Psychosocial interventions targeting recovery in child and adolescent burns: A systematic review

Journal of Pediatric Psychology, 45(1), 2020, 15–33
doi: 10.1093/jpepsy/jsz087
Advance Access Publication Date: 7 November 2019
Systematic Review

Psychosocial Interventions Targeting Recovery in Child and Adolescent Burns: A Systematic Review

Nancy Hornsby [1], MA (Neuropsychology), Lisa Blom[2] PhD, and Mathilde Sengoelge,[2] PhD

[1]Violence, Injury and Peace Research Unit, South African Medical Research Council-UNISA and [2]Department of Public Health Sciences, Karolinska Institutet, Global Health

All correspondence concerning this article should be addressed to Nancy Hornsby, MA (Neuropsychology), Violence, Injury and Peace Research Unit, SAMRC-UNISA, Francie Van Zijl Drive, Tygerberg 7505, South Africa. E-mail: Nancy.Hornsby@mrc.ac.za

Received May 16, 2019; revisions received September 19, 2019; accepted October 2, 2019

Abstract

Children post-burn injury experience a range of psychosocial sequelae that benefit from early provision of psychosocial support. However, no systematic review exists evaluating the full range of psychological interventions. **Objective** To critically evaluate psychosocial interventions for children (<18 years old) with burn injuries in improving psychosocial recovery. **Study design** All-language studies were identified from inception to March 2018 in six electronic databases and appraised according to PRISMA checklist and Cochrane Risk of Bias Tool for quality. Studies were stratified into three groups: distraction (virtual reality, child life therapy, imagery-based therapy, hypnosis), burn camps, and other (social skills, cognitive behavioral therapy, parent group counseling). **Results** Out of a total of 5,456 articles identified, 297 underwent full review resulting in 27 included articles published between 1986 and 2018. Sample sizes ranged from 9 to 266, comprising child and adult participants. A range of interventions and psychosocial outcome measures were found. Several studies ($n = 21$) reported statistically significant improvements in outcome; the majority were distraction interventions to reduce pain and anxiety. A limited number of studies showing effect was found for cognitive behavioral therapy and parent counseling. Risk of bias was high in studies of burn camps and mixed for all other interventions. **Conclusions** A range of psychosocial interventions and outcome tools exist in pediatric burns. Distraction interventions prior to and/or during dressing changes or physical therapy were shown to effectively reduce pain and anxiety for a wide range of pediatric ages.

Key words: burns; children; intervention outcome; psychosocial functioning; social and behavioral skills; systematic review.

Introduction

Pediatric burns are devastating injuries and progress has been made worldwide for their prevention due to a range of primary prevention measures, such as smoke alarms and thermostatic mixing valves (Mock, Peck, Peden, & Krug, 2008; Smolle et al., 2017). As a result of scientific advances in management of acute burns (e.g., grafting) and the multidisciplinary care offered by specialized pediatric burn centers, the survival rate of children with severe burns has increased considerably (Hyland & Holland, 2015). The psychological consequences of burns are wide-ranging (Bakker, Maertens, Van Son, & Van Loey, 2013) and it is well-documented in the burn literature how outcomes vary across the recovery phase (Liber, Faber,

Treffers, & Van Loey, 2008). For example, the treatment needs during the acute stage focuses on physiological recovery which is accompanied by management of pain, anxiety, distress, and depressive symptoms while the long-term rehabilitative phase is characterized by social reintegration challenges (e.g., family stressors, going back to school) and issues with self-esteem and body image (Wiechman & Patterson, 2004). Depression and anxiety are typically problems the child may struggle with even in the rehabilitative phase. The psychosocial difficulties the child and parents experience will therefore be influenced by the period during which the assessment is made.

Children remain a high-risk group for experiencing adverse psychological outcomes following a burn, particularly young ones, due to multiple factors related to their stage of development, rapid rate of physiological development, limited emotion regulation and communication skills, and the importance of a protective attachment relationship early in life (De Young, Haag, Kenardy, Kimble, & Landolt, 2016). Yet there are no models of psychosocial recovery currently available specific to a burn injury, although several theories in recovery and adjustment to a visible difference may apply to scarring from a burn (Armstrong-James, 2017). All professionals working with children have a responsibility to assess the physical and psychosocial needs of burn injured children and to provide evidence-based intervention to ensure the best possible recovery after such a traumatic, life changing experience. Burn victims and their families face not only physical challenges post-injury, but also psychosocial difficulties that often have devastating consequences for quality of life (QOL) if not treated in an effective and timely manner (Esselman, 2007). For intervention strategies to be holistic, recovery targets must therefore focus on both the physiological and psychosocial aspects of rehabilitation (Esselman, 2007; Wiechman & Patterson, 2004).

Pain and anxiety management is a main priority in the immediate care phase to assist in the recovery process, physically, and psychologically (Mock et al., 2008). The experience of pain, and especially poor pain management, have been linked to psychological sequelae such as depression, anxiety, helplessness and withdrawal, factors which all impact on physical and emotional recovery (Ghandi, Thomson, Lord, & Enoch, 2010; Gorczyca, Filip, & Walczak, 2013). In addition, other aspects arise including posttraumatic stress symptoms (PTSS) or disorder (PTSD), social stigmatization (Goodhew et al., 2014), bullying and teasing (Rimmer et al., 2007a), and problems coping with reintegration (De Sousa, 2010; De Young, Kenardy, Cobham, & Kimble, 2012; Landolt, Buehlmann, Maag, & Schiestl, 2007; Pan et al., 2018). Reduced social competence (Szabo, Ferris, Urso, Aballay, & Duncan, 2017) and personality disorders in severe burns (Thomas et al., 2012) have also been examined.

It is estimated that one-fourth to one-third of children suffer acute and posttraumatic stress within the first months after a burn (Bakker et al., 2013) and 36–65% experience psychosocial problems including anxiety, depression, issues with self-esteem, among others (van Baar et al., 2011). Significant deficits in multiple functional domains (such as gross motor skills, language, and play) were found in children 5 years from the burn injury compared with age-matched peers without a burn (Kazis et al., 2016), indicating the essential need for adequate and timely psychosocial interventions for children and adolescents. Equally important is the need to assist parents in the recovery process, as parental distress has been shown to range from 17% to 45% within the first 6 months of a child's injury (Bakker et al., 2013; De Young, Hendrikz, Kenardy, Cobham, & Kimble, 2014; Parrish et al., 2019). This is especially so for younger children who are highly dependent on their parents due to their limited range of skills to communicate or cope with the pain and strong emotions associated with a burn injury, particularly during burn dressing changes (Egberts, de Jong, Hofland, Geenen, & Van Loey, 2018). Parents' mental health and well-being is closely linked to the child's age and distress levels (Odar et al., 2013) and thus contribute to the development and maintenance of recovery in their injured child and to the family as a whole (De Young et al., 2014; Landolt, Ystrom, Sennhauser, Gnehm, & Vollrath, 2012; Phillips & Rumsey, 2008). Moreover, effective pain management is a critical component of psychosocial interventions and is central to the facilitation of recovery and positive psychosocial outcomes (including mood, relationships with others, reintegration) after burn trauma (Fagin & Palmieri, 2017; Ghandi et al., 2010).

Over time, the focus in pediatric burn care has changed from survival and functional restoration to include the provision of psychosocial care, defined as providing culturally sensitive psychological, social, and spiritual care during patient recovery and reintegration (De Young et al. 2012; Dodd, Fletchall, Starnes, & Jacobson, 2017). Interventions are tailored to the acute, rehabilitation, and reintegration phases (Arceneaux & Meyer, 2009) and include psychotherapeutic approaches, distraction therapy with or without virtual reality (VR), school reintegration (Dodd et al., 2017), and burn camps (Rimmer et al., 2012). A number of studies support positive outcomes associated with a specific psychosocial intervention for burn injured children (Blakeney et al., 2005; Brown, Kimble, Rodger, Ware, & Cuttle, 2014; Tarnowski, Rasnake, & Drabman, 1987), but no systematic review has

been completed evaluating the full range of psychological interventions available, for example, pain management options only for all ages (Luo, Cao, Zhong, Chen, & Cen, 2019; Scapin et al., 2018) or burn camps only (Kornhaber et al., 2019; Gaskell et al., 2010; Maslow & Lobato, 2010). The objective of this review was to identify and critically evaluate the types of psychosocial interventions, outcome measures utilized, and quality of comparative studies directed at supporting the psychosocial recovery of pediatric burn survivors. Filling this knowledge gap is important for child survivors, their families, and pediatric resource providers.

Methods

The review was conducted and reported following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement and checklist (Liberati et al., 2009). An all-language search was conducted of published literature across six databases [Medline (Ovid), PsycInfo (Ovid), Embase (Elsevier), CINAHL (Ebsco), Web of Science (Thomson Reuters) and Cochrane (Wiley)] not limited in time, language, or study design. The literature search was conducted by the Karolinska Institutet Library and the Information Services Division of the South African Medical Research Council (SAMRC) assisted with obtaining articles. The search strategy consisted of a range of Medical Subject Headings (Supplementary File 1). Supplementary "snowballing" techniques were used to augment search sensitivity by searching the references of all full-text articles, and correspondence with authors of included studies when necessary for obtaining full texts not sourced online.

The review included all interventions with a psychological or psychosocial focus for pediatric burn survivors 18 or younger or their parents/caregivers. Inclusion criteria were the following: (a) children up to 18 years of age or parents of children who suffered a burn injury; (b) all burn types and severities; (c) psychosocial intervention in the form of cognitive based therapy, art therapy, social work contact, counseling, psychologist or psychiatrist support, support groups, school adjustment; (d) use of a psychological/psychosocial related test or outcome tool for depression, anxiety, PTSD, PTSS, acute stress disorder (ASD), externalizing behavior, body and self-esteem, social functioning, hospital anxiety scale, QOL in child survivors or parent of child; (e) family, parent or child therapies or interventions; (f) any language publication; (g) comparative or experimental studies, single group studies with a pre- and post-assessment over time without a control group. Exclusion criteria included: (a) child survivors above 18 years of age only; (b) medical assessment and treatment without a psychosocial component; (c) case studies, reviews, theses, letters to editors, editorials, commentaries, and conference abstracts.

Studies of all languages were identified from inception to March 2018 and were assessed for inclusion, reviewed, and critically appraised independently by two reviewers and disagreements were resolved through discussion. Forty-six from 292 of the studies were analyzed by a third reviewer for arbitration regarding inclusion. Two of the 46 articles reviewed were in a foreign language not practiced by the authors, and these were reviewed by a native speaker who received the inclusion and exclusion criteria and discussed the articles with the authors. Data were extracted under the following headings: author, country, participants, setting, intervention and dosage, study design/number of controls, child outcome measures and results. For studies which included a control or comparison group, effect sizes, and p-values were reported. Effect size estimates were calculated for studies for which these were not reported. The standard convention for interpreting Cohen's d and eta-squared ($\eta 2$) were used: $d = 0.2$ (small), $d = 0.5$ (medium), $d = 0.8$ (large); $\eta^2 = 0.01$ (small), $\eta^2 = 0.06$ (medium), $\eta^2 \geq 0.14$ (large) (Lakens, 2013). Pilot extraction was performed on the first five studies with full agreement between the two reviewers on the data extracted. They then proceeded to extract the data from the remaining studies.

Included studies were assessed using the Cochrane Risk of Bias Tool (Higgins et al., 2011) at study level by the same two independent reviewers in an unblinded manner. The Cochrane Risk of Bias Tool evaluates studies across five domains: selection, performance, attrition, reporting, and other bias. Each domain is rated as either "low," "high," or "unclear," Studies with randomized controlled designs were evaluated across all five domains. Comparative studies with no randomization were assessed across three domains only (attrition bias, reporting bias, and other bias). Assessment of risk of bias associated with randomization, blinding of assessors and participants, and blinding to the outcome were not assessed in the non-randomized studies. Risk of bias figures were generated using Review Manager 5.3 (Review Manager (RevMan) [Computer program] Version 5.3, 2014). Due to the variation in study design, intervention approaches, definition of psychosocial recovery and outcome measures employed by the different studies, a meta-analysis of data was not possible (Liberati et al., 2009). The content of the systematic review including reporting of the title, abstract, methods, results, discussion, and funding is presented in the PRISMA checklist (Supplementary File 2). Lastly, preparation and reporting of this review article was guided by the Checklist for Preparing and Evaluating Review

Articles (https://academic.oup.com/DocumentLibrary/jpepsy/Checklist_for_Preparing_and_Evaluating_Review_Articles.pdf) (see Supplementary File 3).

Results

Search Findings and Study Characteristics

Out of a total of 5,456 articles identified, 297 underwent full-text review resulting in 27 included articles meeting the inclusion criteria. The studies ranged from 1986 to 2018 (see Table I; Figure 1) and comprised children and adult participants. All but two studies in Iran (Kaheni, Rezai, Bagheri-Nesami, & Goudarzian, 2016) and Nicaragua (Tropez-Arceneaux, Castillo Alaniz, & Icaza, 2017) were conducted in high-income countries as defined by the World Bank (2019) classification of economies based on gross national income per capita: Australia, Canada, the Netherlands, Sweden, Switzerland, United Kingdom, and the United States. The sample size was generally small across the studies with the total number of participants ranging from 9 to 266 with 18.5% including 100 or more participants. The majority (16 studies) took place in the acute phase post-burn in the inpatient or outpatient setting. Sixteen used a randomized design, five used a non-randomized controlled design and six were pre- and post-test. Fifteen different psychosocial outcomes were assessed, and all used one of 44 standardized measures to assess the outcomes (see Table I). None of those standardized measures were burn-specific. The majority measured stress and anxiety, including ASD and PTSD followed by other measures (e.g., self-esteem, confidence, social relationships, depression, behavioral, and social problems). Interventions were delivered by a variety of trained psychologists, burn medical staff, child life therapists, physiotherapists, and child psychiatrists. Post-assessment of interventions ranged from immediately after the treatment to 1-year follow-up.

The 27 studies were grouped into three categories for further analysis based on type of intervention: (a) distraction interventions during dressing changes ($n = 16$ studies) through the use of VR ($n = 11$), pre-dressing teaching and distraction provided by a child life therapist ($n = 3$) and imagery-based treatment ($n = 1$) and hypnosis ($n = 1$); (b) residential burn camps ($n = 7$); and (c) other interventions ($n = 4$ studies) consisting of cognitive behavioral therapy ($n = 2$) and parent group counseling ($n = 2$).

Distraction Interventions

Sixteen interventions targeted pain and anxiety management prior to or during dressing changes or physical therapy, age range 2 months to 18 years. Eleven studies used a form of VR distraction, that is, augmented, multimodal, or computer game during dressing changes or physical therapy and demonstrated significantly positive effects on child pain and anxiety compared to standard care, as reported by the children themselves, their parents or the nurses. VR refers to creating a virtual world, typically using 3D animation in a video game as utilized in the study by Burns-Nader, Joe, and Pinion (2017), Kaheni et al. (2016), and Khadra et al. (2018), or for which a headset may be required in the studies by Das, Grimmer, Sparnon, McRae, and Thomas (2005), Jeffs et al. (2014), and Kipping, Rodger, Miller, and Kimble (2012). The Burns-Nader et al. (2017) video game was found to significantly reduce procedural pain and emotional responses with effect sizes ranging from small to large ($d = 0.39$–0.84) for pain outcomes and small to very large ($d = 0.46$–1.43) for emotional responses during wound care procedures. The video game in the Kaheni et al. (2016) study was found to significantly reduce pain during burn wound dressing procedures with a very large intervention effect ($d = 3.75$) found for pain outcome. The video game in the Khadra et al. (2018) study was not associated with a reduction in pain and anxiety. The VR interventions with headsets in the studies by Das et al (2005) and Jeffs et al. (2014) both resulted in significant reductions in pain with a very large effect associated with the Das et al. (2005) study ($d = 1.16$) and an intervention effect ranging from medium to very large ($d = 0.54$–1.25) for perceptions of pain in the Jeffs et al. (2014) study.

Immersive VR tested by Schmitt et al. (2011) and Sharar et al. (2007) allowed the child to navigate a virtual environment and interact in it. The VR intervention in the Schmitt et al. (2011) study was associated with a marked reduction in pain with a clinically significant intervention effect for cognitive pain (44%), affective pain (32%), and sensory pain (27%). Sharar et al. (2007) reported diminished procedural pain with reduced levels of pain intensity, pain unpleasantness and time thinking about pain in the intervention group compared to the control group. Intervention effects were very large for pain intensity ($d = 3.30$), pain unpleasantness ($d = 3.17$), and time thinking about pain ($d = 5.32$). Augmented reality used by Mott et al. (2008) differed from the VR interventions in that it used overlays of virtual images onto the child's existing, physical environment rather than creating a complete virtual world. Procedural pain was significantly reduced in the intervention group for child pain assessment and parent pain assessment with a very large intervention effect on pain outcomes ($d = 3.54$) (Mott et al., 2008).

The multimodal distraction (MMD) utilized in three additional studies (Brown et al. 2014; Miller, Rodger, Bucolo, Greer, and Kimble, 2010; Miller, Rodger, Kipping, and Kimble, 2011) differed from the other VR devices in that it did not require a

Table I. *Characteristics of Included Studies in the Systematic Review Stratified by Intervention Type*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Distraction techniques (acute interventions)							
Brown et al. (2014), Australia	$N = 117$ Ages 4–12 years	In-patient hospital	Multi-modal distraction (MMD) therapy before wound care, during first dressing change and repeated at every dressing change. Acute intervention delivered to children only	RCT, control $n = 40$	CTSQ; FLACC; FPS-R; VAS-A; Pre- and post-procedural	Sign. reduction in pain and anxiety ($p = .051$) compared to control standard distraction	FPS-R pain scale: Cohen's $d = 0.39$; VAS pain scale: Cohen's $d = 0.58$
Burns-Nader et al. (2017), USA	$N = 30$ Ages 4–12 years	In-patient hospital	Distraction through a tablet provided by a child life specialist during hydrotherapy. Intervention delivered to children only	RCT, control $n = 15$	FPS; CEMS; nurse's reports throughout procedure	Sign. reduction in observed pain ($p = .48$), emotional response during ($p = .0001$) and after procedure ($p < .005$) compared to control	Effect size not reported. Cohen's d calculated: FPS pain scale = 0.39; Nurses' reports of pain: = 0.84; CEMS emotional response: 0.46 pre-procedure, 1.43 during procedure, 1.24 post-procedure
Chester et al. (2018), Australia	$N = 62$ Ages 4–16 years	In-patient hospital	Distraction through hypnosis delivered during burn wound care by a hypnotherapist until ≥95% burn wound re-epithelization. Intervention delivered to children only	Prospective RCT, control standard care (SC) $n = 27$	FPS-R; FLACC; P-NRS; VAS-A; CPSS; YCPC; Parent Satisfaction; SHCS-C, salivary cortisol; stress biomarkers	Self-reported pain not sign. different; sign. decreased anxiety at 2nd dressing change ($p = .03$); parent-reported pre-dressing pain at 3rd dressing change sign. lower ($p = .01$); no sign. difference in stress biomarkers	Effect size not reported. Cohen's d calculated: anxiety (2nd dressing change) = 0.8); parent-reported pain (3rd dressing change) = 0.91
Das et al. (2005), Australia	$N = 9$ Ages 5–16 years	In-patient hospital	Single-session virtual reality distraction therapy during burn wound care. Intervention delivered to children only	RCT, within-subjects control $n = 9$	FPS; Post-procedural	Sign. reduction in pain ($p < .01$) compared to control	Effect size not reported. Cohen's d calculated. FPS pain scale = 1.16

(continued)

Table I. *(continued)*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Foertsch et al. (1998), USA	$N = 23$ Ages 3–12 years	In-patient hospital	Single-session familiar imagery-based therapy distraction during wound care. Intervention delivered to children only	Comparative study, control $n = 10$	FPS; OSBD; VAS; Pre- and post-procedural	No change in pain and distress during wound care compared to standard care. Self-report FPS and VAS scales excluded from analysis	Effect size not reported. Cohen's *d* calculated: OSBD behavioral distress scale = 0.009
Hyland et al. (2015), Australia	$N = 100$ Ages < 16 years	In-patient hospital	Child life therapy as distraction before and during wound care. Intervention involved both children and parents	RCT, control $n = 50$	Primary outcomes: CHEOPS; Children's Fear Scale; FACES. Secondary outcome: VAS pre- and post-procedural	Sign. pain reduction compared to standard care ($p = .03$)	Effect size not reported. Cohen's d calculated for primary outcomes: CHEOPS pain and anxiety scale = 1.19
Jeffs et al. (2014), USA	$N = 28$ Ages 10–17 years	Out-patient	Single-session VR distraction therapy during burn wound care. Intervention delivered to children only	RCT, control $n = 10$ passive distraction (PD), $n = 10$ standard care (SC)	APPT-WGRS; STAI; Pre- and post-procedural	Sign. reduction in pain perception pre- and post-procedural with VR ($p = .029$) compared to control PD or SC	Estimated effect size between VR and SC=0.54, SC and PD=0.79, VR and PD=1.25
Kaheni et al. (2016), Iran	$N = 80$ Ages 3–6 years	In-patient hospital	Video game distraction played during the burn wound dressing change procedure; number of sessions not specified. Intervention delivered to children only	RCT, control $n = 40$	FLACC; Pre- and post-procedural	Sign. pain reduction with video game distraction ($p = .001$) compared to control standard distraction	Pain scale Cohen's $d = 3.75$
Khadra et al. (2018), Canada	$N = 15$ Ages 2 months to 10 years	In-patient hospital	Video game distraction in a VR dome environment played during hydrotherapy session; one session per participant. Intervention delivered to children only	Single-arm pilot study	FLACC (pre-, during, and post-procedural); MSS (pre-procedural); PBCL (pre-, during, and post-procedural); OCCEB-BECCO (during 3rd procedure)	No sign. reduction in pain or anxiety	Effect size not reported. Cohen's *d* calculated: FLACC pain and anxiety scale = 0.06; PBCL anxiety scale = 0.46

(continued)

Table I. *(continued)*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Kipping et al. (2012), Australia	$N = 41$ Ages 11–17 years	In-patient hospital	Single-session virtual reality distraction therapy before wound care and for first conscious dressing change only. Intervention delivered to children only	RCT, control $n = 21$ standard distraction (SD)	FLACC; VAS; pre- and post-procedural	Sign. decrease in pain scores reported by nurses in VR group ($p = .02$) compared to control SD	Cohen's $d = 0.28$
Miller et al. (2010), Australia	$N = 80$ Ages 3–10 years	Out-patient	Multi-modal distraction (MMD) therapy during wound care for the first 3 dressing changes. Intervention delivered to children only	RCT, control $n = 20$ video game (VG), $n = 20$ standard care (SC)	FLACC; FPS; VAS; pre- and post-procedural	Sign. reduction in child ($p < .001$), parents' ($p < .001$) and nurse reported pain ($p < .01$) in MMD compared to control VG or SC	MMD versus SC: pain removal of dressing $\eta^2 = 24.5\%$; η^2 (application dressing) = 38.3%; MMD versus VG: η^2 (removal) = 28.3%; η^2 (application) = 41.0%
Miller et al. (2011), Australia	$N = 40$ Ages 3–10 years	Out-patient	Multimodal distraction (MMD) therapy 30 min before and during wound care. Intervention delivered to children only	RCT, control $n = 20$	FLACC; FPS; VAS; pre- and post-procedural	Sign. reduction in length of treatment, days to healing, number of pain adverse effects pre-procedural ($p < .01$); procedural ($p < .001$)	Effect size not reported. Cohen's d calculated: FLACC pain and anxiety scale = 1.16; FPS = 1.44; VAS pain scale = 1.38
Moore et al. (2015), USA	$N = 21$ Ages 3–6 years	Out-patient	Directed medical play by a child life therapist during wound care for 3 days. Intervention involved both children and parents	Quasi-experimental pilot study, control $n = 9$	FLACC; FPS; STAI; once during wound care procedure	No statistically sign. difference in distress	Effect size not reported. Cohen's d calculated: FLACC pain and anxiety scale = 0.23 (during procedure); FPS pain scale = 1.82 (during procedure), 0.15 (after procedure)
Mott et al. (2008), Australia	$N = 42$ Ages 3.5–14 years	Out-patient	Augmented Reality (AR) distraction therapy before and during wound care. Intervention delivered to children only	RCT, control $n = 20$	FLACC; FPS-R; VAS; pre- and post-procedural	Sign. reduction in child pain ($p = .006$) and parents' pain assessments ($p = .015$) compared to control	Patient pain scores: Cohen's $d = 3.54$
Schmitt et al. (2011), USA	$N = 54$ Ages 6–19 years Avg. age 12 years	In-patient hospital	Virtual reality distraction therapy during physical therapy sessions, with each session lasting between 6 and 20 min over a 1- to 5-day period. Intervention delivered to children only	Randomized control within-subjects cross-over design	GRS; Post-procedural	Sign. pain alleviation ($p < .05$) for intervention group compared to control, sustained over time	Clinical sign. effect size reported with 44% reduction in cognitive pain; 32% reduction in affective pain; 27% reduction in sensory pain

(continued)

Table I. *(continued)*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Sharar et al. (2007), USA	$N = 88$ Ages 6–65 years; 75% 6–18 years	In-patient hospital	Virtual reality distraction therapy during physical therapy sessions for at least one session lasting 3–15 min. Intervention delivered to children only	Prospective randomized control within-subjects design, control $n = 146$	GRS; post-procedural	Sign. higher pain intensity ($p = .003$), pain unpleasantness ($p = .01$) and time thinking about pain ($p < .001$) for standard care group versus intervention group	Cohen's d reported for all outcomes: Worst pain intensity = 3.30; Pain unpleasantness = 3.17; Time spent thinking about pain =5.32; Fun = 17.82
Burn camps (long-term interventions)							
Armstrong-James et al. (2018), UK	$N = 23$ Ages 10–17 years	Burn camp	1-week social, behavioral well-being activities. Intervention delivered to children only	Single-arm, pre- and post-test design; no control	PSQ, SCQ, SWAP, SDQ parent; baseline, last day of camp, 1-month post	Sign. decrease in perceived stigmatization scores at follow-up compared to baseline ($p = .02$); sign. improvement in satisfaction with appearance at 3-month follow-up compared to baseline ($p = .03$)	Rank-biserial correlation (r) reported: Perceived stigmatization ($r = -0.64$); Satisfaction with Appearance ($r = -0.65$)
Arnoldo et al. (2006), USA	$N = 45$ Ages 6–18 years	Burn camp	1-week social, behavioral well-being activities. Intervention delivered to children only	Single-arm, pre- and post-test design; no control	RSES; baseline, post-camp after arrival home	No change in self-esteem; values from analysis not reported	Effect size not reported. No statistical results reported; effect size estimate not calculated
Bakker et al. (2011), the Netherlands	$N = 173$, Avg. age 12.3 years	Burn camp	5- to 6-day social, behavioral well-being activities. Intervention delivered to children only	Comparative study, control (non-campers) $n = 90$	RSES, SWAP; Baseline, 1-week and 16-week post-camp	Sign. decrease in dissatisfaction with appearance compared to controls ($p = .02$).	Effect size not reported. Cohen's d calculated: SWAP dissatisfaction with appearance subscale = 0.006.
Biggs et al. (1997), UK	$N = 43$ Ages 8–18 years	Burn camp	1-week social, behavioral well-being activities. Intervention delivered to children only	Single-arm, pre- and post-test design; no control	RSES; Baseline, post-camp before departure	No change in self-esteem; values from analysis not reported	Effect size not reported. No statistical results reported; effect size estimate not calculated

(continued)

Table I. *(continued)*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Gaskell (2007), UK	$N = 97$ Ages 7–19 years	Burn camp	1-week social, behavioral well-being activities. and play therapists. Intervention delivered to children only	Single-arm, pre- and post-test design; no control	SCPQ; SDQ; SWQ; SPPC; baseline, 1–2 months post	No change in self-esteem, social relationships, and general emotional and behavioral well-being in quantitative measures	Effect size not reported. Cohen's *d* calculated: SCPQ-Parent social competence scale = 0.05; SCPQ-Child social competence scale = 0.002; SWQ-Parent anxiety scale = 0.24; SWQ-Child anxiety scale = 0.26; SDQ difficulties scale = 0.08; SPPC self-esteem scale = 0.05.
Rimmer et al. (2007b), USA	Year 1: $N = 80$ Avg. age 12 years Year 2: N =89 Avg. age 12 years	Burn camp	1-week social, behavioral well-being activities. Intervention delivered to children only	Comparative study, control (non-burn campers) $n = 83$	RSES; CAS Baseline, post-camp before departure (RSES); post-camp before departure (CAS)	Sign. increase in self-esteem for burn campers' year 1 ($p = .008$), non-sign. increase year 2 ($p = .19$); sign. increase for matched group over 4 periods ($p = .05$) versus no increase for comparison group ($p = .98$)	Cohen's *d*: Year 1 self-esteem=0.27; Year 2 self-esteem=0.11; Partial eta squared for trend in self-esteem for all four time periods for matched group=0.042
Tropez-Arceneaux et al. (2017), Nicaragua	$N = 33$ Ages 12–25 years	Burn camp	1-week social, behavioral well-being activities. Intervention delivered to children only	Single-arm pre- and post-test design; no control	BAS; BDI; CDI child/parent; RSES; baseline, 2 weeks, 6 months post	Sign. increase in self-esteem levels ($p = .001$), non-significant reductions in depression and anxiety symptoms ($p = .10$) at six months' post-camp	Effect size not reported. Cohen's *d* calculated: RSES self-esteem scale = 1.20; BDI depression scale = 0.68; BAS anxiety scale = 0.65.
Other (long-term interventions)							
Blakeney et al. (2005), USA	$N = 103$ Ages 12–17 years	Out-patient	Social skills training through cognitive behavioral therapy in a small group, residential format over a 4-day period. Intervention delivered to children only	Prospective randomized experiment, control $n = 32$	CBCL; YSR; baseline, 1-year post	Sign. improvement in social skills 1-year post training ($p < .03$) and fewer total behavioral problems ($p < .001$) compared to controls	Cohen's d: Internalizing =0.29; Externalizing=0.20; Withdrawn=0.39; Anxious/depressed=0.18; Social problems=0.40; Thought problems=0.19; Aggression=0.24. Total behavioral problems=0.25

(continued)

Table I. *(continued)*

Author, country	Participants	Setting	Intervention	Study design	Child outcome measures/timing	Results	Effect size estimate
Kramer & Landolt (2014), Switzerland	$N = 51$ Ages 2–16 years	In-patient hospital	Two-session, cognitive behavioral therapy and coping skills. Intervention delivered to children only	RCT, control $n = 54$	ASC-KIDS; CAPS-CA; CBCL; CDI; PTSDSSI	No effect in preschool children; sign. reduction in internalizing problems for school-aged children ($p = .00$) at 3-month follow-up and compared to controls	3-month follow-up negative effect for intrusion symptom severity ([a]SMD = −0.50), reduction in internalizing problems (SMD = −1.11); 6-month follow-up effect not sign. for internalizing (SMD = −0.53)
Rivlin et al. (1986), UK	$N = 266$ Ages not specified	Hospital burn center	Fifty weekly group counseling sessions with parents/caregivers of burn-injured children; session approximately 1 hr. Intervention delivered to parents only	Single-arm, pre- and post-test design; no control	5-point visual analog rating scale	Sign. improvement in present anxiety ($p < .001$), anxiety about worries ($p < .001$)	Effect size not reported. Cohen's *d* calculated: present anxiety = 1.33; anxiety about worries = 1.42
Sveen et al. (2017), Sweden	$N = 62$ Avg. age 36.4	Hospital burn center	Six-week internet-based information and self-help program for parents of children and adolescents with burn injuries. Intervention delivery focused on parents; children participated in some instances	RCT, wait-list control $n = 31$	IES-R; PSI-SF; PSS; MADRS; SDQ; CSRC-SF; FES-SF; Baseline, 6-week, 3-month, and 12-month follow-up	Sign. improvement in posttraumatic symptoms at 3-months ($p = .003$) and 12-month follow- ($p = .020$)	Effect size not reported. Cohen's *d* calculated: IES-R = 0.47 (3-month follow-up), 0.007 (12-month follow-up)

Note. APPT-WGRS = Adolescent Pediatric Pain Tool Word Graphic Rating Scale; ASC-KIDS = Acute Stress Checklist for Children; BAS = Beck Anxiety Scale; BDI = Beck Depression Inventory; CAPS-CA = Clinician-Administered PTSD Scale for Children and Adolescents; CAS = Community Alienation Scale; CBCL = Child Behavior Checklist; CDI = Children's Depression Inventory; CEMS = Children's Emotional Manifestation Scale; CHEOPS = Children's Hospital of Eastern Ontario Pain Scale; CPSS = Child PTSD Symptom Scale; CSRC-SF = Child Stress Reaction Checklist-Short Form; CTSQ = Child Trauma Screening Questionnaire; FACES = Wong Baker Faces Scale; FES-SF = Family Environment Scale-Short Form; FLACC = Face Legs, Arms, Cry, Consolability Scale; FPS = Faces Pain Scale; FPS-R = Faces Pain Scale-Revised; GRS = Graphic Rating Scale for Pain; IES-R = Impact of Event Scale-Revised; MADRS = Montgomery-Asberg Depression Rating Scale; MSS = Modified Smith Scale; NRS = Numeric Rating Scale; OSBD = Observational Scale of Behavioral Distress; OCCEB-BECCO = Behavioral Observational Scale of Comfort Level for Child Burn Victims; PBCL = Procedure Behavior Check List; P-NRS = Parent Numeric Rating Scale; PSI-SF = Parenting Stress Index-Short Form; PSQ = Perceived Stigmatization Questionnaire; PSS = Perceived Stress Scale; PTSDSSI = Posttraumatic Stress Disorder (PTSD) Semi-structured Interview Observational Record for Infants and Young Children; RSES = Rosenberg Self-Esteem Scale; SCPQ = Social Competence with Peers Questionnaire; SCQ = Social Comfort Questionnaire; SDQ = Strengths and Difficulties; SHCS-C = Stanford Hypnotic Clinical Scale for Children; SPPC = Self-Perception Profile for Children; STAI = State-Trait Anxiety Inventory; SWAP = Satisfaction with Appearance Scale; SWQ = Social Worries Questionnaire; VAS = Visual Analog Scale; VAS-A = Visual Analog Scale for Anxiety; YCPC = Young Child PTSD Checklist; YSR = Youth Self Report.

[a]SMD is standardized mean difference also known as Cohen's *d*.

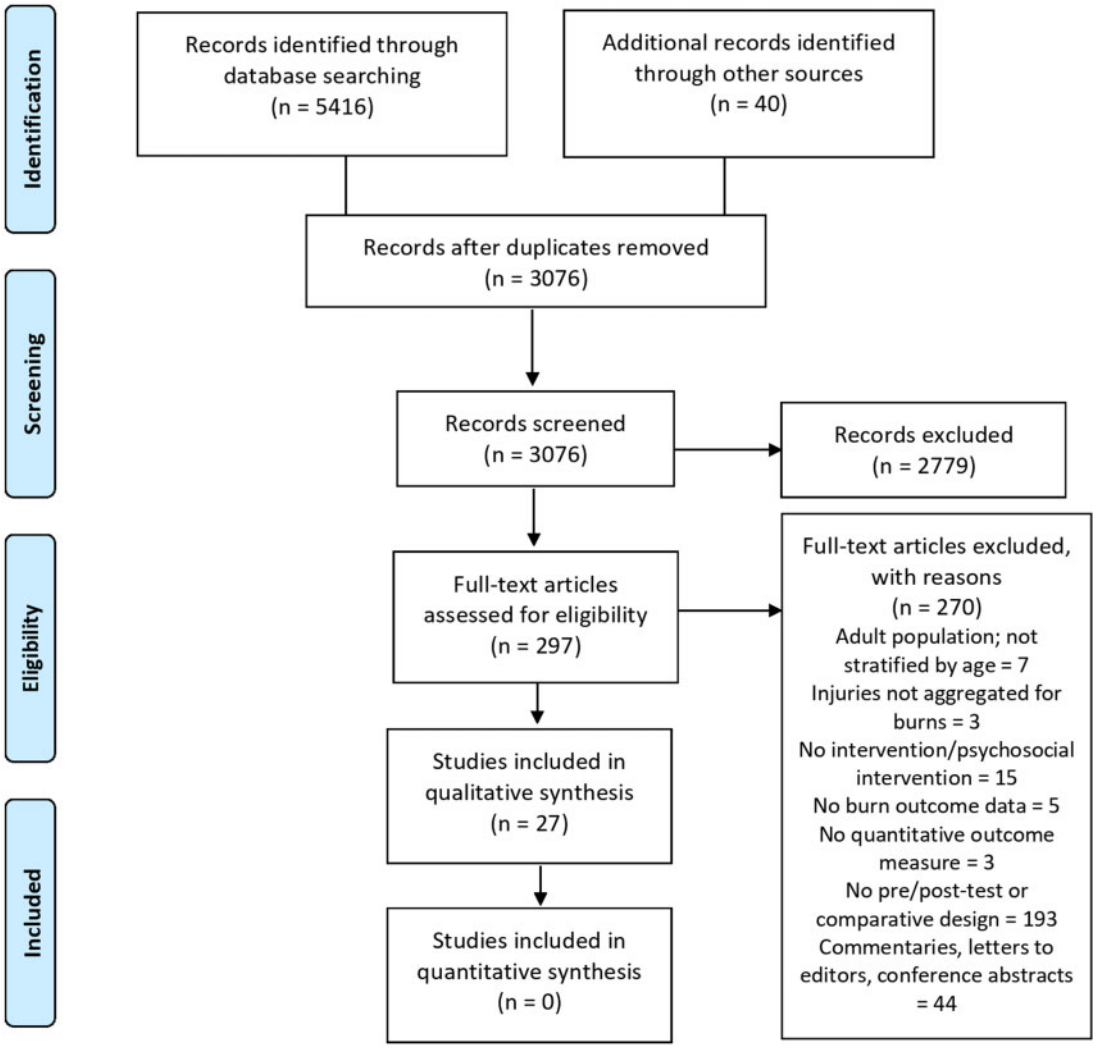

Figure 1. PRISMA flow diagram demonstrating included and excluded studies and the reasons for exclusion in the systematic review.

headset; it was provided in the form of a hand-held device that a child interacted with through movement, character insertion, and touch; 3D animation and interactive stories were developed to prepare the child for what to expect in the dressing change and to engage the child. In Brown et al. (2014), the MMD intervention was associated with a reduction in pain and anxiety and the effect size was reported to be small to medium ($d = 0.39–0.58$) on outcomes of pain. Similarly, in the Miller et al. (2010) study, a significant reduction in reports of pain were reported by, parents, and nurses. Eta squared (η^2) was reported as the effect size estimate with the intervention accounting for 24.5–41.0% of the total variance in procedural pain outcomes. In the following Miller et al. (2011) study, children who received the intervention had a reduction in the length of treatment, days to healing, and number of pain adverse effects both pre-procedurally and during the procedural. The intervention effect was found to be very large with Cohen's d ranging between 1.38 and 1.44.

Two studies provided distraction by a child life therapist involving the parent(s) in the intervention (Hyland et al., 2015; Moore, Bennet, Dietrich, & Wells, 2015). A qualified child life specialist provided support prior to and during the first burn dressing change using age-specific distraction techniques for children and verbal support for the parents. Only the Hyland et al. (2015) study was found to significantly alleviate pain and distress in parents and burn-injured children less than 1 year to 15 years of age compared to standard care. The intervention had a very large effect on pain outcomes ($d = 1.19$). The Moore et al. (2015) study focused on younger children with a median age of 3 years; it reported less distress in the children and higher parent satisfaction in caregivers who observed medical play compared to standard preparation but without statistically significant differences between the two groups. An

older study by Foertsch, O'Hara, Stoddard, and Kealey (1998) utilized familiar imagery-based treatment with children 3–12 years of age undergoing dressing changes. Children were presented with stories based on memories or experiences from their lives that were meant to create images for the child in their imagination. This intervention did not show an effect compared to a social support control group in which the children received words of encouragement but no imagery engagement.

Lastly, Chester and colleagues (2018) investigated the use of hypnosis in addition to standard care (pharmacological pain relief and distraction using handheld electronic games or toys) delivered during burn wound care by a hypnotherapist in a randomized controlled trial (RCT). Significantly decreased anxiety levels were reported for children 4–16 years in the hypnosis group at the second dressing change and significantly lower parent-reported pre-dressing application pain at the third dressing change compared to the parents of the standard care group. The intervention effects were very large with $d = 0.8$ for anxiety at the second dressing change and $d = 0.91$ for parent reports of pain at the third dressing change. There were no significant differences in self-reported pain intensity and mean time to re-epithelialization between the hypnosis and standard care group.

Burn Camps

The seven studies evaluated the effectiveness of residential burn camps of approximately 1-week duration for children 6–19 years of age, to promote interactions with other young burn survivors, to foster companionship and learn from each other about coping with a burn. Camp staff in the studies consisted of persons who work in burn centers, have experienced a burn themselves or have a relative with a burn. A variety of psychosocial social, behavioral and well-being activities are offered to the children, ranging from body paint, to sports, bowling, cinema, campfire, and team building, with emphasis on fun, mastering new skills, and building self-confidence.

Four studies reported significant, positive effects. Armstrong-James, Cadogan, Williamson, Rumsey, and Harcourt (2018) showed significantly lower perceived stigmatization scores and significant improvement of satisfaction with appearance; the intervention explained between 64% of the variance in perceived stigmatization and 65% variance in satisfaction with appearance. Bakker, Van der Heijden, Van Son, Van de Schoot, and Van Loey (2011) demonstrated decreased levels of dissatisfaction with appearance in camp group versus no camp comparison group 1 week after the camp, however, the effect of the intervention was negligible ($d = 0.006$). Rimmer et al. (2007b) reported increased self-esteem in a camper versus a non-burn camper comparison group at 1 year after the camp. The effect of the burn camp at year one was found to be small ($d = 0.27$). Arnoldo, Crump, Burris, Hunt, and Purdue (2006) and Biggs, Heinrich, Fekel, and Cuono (1997) found no changes in self-esteem when comparing baseline to end of the 1-week camp. The Tropez-Arceneaux et al. (2017) study reported improvements in campers' self-esteem with a very large intervention effect ($d = 1.20$); however, no statistically significant levels were reported for anxiety and depression symptoms. The study by Gaskell (2007) employed mixed-methods in which both quantitative and qualitative analyses were used to evaluate burn camps and the qualitative analysis illustrated common themes of improved confidence and coping after involvement with the burn camp. No improvement was reported for self-esteem, social relationships and emotional and behavioral well-being after burn camp participation.

Other Psychosocial Interventions: Social Skills Training, Cognitive Behavioral Therapy, and Parent Counseling

Two studies used cognitive based therapy to target two different age groups. The Blakeney et al. (2005) study was a 4-day social skills training for children, average age 14 years, and demonstrated significantly more improvement in social skills in both internalizing (how they felt) and externalizing behavior (how they behaved towards others), as well as fewer total behavioral problems at 1-year follow-up compared to the controls. The intervention effect for all outcomes were small with $d = 0.29$ for internalizing behavior, $d = 0.20$ for externalizing behavior, and $d = 0.25$ for total behavioral problems. The study by Kramer and Landolt (2014) included children 2–16 years of age and in turn the results were very age-dependent; two treatment sessions took place within 1-month post-burn dealing with reconstruction of the injury, identifying dysfunctional appraisals, and developing coping skills. The intervention showed no effect in preschool children. However, school-aged children had significantly fewer internalizing problems at 3-month follow-up compared to controls. A medium effect size was found for this difference in internalizing problems with a standard mean difference (SMD) = 0.50. SMD is also referred to as Cohen's *d*.

Focusing on parents of child burn survivors, Rivlin, Forshaw, Polowyj and Woodruff (1986) assessed the use of 1-hr parent counseling sessions for psychosocial recovery in parents of child burn survivors during inpatient care using a pre-post study design without a control group. They were able to show an effect in reduced parental anxiety before and after each session (total of 50 sessions with 266 responses to the question "How do you feel now?" before and after the session) with a very large reported intervention effect ($d = 1.33$). Sveen, Andersson, Buhrman, Sjöberg, and

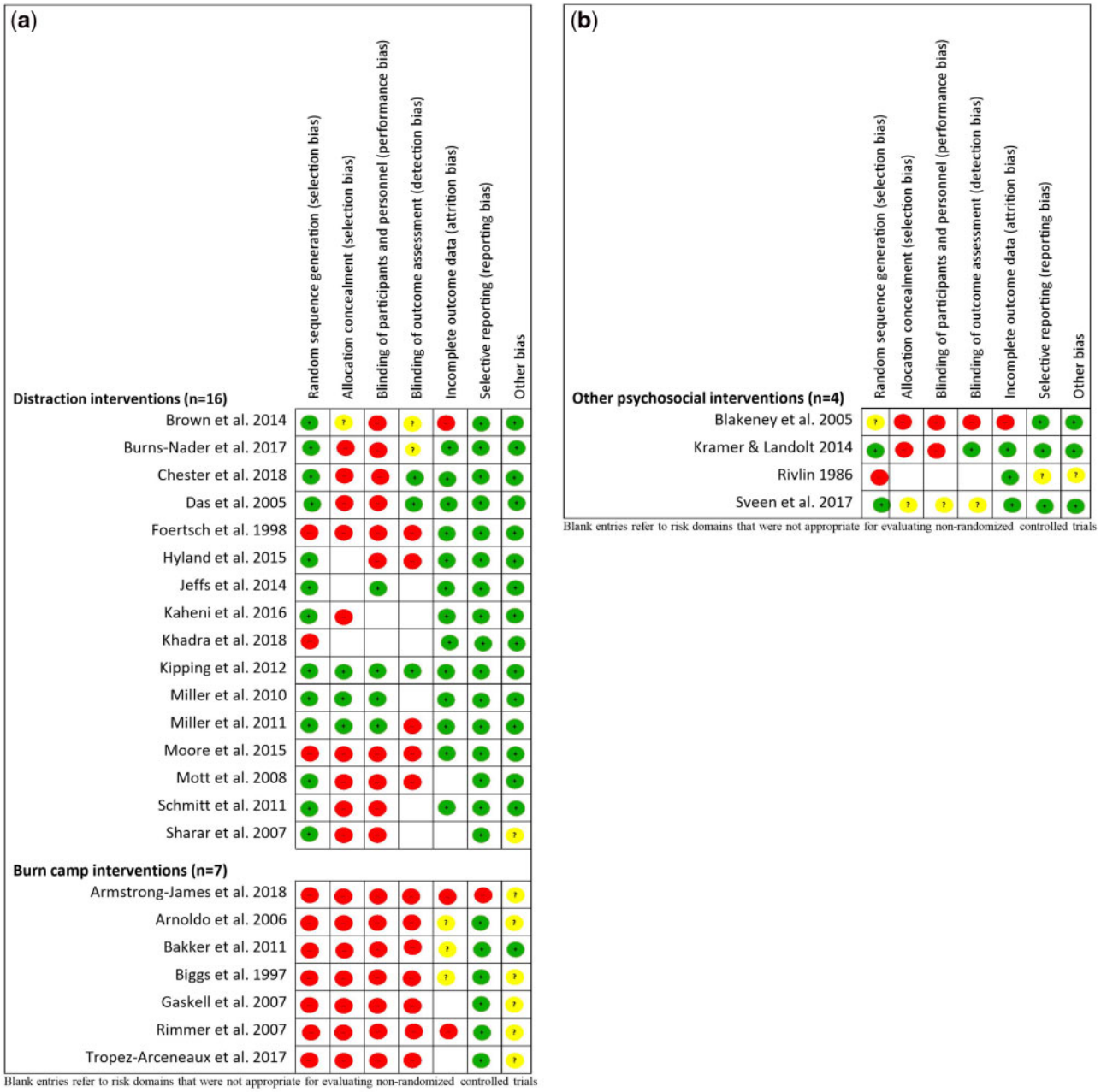

Figure 2. Cochrane risk of bias summary.

Willebrand (2017) also evaluated a parent counseling intervention employing a stronger, RCT study design. The results showed that counseling significantly decreased posttraumatic symptoms at 3-month and 12-month follow-up compared to the wait-list control group. At 3-month follow-up, the intervention effect was medium ($d = 0.47$) and very small ($d = 0.007$) at 12-month follow-up.

Assessment of Bias

A risk of bias summary is presented in Figure 2 for all studies combined and the results presented for the three types of intervention: distraction, burn camps, other intervention. Distraction interventions with RCT designs generally demonstrated "high" risk for allocation concealment and blinding of participants and assessors as well as outcomes. This is due to assessors and interventionists most often aware of group allocation and outcomes being assessed by self-report measures. Both RCT and non-RCT in the distraction and other interventions groups rated "low" on risks for attrition, selective reporting, and other bias. The risk for randomization, allocation, blinding of assessors and participants and outcome blinding were varied. In contrast, studies evaluating burn camp interventions were generally at high risk of bias as none were randomized and allocation concealment/blinding of participants and researchers or outcome

assessors was not applicable as none of these studies had a control group. Across the three groups performance and detection bias were typically a concern in the studies included but attrition bias low.

Discussion

Main Findings

This review identified 27 studies dating from 1986 to 2018 targeting psychosocial interventions for burns in children. The majority of the interventions targeted the acute phase post-burn in the hospital, a demanding and critical time in the physical recovery process with high levels of pain. Only three studies included parents and children combined in the intervention (Hyland et al., 2015; Moore et al., 2015; Sveen et al., 2017).

In the first group using distraction, 13 out of the 16 studies providing distraction intervention prior to/during each dressing changes or physical therapy were shown to be effective in reducing pain and anxiety. These results are similar to those found in two reviews on all ages investigating the use of VR for procedural pain in management of burns in addition to medication (Luo et al., 2019; Scapin et al., 2018). We found no studies utilizing innovative Web- or App-based interventions utilized in other pediatric studies outside of this review (Boixados, Hernandez Encuentra, Nieto Luna, Huguet, & Aumatell, 2014; Grist, Porter, & Stallard, 2018). The effectiveness of the education and distraction provided by a child life therapist during the hospital stay was mixed as only one out of two studies found (Hyland et al., 2015) showed significant differences between the intervention and control groups. In comparison, there was no effect in using imagery-based distraction during dressing changes (Foertsch et al., 1998).

The study on clinical hypnosis during wound care (Chester et al., 2018) demonstrated a significant reduction in anxiety reported due to the hypnosis in addition to standard distraction techniques and pain medication but did not reveal significant differences in self-reported pain or time to re-epithelialization compared to standard care. This differs from a systematic review and meta-analysis of RCTs in adults suffering from a burn injury showing statistically significant reduction in anxiety and pain (Provençal, Bond, Rizkallah, & El-Baalbaki, 2018). Thus, more research is needed prior to making clinical recommendations. In this group of studies, there was low risk for bias overall, except for allocation concealment and blinding bias which were high or unclear.

In the second group of residential burn camps for children and adolescents, there were significant improvements in standardized, measurable psychosocial outcome measures in four studies (Armstrong-James et al., 2018; Bakker et al., 2011; Rimmer et al., 2007b; and Tropez-Arceneaux et al., 2017) out of the total of seven. Children, parents, and staff consistently report in a qualitative manner the progress made in social skills, coping, and self-confidence as a result of participating in the camp activities and interacting with peers in a safe environment. This includes perceived benefits of companionship and coping. The risk of bias overall was high in this type of intervention due to the limitations inherent to the study design, that is, no control group, no randomization. This finding supports earlier reviews focusing exclusively on burn camps that found a discrepancy between qualitative studies with children, parents, and staff consistently reporting benefits of burn camp participation (e.g., improving self-esteem and promoting social and coping skills), while quantitative methods demonstrated little consistent evidence of change due to the complexity of measuring constructs, for example, self-esteem (Kornhaber et al., 2019; Gaskell et al., 2010; Maslow & Lobato, 2010). Recommendations for a more robust research methodology to evaluate the efficacy of burn camps has been presented earlier (Gaskell et al., 2010) and the need to determine the reasons for discrepancy between the qualitative and quantitative studies (Kornhaber et al., 2019).

In the third group comprising all other types of interventions, the two studies on cognitive based therapy (Blakeney et al., 2005; Kramer & Landolt, 2014) targeted social skills and coping skills training and had age-dependent results for reducing internalizing and externalizing behavioral problems. There was no "one size intervention fits all children" as preschool children responded differently than school-aged children to the intervention provided. This highlights again the complexity of tailoring the intervention to the age of the child, while also requiring large sample sizes. Research also shows there is benefit in offering cognitive behavioral therapy-based interventions alongside biofeedback and VR (Gupta, Scott, & Dukewich, 2018). Parent counseling was employed for an extended period of time and the RCT by Sveen et al. (2017) was able to demonstrate its effectiveness in assisting psychosocial recovery in the parents of child burn survivors. For these interventions large scale studies would be required to assess the evidence, in groups of various ages and settings.

Differences in frequency and setting may explain the differences in the effectiveness of psychosocial interventions (De Young et al., 2016; Price, Kassam-Adams, Alderfer, Christofferson, & Kazak, 2016; Rosenberg, Rosenberg, Rimmer, & Fauerbach, 2018). Burn dressing changes occur frequently so these interventions are used repeatedly, compared to the limited number of sessions provided in the cognitive behavioral therapy study at the hospital (two sessions) or to burn camps which are typically offered once a year for 5 days. Thus, the distraction interventions are able to

have an effect immediately post-injury (De Young et al., 2012). This is reflected in a systematic review and meta-analysis showing multiple-session, early interventions posttrauma yielded the highest benefits in the first 3 months post-event (Roberts, Kitchiner, Kenardy, & Bisson, 2009). In addition, the distraction techniques using VR or multimodal devices at the inpatient setting were implemented with no specialized staff, compared to education and distraction provided by a child life therapist or cognitive behavioral therapy requiring the presence of trained staff. This may also contribute to increased use of the intervention. VR and multimodal approaches appear to be valuable, accessible tools for use by clinicians and burn care staff as adjunctive therapies in the treatment and management of burn wound-related pain and anxiety. Pain has been shown to be strongly associated with emotional responses, for example, depression, anxiety, withdrawal, and sleeplessness, factors which typically contribute to non-compliance with treatment and protracted healing (Ghandi et al., 2010; Gorczyca et al., 2013). Effective pain control through the use immersive VR interventions in conjunction with pharmacological therapies during hospitalization will therefore strengthen the recovery process.

This review also highlights the variability in conceptualization and measurement of psychological and social recovery in children after a burn. All 27 studies included in this review utilized standard, non-burn specific outcome measures to capture the multidimensional nature of well-being and captured fifteen psychosocial outcome measures. Surprisingly, no study was identified that utilized a burn specific measure. Condition-specific well-being measurements are particularly informative due to the individual consequences of burn injury that would not otherwise be captured by generic tools (Druery, Newcombe, Cameron, & Lipman, 2017). Furthermore, only three out of the 27 studies involved both the injured child and the parents, although research shows that parental distress is an important predictor of psychological recovery in the child (Kassam-Adams, Bakker, Marsac, Fein, & Winston, 2015; Landolt et al., 2012). The number of studies in this review addressing psychosocial sequelae outside of painful procedures was also limited; only two studies (Blakeney et al., 2005; Kramer & Landolt, 2014) of the 27 were identified utilizing cognitive behavioral therapy, whether for the child or combined for a child and caregiver. This may be due to lack or limited access to such therapy in some settings (Harcourt et al., 2018).

All but two studies were from high-income countries and, as a result, it was not possible to assess the applicability and effectiveness of the interventions to other contexts, such as the use of VR games in resource poor settings. This review has emphasized the lack of intervention research in low-income countries which are characterized by severe resource constraints (Rode et al., 2013) where burn victims will face very different socioeconomic challenges (e.g., poor sanitation, lack of access to comprehensive primary healthcare) compared to their high-income counterparts (Burrows, Van Niekerk, & Laflamme, 2010). An intervention with proven efficacy in a high-income context may not be successfully implemented in a low-income context due to resource barriers (e.g., human resources, financial limitations) and non-uptake of treatment by patients (Alonge et al., 2019). Research in low-income settings is therefore necessary to ensure that interventions are designed and implemented in a practical, cost-effective manner (Watson, Sahota, Taylor, Chen, & Lilford, 2018).

Strengths and Limitations

This systematic review is the first to date to investigate the full range of psychosocial interventions available for child burn injuries. A large number of databases were searched with the assistance of expert library staff. Furthermore, a broad definition of psychosocial recovery was included in order to have a comprehensive assessment of the range of interventions and outcome measures used. An internationally recognized systematic tool was used to assess risk of bias in the interventions. Nonetheless, a number of limitations exist. In accordance with the PRISMA guidelines, the grey literature was not searched. Thus, studies evaluating interventions may have been undertaken but not published in peer-reviewed journals or are unpublished theses. However, these may be of limited number as this review was able to identify published studies with small sample sizes, non-significant findings and limited methodological quality, which could suggest low barriers to publishing. Furthermore, the findings of this review are limited by the small number and sample size of studies identified. Due to heterogeneity of the studies and the potential for methodological bias, it was not possible to demonstrate the relative effectiveness of different psychosocial therapies.

Further Research

Studies should aim to address long term psychosocial outcomes beyond the acute recovery phase, such as trauma-focused cognitive behavioral therapy (TF-CBT) (Ramirez de Arellano et al., 2014; Vaniprabha, Madhusudhan, & Ramesha, 2015), peer support group attendance to improve social interactions (Grieve et al., 2017). Also needed are interventions that integrate a model of care that provides coordination of psychosocial care both during hospitalization (e.g., family support coordinator in pediatric burn

units) and post-discharge for the injured children and their families throughout the recovery trajectory (Curtis, Foster, Mitchell, & Van, 2016; Foster, Young, Mitchell, Van, & Curtis, 2017). Furthermore, interventions targeting the preschool age group are needed as well as parent–child interventions. For burn camps, studies may consider developing or using other standardized scales that better capture the psychosocial recovery aspects. In addition, quasi-experimental studies with larger sample sizes and standard comparison groups (age, years since burn injury, body part involved, previous participation in camps) are recommended.

Conclusion

A range of psychosocial interventions and outcome tools exist for pediatric burns. The majority focus on distraction techniques in the acute recovery phase delivered in the form of VR. These interventions were found to be effective in reducing pain and anxiety prior to or during burn dressing changes or during physical therapy for a wide range of pediatric ages. Burn camps, cognitive behavioral therapy, and parent counseling are promising but more large-scale, robust studies are needed to determine the effectiveness of interventions addressing psychosocial sequelae outside of pain management in order to strengthen the current evidence base for psychosocial burn interventions in children and adolescents.

Supplementary Data

Supplementary data can be found at: https://academic.oup.com/jpepsy.

Acknowledgments

The authors wish to thank Prof. Lucie Laflamme from the Department of Public Health Sciences, Karolinska Institutet, Sweden and Prof. Ashley Van Niekerk from the Violence, Injury and Peace Research, South African Medical Research Council-UNISA, South Africa for their expert knowledge and review of this manuscript. Also, our sincere appreciation goes to Klas Moberg and Carl Gornitzki at the Karolinska Institutet Library as well as Sharleen Lategan at the South African Medical Research Council Library and Information Services Division for supporting the searches and sourcing articles.

Funding

This work was supported by the Swedish Foundation for International Cooperation in Research and Higher Education (STINT) Sweden and the National Research Foundation (NRF) South Africa Research Collaborative Programme (101576).

Conflicts of interest: None declared.

References

References marked with an asterisk (*) indicate studies included in the review.

Alonge, O., Rodriguez, D. C., Brandes, N., Geng, E., Reveiz, C., & Peters, D. H. (2019). How is implementation research applied to advance health in low income and middle-income countries? *BMJ Global Health*, *4*, e001257. doi:10.1136/bmjgh-2018-001257

Arceneaux, L. L., & Meyer, W. J. (2009). Treatments for common psychiatric conditions among children and adolescents during acute rehabilitation and reintegration phases of burn injury. *International Review of Psychiatry*, *21*, 549–558. doi:10.3109/09540260903343984

Armstrong-James, L. (2017). *Psychosocial interventions for young people with burn injuries and their families* (Unpublished doctoral thesis). Faculty of Health and Applied Sciences, University of the West of England, Bristol.

*Armstrong-James, L., Cadogan, J., Williamson, H., Rumsey, N., & Harcourt, D. (2018). An evaluation of the impact of a burn camp on children and young people's concerns about social situations, satisfaction with appearance and behaviour. *Scars, Burns & Healing*, *4*, 2059513118816219. doi:10.1177/2059513118816219

*Arnoldo, B. D., Crump, D., Burris, A. M., Hunt, J. L., & Purdue, G. F. (2006). Self-esteem measurement before and after summer burn camp in pediatric burn patients. *Journal of Burn Care & Research*, *27*, 786–789. doi:10.1097/01.BCR.0000245782.59190.4B

Bakker, A., Maertens, K. J., Van Son, M. J., & Van Loey, N. E. (2013). Psychological consequences of pediatric burns from a child and family perspective: a review of the empirical literature. *Clinical Psychology Review*, *33*, 361–371. doi:10.1016/j.cpr.2012.12.006

*Bakker, A., Van der Heijden, P. G. M., Van Son, M. J. M., Van de Schoot, R., & Van Loey, N. E. E. (2011). Impact of pediatric burn camps on participants' self esteem and body image: An empirical study. *Burns*, *37*, 1317–1325. doi:10.1016/j.burns.2011.01.009

*Biggs, K. S., Heinrich, J. J., Jekel, J. F., & Cuono, C. B. (1997). The burn camp experience: Variables that influence the enhancement of self-esteem. *Journal of Burn Care & Rehabilitation*, *18*, 93–98.

*Blakeney, P., Thomas, C., Holzer, C., Rose, M., Berniger, F., & Meyer, W. J. (2005). Efficacy of a short-term, intensive social skills training program for burned adolescents. *Journal of Burn Care and Rehabilitation*, *26*, 546–555. doi:10.1097/01.bcr.0000185455.81677.a2

Boixados, M., Hernandez Encuentra, E., Nieto Luna, R., Huguet, A., & Aumatell, E. (2014). Paediatrians' perceptions of a potential online psychosocial intervention for children with recurrent abdominal pain. *Journal of Paediatric Child Health*, *50*, 449–454. doi:10.1111/jpc.12511

*Brown, N. J., Kimble, R. M., Rodger, S., Ware, R. S., & Cuttle, L. (2014). Play and heal: Randomized controlled trial of DittoTM intervention efficacy on improving re-epithelialization in pediatric burns. *Burn*, *40*, 204–213. doi:10.1016/jburns.2013.11.0

*Burns-Nader, S., Joe, L., & Pinion, K. (2017). Computer tablet distraction reduces pain and anxiety in pediatric

burn patients undergoing hydrotherapy: a randomized trial. *Burns*, *43*, 1203–1211. doi:10.1016/j.burns.2017.02.015

Burrows, S., Van Niekerk, A., & Laflamme, L. (2010). Fatal injuries among urban children in South Africa: risk distribution and potential for reduction. *Bull World Health Organ*, *88*, 267–272. doi:10.2471/BLT.09.068486

*Chester, S. J., Tyack, Z., De Young, A., Kipping, B., Griffin, B., Stockton, K.,. . .Kimble, R.M. (2018). Efficacy of hypnosis on pain, wound-healing, anxiety, and stress in children with acute burn injuries: a randomized controlled trial. *Pain*, *159*, 1790–1801. doi:10.1097/j.pain.0000000000001276

Curtis, K., Foster, K., Mitchell, R., & Van, C. (2016). How is care provided for patients with paediatric trauma and their families in Australia? A mixed-method study. *Journal of Paediatrics & Child Health*, *52*, 832–836. doi:10.1111/jpc.13189

*Das, D. A., Grimmer, K. A., Sparnon, A. L., McRae, S. E., & Thomas, B. H. (2005). The efficacy of playing a virtual reality game in modulating pain for children with acute burn injuries: a randomized controlled trial. *BMC Pediatrics*, *5*, doi:10.1186/1471-2431-5-1

De Sousa, A. (2010). Psychological aspects of paediatric burns (a clinical review). *Annals of Burns and Fire Disasters*, *XXIII*, 155–159.

De Young, A. C., Haag, A., Kenardy, J. A., Kimble, R. M., & Landolt, M. A. (2016). Coping with Accidents Reactions (CARE) early intervention programme for preventing traumatic stress reactions in young injured children: study protocol for two randomised controlled trials. *Trials*, *17*, 362. doi:10.1186/s13063-016-1490-2

De Young, A. C., Hendrikz, J., Kenardy, J. A., Cobham, V. E., & Kimble, R. M. (2014). Prospective evaluation of parent distress following pediatric burns and identification of risk factors for young child and parent posttraumatic stress disorder. *Journal of Child & Adolescent Psychopharmacology*, *24*, 9–17. doi:10.1089/cap.2013.0066

De Young, A. C., Kenardy, J. A., Cobham, V. E., & Kimble, R. (2012). Prevalence, comorbidity and course of trauma reactions in young burn-injured children. *The Journal of Child Psychology & Psychiatry*, *53*, 56–63.

Dodd, H., Fletchall, S., Starnes, C., & Jacobson, K. (2017). Current concepts burn rehabilitation, Part II: long-term recovery. *Clinics in Plastic Surgery*, *44*, 713–728. doi:10.1016/j.cps.2017.05.013

Druery, M., Newcombe, P. A., Cameron, C. M., & Lipman, J. (2017). Factors influencing psychological, social and health outcomes after major burn injuries in adults: cohort study protocol. *BMJ Open*, *7*, e017545. doi:10.1136/bmjopen-2017-017545

Egberts, M. R., de Jong, A. E. E., Hofland, H. W. C., Geenen, R., & Van Loey, N. E. E. (2018). Parental presence or absence during paediatric burn wound care procedures. *Burns*, *44*, 850–860. doi:10.1016/j.burns.2017.11.016

Esselman, P. C. (2007). Burn rehabilitation: an overview. *Arch Phys Med Rehabil*, *88*, S3–S6. doi:10.1016/j.apmr.2007.09.020

Fagin, A., & Palmieri, T. L. (2017). Considerations for pediatric burn sedation and analgesia. *Burns & Trauma*, *5*, 28. doi:10.1186/s41038-017-0094-8

*Foertsch, C. E., O'Hara, M. W., Stoddard, F. J., & Kealey, G. P. (1998). Treatment-resistant pain and distress during pediatric burn-dressing changes. *Journal of Burn Care & Rehabilitation*, *19*, 219–224.

Foster, K., Young, A., Mitchell, R., Van, C., & Curtis, K. (2017). Experiences and needs of parents of critically injured children during the acute hospital phase: a qualitative investigation. *Injury*, *48*, 114–120. doi:10.1016/j.injury.2016.09.034

*Gaskell, S. L. (2007). The challenge of evaluating rehabilitative activity holidays for burn-injured children: qualitative and quantitative outcome data from a burns camp over a five-year period. *Developmental Neurorehabilitation*, *10*, 149–160. doi:10.1080/13638490701217610

Gaskell, S. L., Cooke, S., Lunke, M., O'Shaughnessy, J., Kazbekov, M., & Zajicek, R. (2010). A Pan-European evaluation of residential burns camps for children and young people. *Burns*, *36*, 511–521.

Ghandi, M., Thomson, C., Lord, D., & Enoch, S. (2010). Management of pain in children with burns. *International Journal of Pediatrics*, *2010*, 825657. doi:10.1155/2010/825657

Goodhew, F., Van Hooff, M., Sparnon, A., Roberts, R., Baur, J., Saccone, E. J., & McFarlane, A. (2014). Psychiatric outcomes amongst adult survivors of childhood burns. *Burns*, *40*, 1079–1088.

Gorczyca, R., Filip, R., & Walczak, E. (2013). Psychological aspects of pain. *Annals of Agricultural and Environmental Medicine 20*, 23–27.

Grieve, B., Shapiro, G. D., Wibbenmeyer, L., Acton, A., Lee, A., Marino, M,. . .LIBRE Advisory Board. (2017). Long-term social reintegration outcomes for burn survivors with and without peer support attendance: a Life Impact of Burn Recovery Evaluation (LIBRE) Study. *Archives of Physical Medicine and Rehabilitation*. pii: S0003-9993(17)31328-X. doi:10.1016/j.apmr.2017.10.007 [Epub ahead of print].

Grist, R., Porter, J., & Stallard, P. (2018). Acceptability, use, and safety of a mobile phone app (BlueIce) for young people who self-harm: qualitative study of service users' experience. *JMIR Ment Health*, *5*, e16. doi:10.1016/j.bodyim.2018.02.001

Gupta, A., Scott, K., & Dukewich, M. (2018). Innovative technology using virtual reality in the treatment of pain: does it reduce pain via distraction or is there more to it? *Pain Medicine*, *19*, 151–159. doi:10.1093/pm/pnx109

Harcourt, D., Hamlet, C., Feragen, K. B., Garcia-Lopez, L. J., Masnari, O., Mendes, J., & Williamson, H. (2018). The provision of specialist psychosocial support for people with visible differences: a European survey. *Body Image*, *14*, 35–39. doi:10.1016/j.bodyim.2018.02.001

Higgins, J. P. T., Altman, D. G., Gotzsche, P. C., Juni, P., Moher, D., Oxman, A. D.,. . .Sterne, J. A. C, Cochrane Statistical Methods Group. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *British Medical Journal*, *343*, d5928. doi:10.113/bmj.d5928

*Hyland, E. J., D'Cruz, R., Harvey, J. G., Moir, J., Parkinson, C., & Holland, A. J. A. (2015). An assessment of Early Child Life Therapy pain and anxiety management: A prospective randomised controlled trial. *Burns*, *41*, 1642–1652. doi:10.1016/j.burns.2015.05.017

Hyland, E. J., & Holland, A. J. (2015). Have we really decreased mortality due to severe burn injury in children? *Translational Pediatrics*, *4*, 201–202.

*Jeffs, D., Dorman, D., Brown, S., Files, A., Graves, T., Kirk, E.,. . .Swearingen, C. J. (2014). Effect of virtual reality on adolescent pain during burn wound care. *Journal of Burn Care & Research*, *35*, 395–408.

*Kaheni, S., Rezai, M. S., Bagheri-Nesami, M., & Goudarzian, A. H. (2016). The effect of distraction technique on the pain of dressing change among 3-6 year old children. *International Journal of Pediatrics*, *4*, 1603–1610.

Kassam-Adams, N., Bakker, A., Marsac, M. L., Fein, J. A., & Winston, F. K. (2015). Traumatic stress, depression, and recovery: Child and parent responses after emergency medical care for unintentional injury. *Pediatric Emergency Care*, *31*, 737–742. doi:10.1097/PEC.0000000000000595

Kazis, L. E., Lee, A. F., Rose, M., Liang, M. H., Li, N. -C., Ren, X. S.,. . .Tompkins, R. G. (2016). Recovery curves for pediatric burn survivors: Advances in patient-oriented outcomes. *JAMA Pediatrics*, *170*, 534–542. doi:10.1001/jamapediatrics.2015.4722

*Khadra, C., Ballard, A., Déry, J., Paquin, D., Fortin, J.-S., Perreault, I.,. . .LeMay, S. (2018). Projector-based virtual reality dome environment for procedural pain and anxiety in young children with burn injuries: A pilot study. *Journal of Pain Research*, *11*, 343–353.

*Kipping, B., Rodger, S., Miller, K., & Kimble, R. M. (2012). Virtual reality for acute pain reduction in adolescents undergoing burn wound care: A prospective randomized controlled trial. *Burns*, *38*, 650–657. doi:10.1016/j.burns.2011.11.010

Kornhaber, R., Visentin, D., Kaji Thapa, D., West, S., Haik, J., & Cleary, M. (2019). Burn camps for burns survivors - Realising the benefits for early adjustment: A systematic review. *Burns*. pii: S0305-4179(18)30894-5. doi:10.1016/j.burns.2018.12.005 [Epub ahead of print].

*Kramer, D. N., & Landolt, M. A. (2014). Early psychological intervention in accidentally injured children ages 2-16: A randomized controlled trial. *European Journal of Psychotraumatology*, *5*, 24402. doi:10.3402/ejpt.v5.24402

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Front. Psychol*, *4*, 1–12. doi:10.3389/fpsyg.2013.00863

Landolt, M. A., Buehlmann, C., Maag, T., & Schiestl, C. (2007). Brief report: Quality of life is impaired in pediatric burn survivors with posttraumatic stress disorder. *Journal of Pediatric Psychology*, *34*, 14–21.

Landolt, M. A., Ystrom, E., Sennhauser, F. H., Gnehm, H. E., & Vollrath, M. E. (2012). The mutual prospective influence of child and parental post-traumatic stress symptoms in pediatric patients. *Journal of Child Psychology & Psychiatry*, *53*, 767–774. doi:10.1111/j.1469-7610.2011.02520.x

Liber, J. M., Faber, A. W., Treffers, P. D., & Van Loey, N. E. (2008). Coping style, personality and adolescent adjustment 10 years post-burn. *Burns*, *34*, 775–782. doi:10.1016/j.burns.2007.10.008

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gotzsche, P. C., Ioannidis, J. P. A.,. . .Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *British Medical Journal*, *339*, b2700. doi:10.1136/bmj.b2700

Luo, H. X., Cao, C., Zhong, J., Chen, J., & Cen, Y. (2019). Adjunctive virtual reality for procedural pain management of burn patients during dressing change or physical therapy: A systematic review and meta-analysis of randomized controlled trials. *Wound Repair & Regeneration*, *27*, 90–101. doi:10.1111/wrr.1

Maslow, G. R., & Lobato, D. (2010). Summer camps for children with burn injuries: A literature review. *Journal of Burn Care & Research*, *31*, 740–749. doi:10.1097/BCR.0b013e3181eebec4

*Miller, K., Rodger, S., Bucolo, S., Greer, R., & Kimble, R. M. (2010). Multi-modal distraction. Using technology to combat pain in young children with burn injuries. *Burns*, *36*, 647–658. doi:10.1016/j.burns.2009.06.199

*Miller, K., Rodger, S., Kipping, B., & Kimble, R. M. (2011). A novel technology approach to pain management in children with burns: A prospective randomized controlled trial. *Burns*, *37*, 395–405. doi:10.1016/j.burns.2010.12.008

Mock, C., Peck, M., Peden, M., & Krug, E. (2008). *A WHO plan for burn prevention and care*. Geneva, Switzerland: World Health Organization.

*Moore, E. R., Bennet, K. L., Dietrich, M. S., & Wells, N. (2015). The effect of directed medical play on young children's pain and distress during burn wound care. *Journal of Pediatric Health Care*, *29*, 265–273. doi:10.1016/j.pedhc.2014.12.006

*Mott, J., Bucolo, S., Cuttle, L., Mill, J., Hilder, M., Miller, K., & Kimble, R. (2008). 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. doi:10.1016/j.burns.2007.10.010

Odar, C., Kirschman, K. J., Pelley, T. J., Butz, C., Besner, G. E., & Fabia, R. B. (2013). Prevalence and correlates of posttraumatic stress in parents of young children postburn. *Journal of Burn Care & Research*, *34*, 299–306. doi:10.1097/BCR.0b013e31825ae15d

Pan, R., Dos Santos, B. D., Nascimento, L. C., Rossi, L. A., Geenen, R., & Van Loey, N. E. (2018). School reintegration of pediatric burn survivors: An integrative literature review. *Burns*, *44*, 494–511. doi:10.1016/j.burns.2017.05.005

Parrish, C., Shields, A., Morris, A., George, A., Reynolds, E., Borden, L.,. . .Ostrander, R. (2019). Parent distress following pediatric burn injuries. *Journal of Burn Care & Research*, *40*, 79–84. doi:10.1093/jbcr/iry048

Phillips, C., & Rumsey, N. (2008). Considerations for the provision of psychosocial services for families following paediatric burn injury: A quantitative study. *Burns*, *34*, 56–62. doi:10.1016/j.burns.2006.12.003

Price, J., Kassam-Adams, N., Alderfer, M. A., Christofferson, J., & Kazak, A. E. (2016). Systematic review: A re-evaulation and update of the integrative (trajectory) model of pediatric medical traumatic stress. *Journal of Pediatric Psychology*, *41*, 86–97. doi:10.1093/jpepsy/jsv074

Provençal, S. C., Bond, S., Rizkallah, E., & El-Baalbaki, G. (2018). Hypnosis for burn wound care pain and anxiety: A systematic review and meta-analysis. *Burns*, *44*, 1870–1881. doi:10.1016/j.burns.2018.04.017

Ramirez de Arellano, M. A., Lyman, D. R., Jobe-Shields, L., George, P., Dougherty, R. H., Daniels, A. S.,. . .Delphin-Rittmon, M. E. (2014). Trauma-focused cognitive behavioral therapy: Assessing the evidence. *Psychiatric Services*, *65*, 591–602. doi:10.117/appi.ps.201300255

Review Manager (RevMan) [Computer program] Version 5.3. (2014). Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration.

Rimmer, R. B., Foster, K. N., Bay, C. R., Floros, J., Rutter, C., Bosch, J., & Caruso, D. M. (2007a). The reported effects of bullying on burn-surviving children. *Journal of Burn Care & Research*, *28*, 484–489.

*Rimmer, R. B., Fornaciari, G. M., Foster, K. N., Bay, C. R., Wadsworth, M. M., Wood, M., & Caruso, D. M. (2007b). Impact of a pediatric residential burn camp experience on burn survivors' perceptions of self and attitudes regarding the camp community. *Journal of Burn Care & Research*, *28*, 334–341. doi:10.1097/BCR.0B013E318031A0F4

Rimmer, R. B., Pressman, M. S., Takach, O. P., Bay, R. C., Croteau, R., Hansen, L. D., & Caruso, D. M. (2012). Burn-injured adolescents report gaining multiple developmental benefits and improved life skills as a result of burn camp attendance. *Journal of Burn Care & Research*, *33*, 552–560. doi:10.1097/BCR.0b013e318242ef11

*Rivlin, E., Forshaw, A., Polowyj, G., & Woodruff, B. (1986). A multidisciplinary group approach to counselling the parents of burned children. *Burns Including Thermal Injury*, *12*, 479–483.

Roberts, N. P., Kitchiner, N. J., Kenardy, J., & Bisson, J. I. (2009). Systematic review and meta-analysis of multiple-session early interventions following traumatic events. *American Journal of Psychiatry*, *166*, 293–301. doi:10.1176/appi.ajp.2008.08040590

Rode, H., Rogers, A., Adams, S., Kleintjes, W., Whitelock-Jones, L., Muganza, A., & Allorto, N. (2013). The dilemma of treating major burns in South Africa. *South African Medical Journal*, *103*, 608–609. doi:10.7196/SAMJ.7361

Rosenberg, L., Rosenberg, M., Rimmer, R. B., & Fauerbach, J. A. (2018). Psychosocial recovery and reintegration of patients with burn injuries. In D. Herndon (Ed.), *Total burn care* (5th edn, pp. 709–720). China: Elsevier. doi:10.1016/B978-0-323-47661-4.00065-4

Scapin, S., Echevarría-Guanilo, M. E., Boeira Fuculo Junior, P. R., Gonçalves, N., Rocha, P. K., & Coimbra, R. (2018). Virtual reality in the treatment of burn patients: A systematic review. *Burns*, *44*, 1403–1416. doi:10.1016/j.burns.2017.11.002

*Schmitt, Y. S., Hoffman, H. G., Blough, D. K., Patterson, D. R., Jensen, M. P., Soltani, M.,. . .Sharar, S. R. (2011). A randomized, controlled trial of immersive virtual reality analgesia during therapy for pediatric patients. *Burns*, *37*, 61–68. doi:10.1016/j.burns.2010.07.007

*Sharar, S. R., Carrougher, G. J., Nakamura, D., Hoffman, H. G., Blough, D. K., & Patterson, D. R. (2007). 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(12 Suppl 2)*, S43–S49. doi:10.1016/j.apmr.2007.09.004

Smolle, C., Cambiaso-Daniel, J., Forbes, A. A., Wurzer, P., Hundeshagen, G., Branski, L. K.,. . .Kamolz, L.-P. (2017). Recent trends in burn epidemiology worldwide: A systematic review. *Burns*, *43*, 249–257. doi:10.1016/j.burns.2016.08.013

*Sveen, J., Andersson, G., Buhrman, B., Sjöberg, F., & Willebrand, M. (2017). Internet-based information and support program for parents of children with burns: A randomized controlled trial. *Burns*, *43*, 583–591. doi:10.1016/j.burns.2016.08.039

Szabo, M. M., Ferris, K. A., Urso, L., Aballay, A. M., & Duncan, C. L. (2017). Social competence in pediatric burn survivors: A systematic review. *Rehabilitation Psychology*, *62*, 69–80. doi:10.1037/rep0000116

Tarnowski, K. J., Rasnake, L. K., & Drabman, R. S. (1987). Behavioral assessment and treatment of pediatric burn injuries: A review. *Behavior Therapy*, *18*, 417–441.

Thomas, C. R., Russell, W., Robert, R. S., Holzer, C. E., Blakeney, P., & Meyer, W. J. (2012). Personality disorders in young adult survivors of pediatric burn injury. *Journal of Personality Disorders*, *26*, 255–266. doi:10.1521/pedi.2012.26.2.255

*Tropez-Arceneaux, L. L., Castillo Alaniz, A. T., & Icaza, I. L. (2017). The psychological impact of first burn camp in Nicaragua. *Journal of Burn Care & Research*, *1*, e1–e7. doi:10.1097/BCR.0000000000000465

van Baar, M. E., Polinder, S., Essink-Bot, M. L., van Loey, N. E. E., Oen, I. M. M. H., Dokter, J.,. . .van Beeck, E. F. (2011). Quality of life after burns in childhood (5-15 years): Children experience substantial problems. *Burns*, *37*, 930–938. doi:10.1016/j.burns.2011.05.004

Vaniprabha, G. V., Madhusudhan, S., & Ramesha, K. T. (2015). Cognitive behaviour therapy of accidental post burn injury survivors: An Indian concept. *International Journal of Humanities and Social Science Invention*, *4*, 31–36.

Watson, S. I., Sahota, H., Taylor, C. A., Chen, Y., & Lilford, R. J. (2018). Cost-effectiveness of health care service delivery interventions in low and middle income countries: A systematic review. *Global Health Research and Policy*, *3*, doi:10.1186/s41256-018-0073-z

Wiechman, S. A., & Patterson, D. R. (2004). Psychosocial aspects of burn injuries. *BMJ*, *329*, 391–393. doi:10.1136/bmj.329.7462.391

World Bank (2019, August 27). World Bank country and lending groups—Country classification. Retrieved from https://datahelpdesk.worldbank.org/knowledgebase/articles/906519.