

CADTH RAPID RESPONSE REPORT: REFERENCE LIST

Virtual Reality or Gaming Applications for Pain Management or Distraction: Clinical Effectiveness and Guidelines

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Research Questions

1. What is the clinical effectiveness of virtual reality or gaming applications for pain management or distraction in patients undergoing medical procedures?
2. What are the evidence-based guidelines regarding the use of virtual reality or gaming-based interventions for pain management or distraction?

Key Findings

Four systematic reviews, 16 randomized controlled trials, two non-randomized studies, and two evidence-based guidelines were identified regarding the clinical effectiveness of virtual reality or video game-based treatment approaches for patients requiring pain management or distraction during medical procedures.

Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and July 27, 2017. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Patients requiring pain management or distraction during medical procedures (e.g., burn patients undergoing wound care, patients receiving immunizations)
Intervention	Virtual reality or video game-based treatment approaches (e.g. virtual reality headset systems, motion capture systems, SnowWorld, Ditto, Nintendo Wii); alone or in combination with standard of care
Comparator	Q1: No treatment; Alternative therapies for pain management or distraction; Standard of care Q2: No comparator required
Outcomes	Q1: Clinical benefits and harms (e.g., pain, anxiety, pain medication use) Q2: Evidence-based guidelines, including recommendations regarding treatment protocols and infection control considerations
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, evidence-based guidelines

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, and evidence-based guidelines.

Four systematic reviews, 16 randomized controlled trials, two non-randomized studies, and two evidence-based guidelines were identified regarding the clinical effectiveness of virtual reality or video game-based treatment approaches for patients requiring pain management or distraction during medical procedures. No relevant health technology assessments or meta-analyses were identified.

Additional references of potential interest are provided in the appendix.

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-Analyses

Mixed Population

1. Shahrbanian S, Ma X, Aghaei N, Korner-Bitenski N, Moshiri K, Simmonds MJ. Use of virtual reality (immersive vs. non immersive) for pain management in children and adults: a systematic review of evidence from randomized controlled trials. *Eur J Exp Biol* [Internet]. 2012 [cited 2017 Aug 8];2(5):1408-22. Available from: <http://www.imedpub.com/articles/use-of-virtual-reality-immersive-vs-non-immersive-for-pain-management-in-children-and-adults-a-systematic-review-of-evidence-from.pdf>

Pediatric Population

2. Rezai MS, Goudarzian AH, Jafari-Koulaee A, Bagheri-Nesami M. The effect of distraction techniques on the pain of venipuncture in children: a systematic review, *J Pediatr Rev* [Internet]. 2017 [cited 2017 Aug 8];5(1):e9459. Available from: <http://jpediatricsreview.com/en/articles/9459.html>
3. Uman LS, Birnie KA, Noel M, Parker JA, Chambers CT, McGrath PJ, et al. Psychological interventions for needle-related procedural pain and distress in children and adolescents. *Cochrane Database Syst Rev*. 2013 Oct 10;(10):CD005179. [PubMed: PM24108531](#)

Unspecified Population

4. Primack BA, Carroll MV, McNamara M, Klem ML, King B, Rich M, et al. Role of video games in improving health-related outcomes: a systematic review. *Am J Prev Med* [Internet]. 2012 Jun [cited 2017 Aug 8];42(6):630-8. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3391574> [PubMed: PM22608382](#)

Randomized Controlled Trials

Adult Population

5. McSherry T, Atterbury M, Gartner S, Helmold E, Searles DM, Schulman C. Randomized, crossover study of immersive virtual reality to decrease opioid use during painful wound care procedures in adults. *J Burn Care Res*. 2017 May 26. [Epub ahead of print]
[PubMed: PM28570305](#)
6. Shourab NJ, Zagami SE, Golmakhani N, Mazlom SR, Nahvi A, Pabarja F, et al. Virtual reality and anxiety in primiparous women during episiotomy repair. *Iran J Nurs Midwifery Res* [Internet]. 2016 Sep [cited 2017 Aug 8];21(5):521-6. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5114799>
[PubMed: PM27904638](#)
7. JahaniShoorab N, Ebrahimzadeh ZS, Nahvi A, Mazluom SR, Golmakani N, Talebi M, et al. The effect of virtual reality on pain in primiparity women during episiotomy repair: a randomize clinical trial. *Iran J Med Sci* [Internet]. 2015 May [cited 2017 Aug 8];40(3):219-24. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4430883>
[PubMed: PM25999621](#)
8. Walker MR, Kallingal GJ, Musser JE, Folen R, Stetz MC, Clark JY. Treatment efficacy of virtual reality distraction in the reduction of pain and anxiety during cystoscopy. *Mil Med*. 2014 Aug;179(8):891-6.
[PubMed: PM25102532](#)

Pediatric Population

9. Crevatin F, Cozzi G, Braido E, Bertossa G, Rizzitelli P, Lionetti D, et al. Hand-held computers can help to distract children undergoing painful venipuncture procedures. *Acta Paediatr*. 2016 Aug;105(8):930-4.
[PubMed: PM27128220](#)
10. Kaheni S, Bagheri-Nesami M, Goudarzian AH, Rezai MS. The effect of video game play technique on pain of venipuncture in children. *Int J Pediatr* [Internet]. 2016 May [cited 2017 Aug 8];4(5, serial no.29):1795-802. Available from: http://ijp.mums.ac.ir/article_6770_0b9207f467762bf200f7d886764083ea.pdf
11. Kaheni S, Rezai MS, Bagheri-Nesami M, Goudarzian AH. The effect of distraction technique on the pain of dressing change among 3-6 year-old children. *Int J Pediatr* [Internet]. 2016 [cited 2017 Aug 8];4(4):1603-10. Available from: http://ijp.mums.ac.ir/article_6699_54b321fedd9302a43ce53253b6115a47.pdf
12. Miller K, Tan X, Hobson AD, Khan A, Ziviani J, O'Brien E, et al. A prospective randomized controlled trial of nonpharmacological pain management during intravenous cannulation in a pediatric emergency department. *Pediatr Emerg Care*. 2016 Jul;32(7):444-51.
[PubMed: PM27380603](#)
13. Brown NJ, Kimble RM, Rodger S, Ware RS, Cuttle L. Play and heal: randomized controlled trial of Ditto intervention efficacy on improving re-epithelialization in pediatric burns. *Burns*. 2014 Mar;40(2):204-13.
[PubMed: PM24360745](#)

14. Hua Y, Qiu R, Yao WY, Zhang Q, Chen XL. The effect of virtual reality distraction on pain relief during dressing changes in children with chronic wounds on lower limbs. *Pain Manag Nurs*. 2015 Oct;16(5):685-91.
[PubMed: PM25972074](#)
15. Jeffs D, Dorman D, Brown S, Files A, Graves T, Kirk E, et al. Effect of virtual reality on adolescent pain during burn wound care. *J Burn Care Res*. 2014 Sep;35(5):395-408.
[PubMed: PM24823326](#)
16. Nilsson S, Enskar K, Hallqvist C, Kokinsky E. Active and passive distraction in children undergoing wound dressings. *J Pediatr Nurs*. 2013 Apr;28(2):158-66.
[PubMed: PM22819747](#)
17. Asl Aminabadi N, Erfanparast L, Sohrabi A, Ghertasi OS, Naghili A. The impact of virtual reality distraction on pain and anxiety during dental treatment in 4-6 year-old children: a randomized controlled clinical trial. *J Dent Res Dent Clin Dent Prospects* [Internet]. 2012 [cited 2017 Aug 8];6(4):117-24. Available from:
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3529924>
[PubMed: PM23277857](#)
18. Kipping B, Rodger S, Miller K, Kimble RM. Virtual reality for acute pain reduction in adolescents undergoing burn wound care: a prospective randomized controlled trial. *Burns*. 2012 Aug;38(5):650-7.
[PubMed: PM22348801](#)
19. Minute M, Badina L, Cont G, Montico M, Ronfani L, Barbi E, et al. Videogame playing as distraction technique in course of venipuncture. *Pediatr Med Chir*. 2012 Mar;34(2):77-83.
[PubMed: PM22730632](#)

Unspecified Population

20. Guo C, Deng H, Yang J. Effect of virtual reality distraction on pain among patients with hand injury undergoing dressing change. *J Clin Nurs*. 2015 Jan;24(1-2):115-20.
[PubMed: PM24899241](#)

Non-Randomized Studies

Mixed Population

21. Faber AW, Patterson DR, Bremer M. Repeated use of immersive virtual reality therapy to control pain during wound dressing changes in pediatric and adult burn patients. *J Burn Care Res* [Internet]. 2013 Sep [cited 2017 Aug 8];34(5):563-8. Available from:
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3770783>
[PubMed: PM23970314](#)

Unspecified Population

22. Wiederhold MD, Gao K, Wiederhold BK. Clinical use of virtual reality distraction system to reduce anxiety and pain in dental procedures. *Cyberpsychol Behav Soc Netw* [Internet]. 2014 Jun [cited 2017 Aug 8];17(6):359-65. Available from:
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4043252>
[PubMed: PM24892198](#)

Guidelines and Recommendations

23. Clinical practice guideline: needle-related procedural pain in pediatric patients [Internet]. Des Plaines (IL): Emergency Nurses Association; 2015 [cited 2017 Aug 8]. Available from: https://www.ena.org/docs/default-source/resource-library/practice-resources/cpg/pedpainmanagementcpg.pdf?sfvrsn=c650e1d6_10
See p. 5 “Behavioural Interventions”
24. González-María E, Fuentelsaz-Gallego C, Moreno Casbas Y, Gil-Rubio P, Herreros-López P, on behalf of the work group of the Clinical practice guideline for pain management in children with cancer. Clinical practice guideline for pain management in children with cancer [Internet]. Madrid (Spain): CRIS Cancer Foundation; 2013 [cited 2017 Aug 8]. Available from: http://www.isciii.es/ISCIII/es/contenidos/fd-el-instituto/fd-organizacion/fd-estructura-directiva/fd-subdireccion-general-servicios-aplicados-formacion-investigacion/fd-centros-unidades/fd-investen-isciii-2/docus/CPG_Pain_Management.pdf
See p. 67 “Virtual reality (VR)”

Appendix — Further Information

Economic Evaluations

26. Brown NJ, David M, Cuttle L, Kimble RM, Rodger S, Higashi H. Cost-Effectiveness of a Nonpharmacological Intervention in Pediatric Burn Care. *Value Health*. 2015 Jul;18(5):631-7.
[PubMed: PM26297091](#)