

## Pain Management in Virtual Reality: A Comprehensive Research Chart

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**H**ERE, WE PROVIDE A COMPREHENSIVE LISTING of re- search done on pain management in virtual reality. MEDLINE was searched in October 2013 for the keywords

“virtual reality and pain.” Results from that search are pre- sented herein.

<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
1981	Perry S, Heidrich G, Ramos E	Assessment of pain by burn patients	Journal of Burn Care and Rehabilitation 2:322–327	Burn
1984	Seyrek SK, Corah NL, Pace LF	Comparison of three distraction techniques in reducing stress in dental patients	Journal of the American Dental Association 108:327–329	Dental treatments
1988	Watson D, Clark LA, Tellegen A	Development and validation of brief measures of positive and negative affect: the PANAS scales	Journal of Personality and Social Psychology 54:1063–1070	Affect
1993	Troesch R, Delaney Y	The influence of guided imagery on chemotherapy-related nausea and vomiting	Oncology Nursing Forum 20:1179–1185	Cancer
1994	Regan EC, Price KR	The frequency of occurrence and severity of side-effects of immersion virtual reality	Aviation, Space, and Environmental Medicine 65:527–530	Side effects
1995	Farr C	E-anesthesia: pulp fiction or virtual reality	Dentistry Today 14:70–75	Anesthesia
1996	Eguchi K	Supportive care programs in cancer at the National Cancer Center in Tokyo	Supportive Care in Cancer 4:266–269	Cancer
1996	Ramachandran VS, Rogers-Ramachandran D	Synaesthesia in phantom limbs induced with mirrors	Proceedings of the Royal Society B: Biological Sciences 263:377–386	Phantom limb
1996	Wiederhold MD, Wiederhold BK	From virtual worlds to the therapist’s office: are virtual reality techniques useful tools in psychotherapy and diagnosis?	IEEE Engineering in Medicine and Biology 15:44–46	Chronic pain
1997	Carson CL, Grissom NL	Ameliorating adult’s acute pain during phlebotomy with a distraction intervention	Applied Nursing Research 10:168–173	Phlebotomy
1997	Cohen LL, Blount RL, Panopoulos G	Nurse coaching and cartoon distraction: an effective and practical intervention to reduce child, parent, and nurse distress during immunizations	Journal of Pediatric Psychology 22:355–370	Immunization

*(continued)*

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
1998	Ohsuga M, Oyama H	Possibility of virtual reality for mental care	Studies in Health Technology and Informatics 58:82–90	Mental care
1998	Ohsuga M, Tatsuno Y, Shimono F, et al.	Bedside wellness—development of a virtual forest rehabilitation system	Studies in Health Technology and Informatics 50: 168–174	Rehabilitation
1998	Ilacqua GE	Migraine headaches: coping efficacy of guided imagery training	Headache 34:99–102	Headache
1999	Oyama H, Ohsuga M, Tatsuno Y, Katsumata N	Evaluation of the psychooncological effectiveness of the bedside wellness system	CyberPsychology and Behavior 2:81–84	Cancer
1999	Schneider SM, Workman ML	Effects of virtual reality on symptom distress in children receiving chemotherapy	CyberPsychology and Behavior 2:125–134	Cancer
2000	Hoffman HG, Patterson DR, Carrougher GJ	Use of virtual reality for adjunctive treatment of adult burn pain during physical therapy: a controlled study	The Clinical Journal of Pain 16:244–250	Burn patient
2000	Hoffman HG, Doctor JN, Patterson DR, et al.	Virtual reality as an adjunctive pain control during burn wound care in adolescent patients	Pain 85:305–309	Burn patient
2000	Sullivan C, Schneider PE, Musselman RJ, et al.	The effect of virtual reality during dental treatment on child anxiety and behavior	ASDC Journal of Dentistry for Children 67:193–196	Dental treatments
2001	Hoffman HG, Garcia-Palacios A, Patterson DR, et al.	The effectiveness of virtual reality for dental pain control: a case study	CyberPsychology and Behavior 4:527–535	Dental procedures
2001	Hoffman HG, Patterson DR, Carrougher GJ, Sharar SR	Effectiveness of virtual reality-based pain control with multiple treatments	Clinical Journal of Pain 17:229–235	Pain control
2001	Anderson PL, Rothbaum BO, Hodges L	Virtual reality: using the virtual world to improve quality of life in the real world	Bulletin of the Menninger Clinic 65:78–91	Improve quality of life
2001	Pennant JH	Anesthesia for laparoscopy in the pediatric patient	Anesthesiology Clinics of North America 19:69–88	Anesthesia
2001	Cupal DD, Brewer BW	Effects of relaxation and guided imagery on knee strength, reinjury anxiety, and pain following anterior cruciate ligament reconstruction	Rehabilitation Psychology 1:28–43	Pain control
2002	Schultheis MT, Himmelstein J, Rizzo AA	Virtual reality and neuropsychology: upgrading the current tools	Journal of Head Trauma Rehabilitation 17:378–394	Neuropsychology
2002	Poletto CJ, Van Doren CL	Elevating pain thresholds in humans using depolarizing prepulses	IEEE Transactions on Biomedical Engineering 49:1221–1224	Depolarizing prepulses
2002	Sander Wint S, Eshelman D, Steele J, Guzzetta CE	Effects of distraction using virtual reality glasses during lumbar punctures in adolescents with cancer	Oncology Nursing Forum 29:E8–E15	Cancer
2002	Fors EA, Sexton H, Gotestam G	The effect of guided imagery and amitriptyline on daily fibromyalgia pain: a prospective, randomized, controlled trial	Journal of Psychiatric Research 36:179–187	Fibromyalgia

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2003	Gershon J, Zimand E, Lemos R, et al.	Use of virtual reality as a distractor for painful procedures in a patient with pediatric cancer: a case study	CyberPsychology and Behavior 6:657–661	Cancer
2003	Steele E, Grimmer K, Thomas B, et al.	Virtual reality as a pediatric pain modulation technique: a case study	CyberPsychology and Behavior 6:633–638	Pain modulation
2003	Sveistrup H, McComas J, Thornton M, et al.	Experimental studies of virtual reality-delivered compared to conventional exercise programs for rehabilitation	CyberPsychology and Behavior 6:245–249	Rehabilitation
2003	Hoffman HG, Richards T, Coda B, et al.	The illusion of presence in immersive virtual reality during an fMRI brain scan	CyberPsychology and Behavior 6:127–31	Burn patient
2003	Tse MM, Ng JK, Chung JW	Visual stimulation as pain relief for Hong Kong Chinese patients with leg ulcers	CyberPsychology and Behavior 6:315–320	Leg ulcers
2003	Reger GM	Effectiveness of virtual reality for attentional control to reduce children's pain during venipuncture	Proceedings of the 2nd International Workshop in Virtual Rehabilitation, Piscataway, NJ, pp. 62–67	Venipuncture
2003	Schneider SM	Virtual reality for the treatment of breast cancer	San Diego, CA: Interactive Media Institute	Cancer
2003	Schneider SM, Ellis M, Coombs WT, et al.	Virtual reality intervention for older women with breast cancer	CyberPsychology and Behavior 6:301–307	Cancer
2003	Hoffman HG, Coda BA, Sharar SR, et al.	Virtual reality analgesia during thermal and electrical pain for longer durations, and multiple treatments	San Diego, CA: Interactive Media Institute	Analgesia
2004	Gershon J, Zimand E, Pickering M, et al.	A pilot and feasibility study of virtual reality as a distraction for children with cancer	Journal of the American Academy of Child & Adolescent Psychiatry 43:1243–1249	Cancer
2004	Hoffman HG, Sharar SR, Coda B, et al.	Manipulating presence influences the magnitude of virtual reality analgesia	Pain 111:162–168	Analgesia
2004	Hoffman HG	Virtual-reality therapy	Scientific American 291: 58–65	Burn patient
2004	Patterson DR, Tininenko JR, Schmidt AE, Sharar SR	Virtual reality hypnosis: a case report	International Journal of Clinical and Experimental Hypnosis 52:27–38	Burn patient
2004	Hoffman HG, Patterson DR, Magula J, et al.	Water-friendly virtual reality pain control during wound care	Journal of Clinical Psychology 60:189–195	Burn patient
2004	Schneider SM, Prince-Paul M, Allen MJ, et al.	Virtual reality as a distraction intervention for women receiving chemotherapy	Oncology Nursing Forum 31:81–88	Cancer
2004	Simmons D, Chabal C, Griffith J, et al.	A clinical trial of distraction techniques for pain and anxiety control during cataract surgery	Insight 29:13–16	Cataract surgery
2005	Wright JL, Hoffman HG, Sweet RM	Virtual reality as an adjunctive pain control during transurethral microwave thermotherapy	Urology 66:1320	Pain control
2005	Wismeijer AA, Vingerhoets AJ	The use of virtual reality and audiovisual eyeglass systems as adjunct analgesic techniques: a review of the literature	Annals of Behavioral Medicine 30:268–278	Analgesia

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2005	Pesudovs K	The development of a symptom questionnaire for assessing virtual reality viewing using a head-mounted display	Optometry & Vision Science 82:571; author reply 571-572	Questionnaire
2005	Ames SL, Wolffsohn JS, McBrien NA	The development of a symptom questionnaire for assessing virtual reality viewing using a head-mounted display	Optometry & Vision Science 82:168-176	Questionnaire
2005	Das DA, Grimmer KA, Sparnon AL, et al.	The efficacy of playing a virtual reality game in modulating pain for children with acute burn injuries: a randomized controlled trial	BMC Pediatrics 5:1	Burn patients
2005	Sherstyuk A, Aschwanden C, Saiki S	Affordable virtual environments: building a virtual beach for clinical use	Studies in Health Technology and Informatics 111: 465-467	Pain treatment
2005	Hoffman HG, Richards TL, Coda B, et al.	Modulation of thermal pain-related brain activity with virtual reality: evidence from fMRI	Neuroreport 15:1245-1248	Analgesia
2005	Schneider SM	Virtual reality intervention for chemotherapy symptoms	Orlando, FL: Oncology Nursing Society	Cancer
2005	Wolitzkya K, Fivushb R, Zimand E, et al.	Effectiveness of virtual reality distraction during a painful medical procedure in pediatric oncology patients	Psychology & Health 20: 817-824	Cancer
2005	Tse MM, Pun SP, Benzie IF	Affective images: relieving chronic pain and enhancing quality of life for older persons	CyberPsychology and Behavior 8:571-579	Chronic pain
2005	Wiederhold BK	Advances in the clinical delivery of virtual reality	American Psychological Association Annual Convention, Washington, DC, August 18-21, 2005	Pain control
2005	deCharms R, Maeda F, Glover GH, Ludlow d	Control over brain activation and pain learned by using real-time functional MRI	St. Louis, MO: Washington University School of Medicine	Pain learned, fMRI
2006	Patterson DR, Hoffman HG, Palacios AG, Jensen MJ	Analgesic effects of posthypnotic suggestions and virtual reality distraction on thermal pain	Journal of Abnormal Psychology 115:834-841	Thermal pain
2006	Hoffman HG, Seibel EJ, Richards TL, et al.	Virtual reality helmet display quality influences the magnitude of virtual reality analgesia	Journal of Pain 7:843-850	Analgesia
2006	Magora F, Cohen S, Shochina M, Dayan E	Virtual reality immersion method of distraction to control experimental ischemic pain	Israel Medical Association Journal 8:261-265	Ischemic pain
2006	Gold JI, Kim SH, Kant AJ, et al.	Effectiveness of virtual reality for pediatric pain distraction during i.v. placement	CyberPsychology and Behavior 9:207-212	I.V. placement
2006	Murray CD, Patchick E, Pettifer S, et al.	Immersive virtual reality as a rehabilitative technology for phantom limb experience: a protocol	CyberPsychology and Behavior 9:167-170	Phantom limb
2006	Patterson DR, Wiechman SA, Jensen M, Sharar SR	Hypnosis delivered through immersive virtual reality for burn pain: a clinical case series	International Journal of Clinical and Experimental Hypnosis 54:130-142	Burn patients
2006	Haik J, Tessone A, Nota A, et al.	The use of video capture virtual reality in burn rehabilitation: the possibilities	Journal of Burn Care & Research 27:195-197	Burn patients

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2006	Murray CD, Patchick EL, Caillette F, et al.	Can immersive virtual reality reduce phantom limb pain?	Studies in Health Technology and Informatics 119: 407–412	Phantom limb
2006	Hoffman HG, Richards TL, Bills AR, et al.	Using FMRI to study the neural correlates of virtual reality analgesia	CNS Spectrums 11:45–51	Analgesia
2006	Cole SW, Kato PM, Marin-Bowling VM, et al.	Clinical trial of re-mission: a video game for young people with cancer	CyberTherapy 11, Conference, Gatineau, Canada, June 12–15	Cancer
2006	Wiederhold BK	Virtual Reality applications for mental assessment and rehabilitation	Virtual Reality Conference, Alexandria, Virginia, March 25–29	Rehabilitation
2006	Lange B, Williams M, Fulton I, Craigie M	Virtual Reality distraction for children receiving minor medical procedures	CyberTherapy 11, Conference, Gatineau, Canada, June 12–15	Minor medical procedures
2007	Vazquez JLM, Santander A, Gao K, et al.	Using cybertherapy to reduce postoperative anxiety in cardiac recovery intensive care units	Journal of Anesthesia and Clinical Research 4:363	Surgical anxiety
2007	Hoffman HG, Richards TL, Van Oostrom T, et al.	The analgesic effects of opioids and immersive virtual reality distraction: evidence from subjective and functional brain imaging assessments	Anesthesia & Analgesia 105:1776–1783	Analgesic, opioids
2007	Dahlquist LM, McKenna KD, Jones KK, et al.	Active and passive distraction using a head-mounted display helmet: effects on cold pressor pain in children	Health Psychology 26: 794–801	Cold pressor pain
2007	Li S, Kay S, Hardicker NR	Virtual reality: towards a novel treatment environment for ankylosing spondylitis	Studies in Health Technology and Informatics 127: 190–196	Ankylosing spondylitis
2007	Gold JI, Belmont KA, Thomas DA	The neurobiology of virtual reality pain attenuation	CyberPsychology and Behavior 10:536–544	Pain reduction
2007	Wiederhold MD, Wiederhold BK	Virtual reality and interactive simulation for pain distraction	Pain Medicine 8:S182–S188	Pain distraction
2007	Mühlberger A, Wieser MJ, Kenntner-Mabiala R, et al.	Pain modulation during drives through cold and hot virtual environments	CyberPsychology, Behavior, and Social Networking 10:516–522	Pain modulation
2007	van Twillert B, Bremer M, Faber AW	Computer-generated virtual reality to control pain and anxiety in pediatric and adult burn patients during wound dressing changes	Journal of Burn Care & Research 28:694–702	Burn patients
2007	Chan EA, Chung JW, Wong TK, et al.	Application of a virtual reality prototype for pain relief of pediatric burn in Taiwan	Journal of Clinical Nursing 16:786–793	Burn patients
2007	Mosso JL, Rizzo S, Wiederhold B, et al.	Cybertherapy—new applications for discomfort reductions. Surgical care unit of heart, neonatology care unit, transplant kidney care unit, delivery room-cesarean surgery and ambulatory surgery, 27 case reports	Studies in Health Technology and Informatics 125: 334–336	Discomfort reduction
2007	Windich-Biermeier A, Sjoberg I, Dale JC, et al.	Effects of distraction on pain, fear, and distress during venous port access and venipuncture in children and adolescents with cancer	Journal of Pediatric Oncology Nursing 24:8–19	Cancer

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2008	Gregoretta C, Decaroli D, Piacevoli Q, et al.	Analgo-sedation of patients with burns outside the operating room	Drugs 68:2427–2443	Burn patients
2008	Sharar SR, Miller W, Teeley A, et al.	Applications of virtual reality for pain management in burn-injured patients	Expert Review of Neurotherapeutics 8:1667–1674	Burn patients
2008	Oneal BJ, Patterson DR, Soltani M, et al.	Virtual reality hypnosis in the treatment of chronic neuropathic pain: a case report	International Journal of Clinical and Experimental Hypnosis 56:451–462	Chronic neuropathic pain
2008	Hoffman HG, Patterson DR, Seibel E, et al.	Virtual reality pain control during burn wound debridement in the hydrotank	Clinical Journal of Pain 24:299–304	Burn patients
2008	Dahlquist LM, Weiss KE, Clendaniel LD, et al.	Effects of videogame distraction using a virtual reality type head-mounted display helmet on cold pressor pain in children	Journal of Pediatric Psychology 34:574–584	Cold pressor pain
2008	Mott J, Bucolo S, Cuttle L, et al.	The efficacy of an augmented virtual reality system to alleviate pain in children undergoing burns dressing changes: a randomised controlled trial	Burns 34:803–808	Burn patients
2008	Sharar SR, Carrougher GJ, Nakamura D, et al.	Factors influencing the efficacy of virtual reality distraction analgesia during postburn physical therapy: preliminary results from 3 ongoing studies	Archives of Physical Medicine and Rehabilitation 88:S43–S49	Postburn physical therapy
2008	Maani C, Hoffman HG, Desocio PA, et al.	Pain control during wound care for combat-related burn injuries using custom articulated arm mounted virtual reality goggles	Journal of Cybertherapy and Rehabilitation 1:193–198	Wound care
2008	Wiederhold MD, Wiederhold BK	Pain management with cell phone technology	CyberTherapy 13: Changing the Face of Healthcare, June 23–25, 2008, San Diego, CA	Cell phone pain management
2009	Furman E, Jasinevicius TR, Bissada NF, et al.	Virtual reality distraction for pain control during periodontal scaling and root planning procedures	The Journal of the American Dental Association 140:1508–1516	Dental treatments
2009	Miller K, Rodger S, Bucolo S, et al.	Multi-modal distraction. Using technology to combat pain in young children with burn injuries	Burns 36:647–658	Burn patients
2009	Cheetham M, Pedroni AF, Antley A, et al.	Virtual milgram: empathic concern or personal distress? Evidence from functional MRI and dispositional measures.	Frontiers in Human Neuroscience 3:29	Empathy
2009	Morris LD, Louw QA, Grimmer-Somers K	The effectiveness of virtual reality on reducing pain and anxiety in burn injury patients: a systematic review	Clinical Journal of Pain 25:815–826	Burn patients
2009	Casale R, Damiani C, Rosati V	Mirror therapy in the rehabilitation of lower-limb amputation: are there any contraindications	American Journal of Physical Medicine & Rehabilitation 88:837–842	Amputation
2009	Leibovici V, Magora F, Cohen S, Ingber A	Effects of virtual reality immersion and audiovisual distraction techniques for patients with pruritus	Pain Research & Management 14:283–286	Pruritus
2009	Carrougher GJ, Hoffman HG, Nakamura D, et al.	The effect of virtual reality on pain and range of motion in adults with burn injuries	Journal of Burn Care & Research 30:785–791	Burn patients

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2009	Powell W, Stevens B, Simmonds M	Treadmill interface for virtual reality vs. overground walking: a comparison of gait in individuals with and without pain	Studies in Health Technology and Informatics 144: 198–203	Pain reduction
2009	Shahrbanian S, Ma X, Korner-Bitensky N, Simmonds MJ	Scientific evidence for the effectiveness of virtual reality for pain reduction in adults with acute or chronic pain	Studies in Health Technology and Informatics 144:40–43	Acute/chronic pain
2009	Markus LA, Willems KE, Maruna CC, et al.	Virtual reality: feasibility of implementation in a regional burn center	Burns 35:967–969	Burn patients
2009	Sarig-Bahat H, Weiss PL, Laufer Y	Cervical motion assessment using virtual reality	Spine (Phila Pa 1976) 34:1018–1024	Cervical motion
2009	Mosso JL, Gorini A, De La Cerda G, et al.	Virtual reality on mobile phones to reduce anxiety in outpatient surgery	Studies in Health Technology and Informatics 142: 195–200	Surgery
2009	Mahrer NE, Gold JI	The use of virtual reality for pain control: a review	Current Pain and Headache Reports 13:100–109	Pain control
2009	Askay SW, Patterson DR, Sharar SR	Virtual reality hypnosis	Contemporary Hypnosis 26:40–47	Hypnosis
2009	Rutter CE, Dahlquist LM, Weiss KE	Sustained efficacy of virtual reality distraction	Journal of Pain 10:391–397	Cold pressor pain
2009	Nilsson S, Finnström B, Kokinsky E, Enskär K	The use of virtual reality for needle-related procedural pain and distress in children and adolescents in a paediatric oncology unit	European Journal of Oncology Nursing 13:102–109	Cancer
2009	Cole J, Crowle S, Austwick G, Slater DH	Exploratory findings with virtual reality for phantom limb pain; from stump motion to agency and analgesia	Disability and Rehabilitation 31:846–854	Phantom limb
2009	Meng FG, Wu CY, Liu YG, Liu L	Virtual reality imaging technique in percutaneous radiofrequency rhizotomy for intractable trigeminal neuralgia	Journal of Clinical Neuroscience 16:449–451	Neuralgia
2009	Konstantatos AH, Angliss M, Costello V, et al.	Predicting the effectiveness of virtual reality relaxation on pain and anxiety when added to PCA morphine in patients having burns dressings changes	Burns 35:491–499	Burn patients
2009	Hoffman HG, Patterson DR, Soltani M, et al.	Virtual reality pain control during physical therapy range of motion exercises for a patient with multiple blunt force trauma injuries	CyberPsychology and Behavior 12:47–49	Motion exercises, trauma
2009	O'Dell MW, Lin CC, Harrison V	Stroke rehabilitation: strategies to enhance motor recovery	Annual Review of Medicine 60:55–68	Rehabilitation
2009	Wood DP, Webb-Murphy J, Center K, et al.	Combat-related post-traumatic stress disorder: a case report using virtual reality graded exposure therapy with physiological monitoring with a female Seabee	Military Medicine 174: 1215–1222	Post-traumatic stress disorder (PTSD)
2009	Wood DP, Murphy J, McLay R, et al.	Cost effectiveness of virtual reality graded exposure therapy with physiological monitoring for the treatment of combat related post traumatic stress disorder	Studies in Health Technology and Informatics 144: 223–229	PTSD

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2009	Walker ML, Ringleb SI, Maihafer GC, et al.	Virtual reality-enhanced partial body weight-supported treadmill training poststroke: feasibility and effectiveness in 6 subjects	Archives of Physical Medicine and Rehabilitation 91:115–122	Stroke
2009	Kott K, De Leo G, Leshner K, et al.	Virtual reality gaming for treadmill training: improved functional ambulation in children with cerebral palsy	Journal of CyberTherapy and Rehabilitation 2:35–42	Cerebral palsy
2010	Sarig Bahat H, Weiss PL, Laufer Y	The effect of neck pain on cervical kinematics, as assessed in a virtual environment	Archives of Physical Medicine and Rehabilitation 91:1884–1890	Neck pain
2010	Bayat A, Ramaiah R, Bhananker SM	Analgesia and sedation for children undergoing burn wound care	Expert Review of Neurotherapeutics 10:1747–1759	Burn patients
2010	Dahlquist LM, Herbert LJ, Weiss KE, Jimeno M	Virtual-reality distraction and cold-pressor pain tolerance: does avatar point of view matter?	CyberPsychology, Behavior, and Social Networking 13:587–591	Cold pressor pain
2010	Huang SW	Comments on “Feasibility and potential effect of a low-cost virtual reality system on reducing pain and anxiety in adult burn injury patients during physiotherapy in a developing country.”	Burns 37:354; author reply 354–355	Burn patients
2010	Zschaler S	Increased pain through psychological therapy? Combination of PCA morphine therapy with virtual reality by awake dressing change: paradoxical effects	Schmerz 24:629–630	Morphine vs. virtual reality
2010	Ramachandran VS, Seckel EL	Using mirror visual feedback and virtual reality to treat fibromyalgia	Medical Hypotheses 75: 495–496	Fibromyalgia
2010	Malloy KM, Milling LS	The effectiveness of virtual reality distraction for pain reduction: a systematic review	Clinical Psychology Review 30:1011–1018	Pain reduction
2010	Gaggioli A, Amoresano A, Gruppioni E, et al.	A myoelectric-controlled virtual hand for the assessment and treatment of phantom limb pain in trans-radial upper extremity amputees: a research protocol	Studies in Health Technology and Informatics 154: 220–222	Phantom limb
2010	Gutierrez-Maldonado J, Gutierrez-Martinez O, Loreto D, et al.	Presence, involvement and efficacy of a virtual reality intervention on pain	Studies in Health Technology and Informatics 154: 97–101	Pain control
2010	Patterson DR, Jensen MP, Wiechman SA, Sharar SR	Virtual reality hypnosis for pain associated with recovery from physical trauma	International Journal of Clinical and Experimental Hypnosis 58:288–300	Physical trauma
2010	Sato K, Fukumori S, Matsusaki T, et al.	Nonimmersive virtual reality mirror visual feedback therapy and its application for the treatment of complex regional pain syndrome: an open-label pilot study	Pain Medicine 11:622–629	Chronic pain
2010	Sarig-Bahat H, Weiss PL, Laufer Y	Neck pain assessment in a virtual environment	Spine (Phila Pa 1976) 35:E105–E112	Neck pain

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2010	Morris LD, Louw QA, Crous LC	Feasibility and potential effect of a low-cost virtual reality system on reducing pain and anxiety in adult burn injury patients during physiotherapy in a developing country	Burns 36:659–664	Burn patients
2010	Kwekkeboom KL, Cherwin CH, Lee JW, Wanta B	Mind-body treatments for the pain-fatigue-sleep disturbance symptom cluster in persons with cancer	Journal of Pain and Symptom Management 39:126–138	Cancer
2010	Dahlquist LM, Weiss KE, Law EF, et al.	Effects of videogame distraction and a virtual reality type head-mounted display helmet on cold pressor pain in young elementary school-aged children	Journal of Pediatric Psychology 35:617–625	Cold pressor pain
2010	Wiederhold MD, Wiederhold BK	Virtual reality and interactive simulation for pain distraction: an overview	CyberTherapy & Rehabilitation 3:14–19	Pain distraction
2010	Wood DP, Wiederhold BK, Spira J	Lessons learned from 350 virtual-reality sessions with warriors diagnosed with combat-related posttraumatic stress disorder	CyberPsychology, Behavior, and Social Networking 13:3–11	PTSD
2011	Lamont K, Chin M, Kogan M	Mirror box therapy: seeing is believing	Explore (NY) 7:369–372	Phantom limb
2011	Maani CV, Hoffman HG, Morrow M, et al.	Virtual reality pain control during burn wound debridement of combat-related burn injuries using robot-like arm mounted VR goggles	Journal of Trauma 71: S125–S130	Burn patients
2011	Li A, Montaña Z, Chen VJ, Gold JI	Virtual reality and pain management: current trends and future directions	Pain Management 1:147–157	Current trends
2011	Gutiérrez-Martínez O, Gutiérrez-Maldonado J, Loreto-Quijada D	Control over the virtual environment influences the presence and efficacy of a virtual reality intervention on pain	Studies in Health Technology and Informatics 167: 111–115	Cold pressor pain
2011	Gutierrez-Maldonado J, Gutierrez-Martinez O, Cabas-Hoyos K	Interactive and passive virtual reality distraction: effects on presence and pain intensity	Studies in Health Technology and Informatics 167:69–73	Cold pressor pain
2011	Alvarez AG, Dal Sasso GT	Virtual learning object for the simulated evaluation of acute pain in nursing students	Revista Latino-Americana de Enfermagem 19:229–237	Acute pain
2011	Hänsel A, Lenggenhager B, von Känel R, et al.	Seeing and identifying with a virtual body decreases pain perception	European Journal of Pain 15:874–879	Decrease pain perception
2011	Morris LD, Grimmer-Somers KA, Spottiswoode B, Louw QA	Virtual reality exposure therapy as treatment for pain catastrophizing in fibromyalgia patients: proof-of-concept study (study protocol)	BMC Musculoskeletal Disorders 12:85	Fibromyalgia
2011	Maani CV, Hoffman HG, Fowler M, et al.	Combining ketamine and virtual reality pain control during severe burn wound care: one military and one civilian patient	Pain Medicine 12:673–678	Burn patients
2011	Hoffman HG, Chambers GT, Meyer WJ 3rd, et al.	Virtual reality as an adjunctive non-pharmacologic analgesic for acute burn pain during medical procedures	Annals of Behavioral Medicine 41:183–191	Parkinson

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2011	Griffin HJ, Greenlaw R, Limousin P, et al.	The effect of real and virtual visual cues on walking in Parkinson's disease	Journal of Neurology 258:991–1000	Gluteal hidradenitis
2011	Danilov AB, Gak SV	[Virtual reality in treatment of pain syndromes]	Zhurnal Nevrologii I Psikhiatrii Imeni S.S. Korsakova 111:81–85	Pain syndromes
2011	Schmitt YS, Hoffman HG, Blough DK, et al.	A randomized, controlled trial of immersive virtual reality analgesia, during physical therapy for pediatric burns	Burns 37:61–68	Burn patients
2011	Law EF, Dahlquist LM, Sil S, et al.	Videogame distraction using virtual reality technology for children experiencing cold pressor pain: the role of cognitive processing	Journal of Pediatric Psychology 36:84–94	Cold pressor pain
2011	Bell KM, Bechara BP, Hartman RA, et al.	Influence of number of operated levels and postoperative time on active range of motion following anterior cervical decompression and fusion procedures	Spine (Phila Pa 1976) 36:263–268	Cervical motion
2011	Zeher MJ, Armiger RS, Burck JM, et al.	Using a virtual integration environment in treating phantom limb pain	Studies in Health Technology and Informatics 163: 730–736	Phantom limb
2011	Wood DP, Webb-Murphy J, McLay RN, et al.	Reality graded exposure therapy with physiological monitoring for the treatment of combat related post traumatic stress disorder: a pilot study	Studies in Health Technology and Informatics 163: 696–702	PTSD
2011	McLay RN, Wood DP, Webb-Murphy JA, et al.	A randomized, controlled trial of virtual reality-graded exposure therapy for post-traumatic stress disorder in active duty service members with combat-related post-traumatic stress disorder	CyberPsychology, Behavior, and Social Networking 14:223–229	PTSD
2012	Spyridonis F, Gronli TM, Hansen J, Ghinea G	Evaluating the usability of a virtual reality-based Android application in managing the pain experience of wheelchair users	Conference Proceedings of the IEEE Engineering in Medicine & Biology Society 2012:2460–2463	Wheelchair users
2012	Seifert AR	Absence of verbal recall or memory for symptom acquisition in fear and trauma exposure: a conceptual case for fear conditioning and learned nonuse in assessment and treatment	Journal of Rehabilitation Research & Development 49:1209–1220	Avoidance learning
2012	Asl Aminabadi N, Erfanparast L, Sohrabi A, et al.	The impact of virtual reality distraction on pain and anxiety during dental treatment in 4–6 year-old children: a randomized controlled clinical trial	Journal of Dental Research, Dental Clinics, Dental Prospects 6:117–124	Dental treatments
2012	Brown NJ, Rodger S, Ware RS, et al.	Efficacy of a children's procedural preparation and distraction device on healing in acute burn wound care procedures: study protocol for a randomized controlled trial	Trials 13:238	Burn patients
2012	Chang CM, Chang YC, Chang HY, Chou LW	An interactive game-based shoulder wheel system for rehabilitation	Journal of Patient Preference and Adherence 6:821–828	Rehabilitation

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2012	Llobera J, González-Franco M, Perez-Marcos D, et al.	Virtual reality for assessment of patients suffering chronic pain: a case study	Experimental Brain Research 225:105–117	Chronic pain
2012	Sil S, Dahlquist LM, Thompson C, et al.	The effects of coping style on virtual reality enhanced videogame distraction in children undergoing cold pressor pain	J Behav Med [Epub ahead of print]	Cold pressor pain
2012	Michiels S, De Hertogh W, Truijjen S, et al.	The assessment of cervical sensory motor control: a systematic review focusing on measuring methods and their clinimetric characteristics	Gait & Posture 38:1–7	Neck pain
2012	Gutiérrez-Maldonado J, Gutiérrez-Martínez O, Loreto-Quijada D, Nieto-Luna R	The use of virtual reality for coping with pain with healthy participants	Psicothema 24:516–522	Cold pressor pain
2012	Won AS, Collins TA	Non-immersive, virtual reality mirror visual feedback for treatment of persistent idiopathic facial pain	Pain Medicine 13:1257–1258	Facial pain
2012	Keefe FJ, Huling DA, Coggins MJ, et al.	Virtual reality for persistent pain: a new direction for behavioral pain management	Pain 153:2163–2166	Persistent pain
2012	Teeley AM, Soltani M, Wiechman SA, et al.	Virtual reality hypnosis pain control in the treatment of multiple fractures: a case series	American Journal of Clinical Hypnosis 54:184–194	Multiple fractures
2012	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 38:650–657	Burn patients
2012	Flor H	New developments in the understanding and management of persistent pain	Current Opinion in Psychiatry 25:109–113	Persistent pain
2012	Louw Q, Grimmer-Somers K, Schrikk A	Measuring children's distress during burns dressing changes: literature search for measures appropriate for indigenous children in South Africa	Journal of Pain Research 4:263–277	Burn patients
2012	Kho ME, Damluji A, Zanni JM, Needham DM	Feasibility and observed safety of interactive video games for physical rehabilitation in the intensive care unit: a case series	Journal of Critical Care 27:219.e1–e6	Rehabilitation
2012	Humphries C	The mystery behind anesthesia: technology review published by MIT	The Wall Street Journal, pp. D1, D2	Chronic pain
2012	Wiederhold BK, Wiederhold M	Managing pain in military populations with virtual reality	NATO Science for Peace and Security Series—E: Human and Societal Dynamics	Military population
2012	Alphonso AL, Monson BT, Zeher MJ, et al.	Use of a virtual integrated environment in prosthetic limb development and phantom limb pain	Studies in Health Technology and Informatics 181: 305–309	Phantom limb
2012	Stetz MC, Brown KS, Folen RA, et al.	Comparing distraction/relaxation modalities with chronic pain patients	NATO Science for Peace and Security Series—E: Human and Societal Dynamics	Chronic pain

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<i>Year</i>	<i>Author</i>	<i>Title</i>	<i>Publication</i>	<i>Topic</i>
2013	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	Journal of Burn Care & Research 34:563–568	Burn patients
2013	Cacau Lde A, Oliveira GU, Maynard LG, et al.	The use of the virtual reality as intervention tool in the postoperative of cardiac surgery	The Revista Brasileira de Cirurgia Cardiovascular 28:281–289	Rehabilitation
2013	Martini M, Perez-Marcos D, Sanchez-Vives MV	What color is my arm? Changes in skin color of an embodied virtual arm modulates pain threshold	Frontiers in Human Neuroscience 7:438	Pain perception
2013	Giggins OM, Persson UM, Caulfield B	Biofeedback in rehabilitation	Journal of NeuroEngineering and Rehabilitation 10:60	Rehabilitation
2013	Villiger M, Bohli D, Kiper D, et al.	Virtual reality-augmented neurorehabilitation improves motor function and reduces neuropathic pain in patients with incomplete spinal cord injury	Neurorehabilitation & Neural Repair 27:675–683	Neurorehabilitation
2013	Shiri S, Feintuch U, Weiss N, et al.	A virtual reality system combined with biofeedback for treating pediatric chronic headache—a pilot study	Pain Medicine 14:621–627	Pediatric headache
2013	Diers M, Flor H	[Phantom limb pain. Psychological treatment strategies]	Schmerz 27:205–211; quiz 212–213	Phantom limb
2013	Loreto-Quijada D, Gutiérrez-Maldonado J, Gutiérrez-Martínez O, Nieto R	Testing a virtual reality intervention for pain control	European Journal of Pain 17:1403–1410	Pain control
2013	Botella C, Garcia-Palacios A, Vizcaíno Y, et al.	Virtual reality in the treatment of fibromyalgia: a pilot study	CyberPsychology, Behavior, and Social Networking 16:215–223	Fibromyalgia
2013	Crews RT, Yalla SV, Fleischer AE, Wu SC	A growing troubling triad: diabetes, aging, and falls	Journal of Aging Research 2013:342650	Diabetes, falls
2013	de Tommaso M, Ricci K, Laneve L, et al.	Virtual visual effect of hospital waiting room on pain modulation in healthy subjects and patients with chronic migraine	Pain Research and Treatment 2013:515730	Chronic migraine
2013	Bouchard S, Bernier F, Boivin É, et al.	Empathy toward virtual humans depicting a known or unknown person expressing pain	CyberPsychology, Behavior, and Social Networking 16:61–71	Empathy
2013	Baas JM	Individual differences in predicting aversive events and modulating contextual anxiety in a context and cue conditioning paradigm	Biological Psychology 92: 17–25	Anxiety

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