness and external validity of these findings. Paired trajectory plots would provide a more transparent view of within-subject heterogeneity.

Finally, we believe that some conclusions should be interpreted with greater caution. The discussion links immediate post-procedural pain scores to vaccine hesitancy and healthcare utilization. These behavioral endpoints were not measured in this study, and immediate pain reduction is not a validated surrogate for them.⁹ Conclusions regarding long-term behavioral impact should await studies designed to measure those outcomes directly.

Overall, this study provides preliminary evidence supporting the potential role of vibration anesthesia in reducing pain associated with needle-based procedures. Future randomized crossover studies with sequence randomization, assessment of psychological covariates, and larger samples are needed to establish the generalizability and mechanism of this effect.

Artificial Intelligence Statement

ChatGPT (OpenAI, San Francisco, CA, USA; GPT-5.5) was used solely to improve language and grammar. All suggested revisions were reviewed and approved by the authors, who retain full responsibility for the manuscript's scientific content.

Disclosure

The authors report no conflicts of interest in this communication.

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