

REVIEW

Distance Interventions for Children with Sleep Problems: A Review

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Abstract: Sleep problems in childhood are frequent and may cause damage to the children and their families; however, parental orientation appears to be effective in its many new formats, such as the distance treatment. This study aimed to review the literature about behavioral intervention performed by distance to sleep problems in childhood and summarize the main characteristics of such interventions. Searches were performed up to November 2021 in BVS Psicologia ULAPSI Brasil, SCOPUS, and PsycINFO, using the key words: sleep problems, insomnia, nighttime fears, behavioral intervention, behavioral treatment, treatment, intervention, sleep, behavior, child, children, infant, mobile phones, smartphone, app, telephone, online, internet, bibliotherapy. We included 14 studies. The main results indicate that interventions were implemented between 2 and 12 weeks, the most reported procedure was pre-sleep routines, and semi-presentational interventions that required some presentational contact were the most frequent. Written educational information about sleep through bibliotherapy and telephone contacts were the most used tools to implement the remote component of interventions. Ten studies indicated improvements on children's sleep, and secondary results (parental sleep and/or mental health) were also reported among studies. Therefore, our findings suggest that distance interventions for childhood sleep problems are promising, but future research is still needed.

Keywords: Sleep problems, Distance intervention, Children, Review

1. Introduction

Sleep is a fundamental physiological and behavioral process for the health of the body^[1], responsible for about 40% of a child's day. However, sleep problems in childhood occur with a prevalence of 20 to 30%

^[2], and can negatively affect different aspects of child development^[3,4].

Half of the children population have trouble falling asleep and one third wakes up several times during the night and becomes sleepy during the day^[5]. These difficulties are associated with inadequate habits, such

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as lack of pre-sleep routine and parental inconsistency^[6]. Resistance of children to sleep can result from nocturnal fears, such as fear of the dark, or insomnia caused by difficulties related to sleep, such as the inconsistency of pre-sleep routines, and association with the presence of parents in the moment of falling asleep^[7]. This way, children who do not have a routine before going to sleep (showering, reading before going to bed, remain in a silent environment in the bedroom) may not have their sleep properly induced in appropriate time, and children who are conditioned to sleep only with the parents by their side, may experience difficulties falling asleep on their own. In this context, family members can also experience parental stress, depression, and marital maladjustment^[2].

Common sleep problems in childhood are treatable, mostly with behavioral intervention through parental guidance and effectiveness is shown in literature^[2,8-10]. Behavioral interventions based on parental guidance are traditionally carried out in person, aiming to reduce inappropriate behaviors and teach adequate sleep-related behaviors. Although the literature reports effectiveness of these interventions^[9,11], health professionals deal with challenges that restrict access to treatment^[12]. Parental compliance occurs in 50% of cases and approximately one third is absent in the first session^[13]. Thus, the characteristics of face-to-face interventions can make adherence to treatment difficult; therefore, new alternatives to involve parents in the treatment, including parental training via telephone, internet and written information, such as booklets, books or manuals have been developed^[14,15].

These self-directed interventions, as interventions that do not have the physical presence of a professional during treatment, have shown results similar to face-to-face guidance regarding their effectiveness^[15]. Such interventions also stand out for their flexibility, convenience, facility of access, reduction of time and cost associated with transporting participants to face-to-face meetings; therefore, distance interventions have several possible advantages compared to face-to-face interventions that can facilitate adherence to treatment and, at the same time, promote improvements in children's sleep problems^[13].

Studies that address the complaint of sleep problems in children and new distance treatment modalities have already been carried out. Mindell et al.^[17] investigated the caregivers' concerns about child sleep through a smartphone application, which was accessed mostly at night, when professionals are normally inaccessible. According to the authors, the high-rate use of this service, especially outside working hours, would support the

interest of parents regarding information and guidance for 24 hours, and not just while the professional is present, since the night shift could be the most propitious time for the use of technology or the most susceptible time for doubts about sleep to arise^[17].

There is still a shortage of reviews that studied interventions, especially distance interventions, to treat sleep problems among children. A recent systematic review that analyzed 10 studies about telehealth interventions for sleep problems among children and adolescents verified that most interventions were web-based and had a cognitive-behavioral approach to treat insomnia. Additionally, interventions focused on children were mediated by their parents, whereas adolescents engaged directly with the interventions^[18]. Another similar systematic review aimed to investigate the effects of interventions that were delivered only digitally for adolescents and young adults with insomnia. Only three studies were included in the review, but the authors found evidence of effectiveness of such interventions, and they argue that this format of intervention is a promising option for treating sleep problems^[19].

As noted, the few reviews on the topic included adolescents as the target population, with no review involving children only to this date. Interventions for adolescents may have different characteristics from interventions for children. Thus, there is still a gap in literature on the characteristics of remote interventions for children's sleep. Additionally, due to the prevalence and losses related to sleep problems in childhood, the relevance of better understanding new distance interventions, and the lack of previous reviews about remote interventions to treat sleep problems among children, it is relevant to review the literature about this topic.

Therefore, this study aimed to review the literature and summarize the main aspects of remote (telephone, online, bibliotherapy, etc.) behavioral interventions for children with sleep problems.

2. Materials and Methods

2.1 Search Strategy

Literature review were carried out between June and November 2015, latter the searches were updated until November 2021 in the electronic databases: BVS Psicologia ULAPSI Brasil, SCOPUS, and PsycINFO. The search descriptors should belong to one of the subgroups: (1) sleep problems (OR) insomnia (OR) nighttime fears, (AND) (2) behavioral (OR) behavioral treatment (OR) treatment (OR) intervention, (AND) (3) mobile phones

(OR) smartphone (OR) app (OR) telephone (OR) online (OR) internet (OR) bibliotherapy, (AND) (4) child (OR) children (OR) infant (OR) toddler. The searches were not restricted in language or year.

2.2 Eligibility Criteria

Exclusion criteria were: wrong population (sample with adults or adolescents); wrong intervention (pharmacological, exclusively face-to-face intervention or absence of interventions carried out at distance, not aimed at sleep problems); wrong outcome (studies that did not report sleep problems, insomnia, nighttime fears as outcome); and wrong study design (theoretical studies, literature review, abstracts or protocols without published results).

Inclusion criteria were: studies published in peer-reviewed journals; studies with a sample of children up to 12 years old; studies with behavioral, cognitive-behavioral or psychosocial interventions; studies with semi-presential or distance intervention; and studies with case report, case-control, controlled randomized trial or cohort designs.

2.3 Studies Selection Processes and Data Extraction

The stages of study selection followed the recommendations as suggested by PRISMA ^[16]. Thus, after the searches, duplicate studies were removed and then the studies had their title and abstract screened. Possible eligible papers had their full text assessed and then were excluded or included according with exclusion/inclusion criteria.

After the final inclusion, studies had their full text assessed. To better understand and summarize the main characteristics of studies about distance interventions for children with sleep problems, we developed a data extraction sheet containing the following elements: study identification (author, year), country of study, number of participants (n), age of participants, sleep problem addressed, intervention duration, procedures used, intervention format, instruments to assess results, and main results.

3. Results

3.1 Selection of Studies

Searches in databases resulted in 1.434 records. After duplication removal 721 records had their title and abstract screened. Of the 258 records retrieved for possible eligibility, 244 were excluded because they did

not meet the inclusion criteria; therefore, 14 studies were included in the present review. Figure 1 shows the study flowchart.

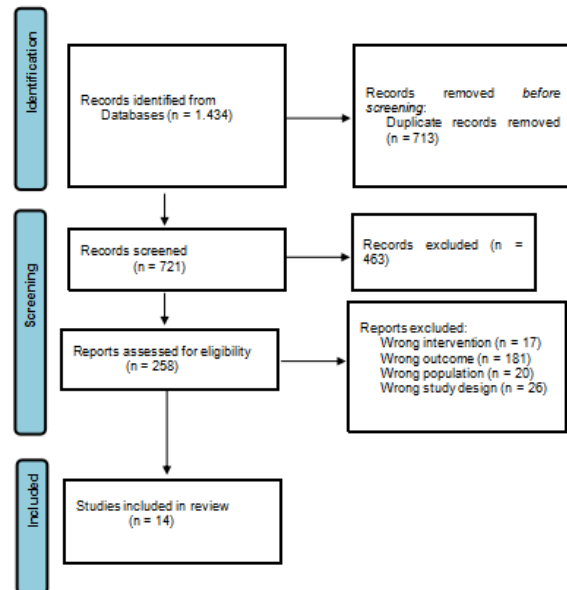


Figure 1. Study flowchart.

3.2 Studies Characteristics

The main characteristics of each included study are shown in Table 1, and the main results are described below.

3.3 Year and Country of Studies

Two studies were published between 1999 and 2003 ^[21,32]; two between 2004 and 2008 ^[20,22]; five between 2009 and 2013 ^[7,25,26,28,30]; and five were published from 2014 to 2018 ^[23,24,27,29,31].

Only one paper is from Brazil ^[27], one from Germany ^[28], one from Sweden ^[21], one from Israel ^[7], two from Australia ^[23,29], two from Canada ^[26,30], three from the United States ^[20, 24, 25] and three from the United Kingdom ^[22,31,32].

3.4 Sample of Studies

The largest sample comprised 781 children ^[23], whereas the study with the smallest sample size was three children ^[26]. Eight studies had samples with children older than 1 year old ^[7,20,24,26,27,29,31,32], three studies had children with less than 1 year old in their sample ^[22,23,30], and also three studies had their sample composed by children with less and more than 1 year old ^[21,25,28]. Ages from children among studies ranged from newborns ^[30] to 10 years old ^[32].

Table 1. Characteristics of studies.

Study	Country	n	Age	Sleep problem	Duration	Procedures	Format	Instruments	Results
^[20] Burke et al. (2004)	USA	4	2-7 y/o	Insomnia	2-4,5 weeks	Pre-sleep routine Positive reinforcement	Bibliotherapy	Sleep diary CBCL	Decrease of disruptive behaviors to sleep, fewer awakenings during the night, improvements of behaviors during the day and good acceptance of the intervention
^[21] Eckerberg (2002)	Sweden	67	4-18 months	Insomnia	3 weeks	Extinction Educational information about sleep	Bibliotherapy Face-to-face consultations Telephone	Sleep diary	Decrease in awakenings during the night
^[22] Hall et al. (2006)	UK	39	6-12 months	Insomnia	2 weeks	Pre-sleep routine	Face-to-face consultations Telephone	PSQI CESD MAF MCISQ ESS DAS	Increase in parental sleep quality, humor, and knowledge about infant sleep, and decrease in fatigue
^[23] Hiscock H., et al. (2014)	Australia	781	4-13 weeks	Insomnia	12 weeks	Educational sleep information Pre-sleep routine	Face-to-face consultation Bibliotherapy DVD Telephone	MCISQ EPDS	Decrease in depressive symptoms among mothers, crying, and sleep problems among children
^[7] Kushnir & Sadeh (2012)	Israel	104	4-6 y/o	Nighttime fears	4 weeks	Positive reinforcement Relaxation	Face-to-face consultation Telephone	CBCL 1,5-5 y/o BCSQ Interview Actigraphy	Decrease in nighttime fears, sleep latency, and awakenings during the night
^[24] Lewis et al. (2015)	USA	9	5-7 y/o	Nighttime fears	4 weeks	Pre-sleep routine Gradual exposure	Bibliotherapy Telephone Face-to-face consultation	ADIS-P What My Child Can Do at Night in the Dark PPVT-4 KFQ PAS	Decrease in nighttime fears, and increase in quantity of nights the children slept in their own bed
^[25] Mindell et al. (2011)	USA	264	6-36 months	Insomnia	3 weeks	Pre-sleep routine	Online	PSQI BISQ POMS	Decrease in sleep latency and awakenings during the night among children and parents, decrease in problematic behaviors among children, increase in sleep duration and quality, and decrease in fatigue and depressive symptoms among parents
^[26] Moon et al. (2010)	Canada	3	5-9 y/o	Insomnia	7-9 weeks	Positive reinforcement Gradual exposure	Bibliotherapy Telephone	CBCL 6-18 CSHQ Actigraphy Sleep diary	Decrease in sleep latency, and overall behavior problems
^[27] Rafihi-Ferreira et al. (2018)	Brazil	68	4-6 y/o	Nighttime fears	4 weeks	Pre-sleep routine Positive reinforcement Gradual exposure	Bibliotherapy Telephone Face-to-face consultation	Sleep diary Interview SHIPC PAS FSSIP CBCL 1,5-5	Decrease in nighttime fears, anxiety, behavior problems, and increase in quantity of night the children slept by their own
^[28] Schlarb & Brandhorst (2012)	Germany	55	8-57 months	Insomnia	6 weeks	Positive reinforcement Relaxation	Online	CBCL 1,5-5 Mini-KiSS Online Questionnaire Sleep diary	Decrease in awakenings during the night, need of parents help to fall asleep, and increase in sleep duration

Study	Country	n	Age	Sleep problem	Duration	Procedures	Format	Instruments	Results
^[28] Stewart & Gordon (2014)	Australia	4	6-10 y/o	Nighttime fears	5 weeks	Positive reinforcement Gradual exposure Relaxation	Face-to-face consultation Online Telephone Bibliotherapy	CBCL 6-18 Fear Thermometer: Child and parent report FSSC-II PFQ Interview Sleep diary	Decrease in nighttime fears
^[30] Stremler et al. (2013)	Canada	246	0-12 weeks	Insomnia	4 weeks	Pre-sleep routine	Face-to-face consultation Bibliotherapy Telephone	Actigraphy Sleep diary Fatigue-VAS GSDS EPDS	No changes in children or parents sleep
^[31] Stuttard et al. (2015)	UK	15	1-4 y/o	Insomnia	3-10 weeks	Educational information about sleep	Face-to-face consultation Telephone	Interview	Good acceptance of treatment, but no changes in sleep data
^[32] Wiggs & Stores (1999)	UK	30	5-10 y/o	Insomnia	4 weeks	Extinction Positive reinforcement Pre-sleep routine	Face-to-face consultation Telephone	Composite sleep index Actigraphy	No changes in children's sleep, but increase in parents sleep duration

3.5 Sleep Problems and Interventions

Insomnia was addressed in 10 studies ^[20-23,25,26,28,30-32], whereas four studies addressed nighttime fears ^[7,24,27,29].

The briefest interventions lasted 2 weeks ^[20,22], and the longest intervention lasted 12 weeks ^[23]. The most frequent procedure used among interventions were pre-sleep routines (n=8) ^[20,22-25,27,30,32], followed by positive reinforcement (n=7) ^[7,20,26-29,32].

Semi-presential interventions which had a remote format combined with some presential consultations was the most frequent (n=10) ^[7,21-24,27,29-32]. Among the resources used to implement the interventions remotely, the most frequent was the telephone (n=11) ^[7,21-24,26,27,29-32], followed by bibliotherapy (n=8) ^[20,21,23,24,26,27,29,30], and online interventions (n=3) ^[25,28,29].

3.6 Instruments and Results

Scales were used to measure results in 13 of the 14 included studies, only Stuttard et al.'s ^[31] study did not use any scale to assess results. Sleep diaries were the most frequent tool among studies (n=7) ^[20,21,26-30], whereas actigraphy was used only in four studies ^[7,26,30,32].

Ten of the fourteen studies reported improvements on children's sleep, and among the four studies that did not find significant changes on children's sleep ^[22,30-32], one of them reported that the new format of implemented treatment had good acceptance among participants ^[31], and other studies found improvements on parent's sleep ^[22,32]. In addition to children's sleep, four studies also reported improvements of secondary results among parents, such as, improvement sleep ^[22,25,32], or better mental health

outcomes ^[22,23,25].

4. Discussion

The present study aimed to review the literature about distance interventions for children with sleep problems and summarize the main characteristics of such interventions. Only 14 studies met the inclusion criteria and could be included. This small number of studies that could be included is similar to other reviews that also investigated remotely-delivered treatments for sleep problems ^[18,19], and this may indicate that there is still a lack of studies on the topic.

The countries where most included studies were developed were USA and UK, and majority of studies were published in the most recent years. Sample size of studies and age from children varied greatly, ranging from 3 to 781 children aged from newborns to 10 years old. These variations of sample sizes among studies and age of participants were also found by other similar reviews. The authors of a systematic review that addressed telehealth interventions for children and adolescents with sleep problems report studies with samples ranging from 3 to 264 participants, and ages ranging from 6 months to 10 years old among the children population ^[18]. Similarly, Werner-Seidler, Johnston, & Christensen ^[19] that addressed digital cognitive-behavioral therapy for adolescents and young adults with sleep problems report study samples ranging from 26 to 96 participants aged from 12 to 34 years old.

Insomnia, defined as the difficulty of falling asleep or having night awakenings, was addressed in most included studies. This prominence of insomnia over nighttime fears

could be explained by the fact that insomnia is the most prevalent complaint about sleep problems among children^[9].

Overall, interventions were relatively brief, as none of them lasted longer than 4 months; additionally, almost all interventions mixed remote components, such as telephone contacts with parents and bibliotherapy, with presentational components, such as face-to-face meetings with parents. The most frequent distance components of interventions comprised telephone contacts, written educational sleep information for parents, and online interventions, respectively. Brief interventions were also identified by other reviews. Interventions lasting from 2 to 6 weeks, which had written educational information about sleep, and telephone contacts with parents were also some of the main intervention characteristics identified by McLay et al.^[18]. Six to seven weeks of treatment were also reported in the Werner-Seidler, Johnston, & Christensen's study^[19], but only digitally delivered, such as through web-based or mobile phone application, were included in their review.

Subjective (e.g., scales, sleep diaries, and interviews), and objective (e.g., actigraphy) measurement tools were used to assess results among studies. Scales answered by the parents were the most frequent tool used to assess results, followed by sleep diaries. Only four studies used actigraphy, a device placed in the children's finger during the night to monitor sleep patterns, to assess results. Likewise, McLay et al.'s^[18] systematic review report majority of studies using sleep questionnaires to assess results, but only half of studies assessed results through sleep diaries, and actigraphy. Self-reported scales were also the most used measurement tool used to assess results among the three studies included in the Werner-Seidler, Johnston, & Christensen's systematic review^[19], but two of them, that had the same author, used actigraphy as an objective measure.

Ten studies (71,4%) included in the present review reported improvements in the children's sleep. Of the four studies that did not report such improvements, three found secondary positive outcomes, such as acceptance of treatment^[31], improvements in parental sleep^[22,32], or in parental mental health^[22,23,25]. Only one study did not report significant changes in children or parent's sleep^[30]. McLay et al.'s^[18] systematic review also found most of included studies (60%) reporting improvements in children's sleep, and although Werner-Seidler, Johnston, & Christensen's systematic review^[19] included only three studies with a population older than the target population of the present review, the authors found evidence of effectiveness of treatments for sleep problems digitally delivered.

It is noteworthy that all interventions analyzed in the present review involved a parent guidance approach to teach them how to implement a pre-sleep routine that could induce and be associated with sleep, or to guide their actions at home when children expressed the resistance of going to bed. This approach involving parents seems to be the most indicated when trying to improve children's problems^[2,8-10,33]. Interventions implemented remotely becomes even more interesting and relevant, as this new format provides additional benefits, such as the interventions become more easily accessible for more people, more environmentally friendly, and convenient because there is no need to travel distances to attend a clinical appointment^[18]. Therefore, remote interventions could be a new feasible treatment format^[13,20,31].

Some limitations of this study must be addressed, such as the shortage number of studies that could be included in the present review, the diversity of sample sizes, ages of participants, duration of interventions, and instruments used to access outcomes among studies. Alongside this diversity, it is noteworthy that each study assessed different outcomes (e.g., child sleep, children's behavior, parents' sleep, parents' well-being), which makes a quantitative analysis of the results unfeasible. Finally, the absence of a meta-analysis makes it is more difficult to draw more definitive conclusions about the real effectiveness of distance interventions for children with sleep problems.

Despite these limitations, the present review still is the only one, to our knowledge, that aimed to summarize the literature about distance interventions for children with sleep problems and provides relevant information that could help guiding future research and assist the development of future evidence-based interventions on this field. Therefore, we recommend more studies with strong designs, such as randomized controlled trials, in order to facilitate quantitative analyzes on the effects of interventions for children with sleep problems, when compared to control groups (e.g., waiting list, usual face-to-face treatment). With a greater number of quality studies, future reviews with meta-analysis may be carried out in order to reach clearer conclusions about the real effectiveness of these interventions.

5. Conclusions

Child sleep problems may lead to a lot of harm to children's development and the well-being of their caregivers^[2-4]. Interventions for this problem usually involves parental guidance to teach parents and caregivers how to deal with inadequate children's behaviors when it

is time to go to bed and create a sleep routine in order to facilitate children's sleep. Such interventions have been shown to be effective in the literature ^[2,8-10], but a number of aspects of face-to-face treatments, such as the time spent traveling to attend the sessions, can make adherence to treatment more difficult ^[13-15].

Therefore, new formats of completely distance or semi-presential treatments have been developed. Usually, these distance interventions involve parental training via telephone, internet or written information ^[14,15]. Additionally, remote interventions have advantages when compared to face-to-face interventions, such as greater convenience and less time and cost required to attend a presential session ^[13]. Given these new treatments available, it is relevant to investigate and summarize the main characteristics of such interventions.

Our results show that most of distance interventions for children with sleep problems were brief, lasting from 2 to 12 weeks, and semi-presential interventions, that required at least one in-person session with the professional, were the most frequent treatment. The telephone, followed by written informations were the most used tools to implement the distance intervention. Results of studies were majority assessed through subjective measures, such as scales and sleep diaries, and 71,4% of the included studies reported some form of improvement in the children's sleep. Those studies that did not report improvements in children's sleep found secondary outcomes, such as improvements in parental sleep or mental health. Overall, these findings are in line with other similar reviews ^[18,19].

Still, despite the promising results that suggest improvements of children's sleep and secondary outcomes resulting from distance interventions for children with sleep problems, more studies are still necessary to the scientific evidence of this field.

Authors' Contributions

TP performed the searches, selection of studies, wrote the first draft and reviewed the paper. JS reviewed the paper. RF designed the study and reviewed the paper. EF designed the study and reviewed the paper.

Conflict of Interest

The authors declare no conflict of interest.

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Abbreviations

y/o: Years old

CBCL: Child Behavior Check List

PSQI: Pittsburgh Sleep Quality Index

CESD: Centre for Epidemiologic Studies Depression Scale

MAF: Multidimensional Assessment of Fatigue Scale

MCISQ: Maternal Cognitions about Infant Sleep Questionnaire

ESS: Epworth Sleepiness Scale

DAS: Spanier's Dyadic Adjustment Scale

MCISQ: Maternal Cognitions about Infant Sleep Questionnaire

EPDS: Edinburgh Postnatal Depression Scale

BCSQ: Brief Child Sleep Questionnaire

ADIS-P: Anxiety Disorders Interview Schedule for Children - Parent Version

PPVT-4: Peabody Picture Vocabulary Test

KFQ: Koala Fear Questionnaire

PAS: Preschool Anxiety Scale

BISQ: Brief Infant Sleep Questionnaire

POMS: Brief Infant Sleep Questionnaire

CSHQ: Children's Sleep Habits Questionnaire

SHIPC: Sleep Habits Inventory for Preschool Children

FSSIP: Fear Survey Schedule for Infants-Preschoolers

FSSC-II: Fear Survey Schedule for Children-I

PFQ: Parent Nighttime Fear Questionnaire

Fatigue-VAS: Fatigue Visual Analogue Scale

GSDS: General Sleep Disturbance Scale