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The consequences of having an excessively crying infant in the family: an integrative review by Botha, Elina; Joronen, Katja; Kaunonen, Marja

Abstract

Background: The consequences of having an excessively crying infant in the family is acknowledged in research, yet to our knowledge, no literature review has been made regarding the overall consequences to the family and infant. This integrative review fills the gap with the aim to review and synthesize current research.

Aims: To identify, describe and synthesize previous studies on the consequences of having an excessively crying infant in the family.

Design: An integrative review of literature published between January 2008 and April 2018. The search was conducted in the following databases: MEDLINE, CINAHL, PsycINFO, Medica and Journals@Ovid. Empirical literature reporting the consequences of having an excessively crying infant in the family was eligible for inclusion. Quality appraisal was performed using CASP tools and JBI checklists. The extracted data were analyzed using thematic analysis.

Findings: Thirty-one articles were included in the review. Ten themes were identified: The consequences of having an excessively crying infant in the family creates desperation, it ruins everyday life, impairs breastfeeding, isolates and casts parents into loneliness, strains and breaks family relationships with feelings of failure as a parent. The excessively crying infant in the family brings a struggle that can lead to physical and mental exhaustion. The infant may have problems later in childhood. Parents are actively trying to solve the problem and to adjust. Time allows survival with traces of negative symptoms, feelings and memories.

Conclusions: The consequences of having an excessively crying infant in the family are harmful for relationships and health. Caring for the crying infant can lead to exhaustion which might escalate into abuse. These findings help professionals understand this complex phenomenon and encourage actions for concrete support. Further research is required to explore evidence-based interventions that can help excessively crying infants and their families.

Keywords: excessive infant crying, infant colic, infant, family, integrative literature review

Introduction

The prevalent estimates of excessively crying infants are inconclusive since they vary between 3-40% and 14-30% (1, 2). These variations are partly explained by inconclusive diagnosing methods and the difficulty in defining excessive crying –using experience or existing criterion. In addition, there are unreported amounts of newborns that are inconsolable at some point of their early life, with more or less serious consequences. Unexplained crying is the most common reason for pediatric consultations and hospital

emergency department visits in the first weeks of life (2, 3), thus the impact of excessive infant crying on health care services is indubitable.

Crying is the only language that an infant can use to indicate a need, therefore crying is essentially a good, life protecting ability. However, if the crying persists despite the endless efforts of the parents, it becomes a problem. An inconsolable infant signals the carers' insufficiency, incompetence and unpreparedness to meet the needs of their child, which has a significant impact on the parent-infant relationship (4). Hearing the infant's cry causes distress, anxiety and hopelessness in any parent (5, 6). Life with the baby is nothing as the parents expected (7).

An attack of crying or extended and repeated periods of crying or fussing in an otherwise healthy infant is typically defined as "colic". A widely used criteria for colic is Wessel's (8) "rule of threes" which indicates that the infant cries for at least three hours a day, for at least three days a week, for at least three weeks in the first three to four months of life. Colic starts typically when the infant is two weeks old and continues until twelve to sixteen weeks of age. Overall, parents' experience of the crying that is inconsolable is sufficient to create disturbance in everyday life and expectations of having a baby (9) and therefore should be taken seriously.

Explaining colic is puzzling. It has been hypothesized that there may be multiple reasons for excessive infant crying. Maternal stress during pregnancy (10), pre, peri and postnatal neurophysiological, psychosocial (11) or neurological factors might be the reason for colicky crying (12). Ear infections are also considered an underlying reason for crying (13). In addition, sleeping, feeding, thermoregulation, immunological, endocrinological, gastrointestinal factors and intestinal bacteria (14, 15) are trying to explain excessive crying in infants. A theory has been proposed that colic is related to a complex interaction between over- and under-stimulation, state control and inborn temperament (16, 17).

Parents need much help and support to cope throughout the infant's colicky phase; every crying incident that the parent cannot calm is burdening (7, 11). There are different interventions available to calm a persistently crying infant. Evidence (18) suggests that behavioral interventions may present a solution for infant colic, but further outcome research is needed (19, 20).

Most adults have first or second-hand experiences of an inconsolably crying infant. This experience causes traumatic memories with discussions on different social media forums. People and professionals debate on etiology, correct diagnosis, causes and treatments. In addition, colic has provoked much research from different angles and yet left results and conclusions thin; this health problem remains still unresolved. There are studies and reviews from recent years that explain the impact that an excessively crying infant has on the parent-infant relationship (4), but a review of the broader consequences for the whole family and the infant him or herself is absent. Although it is known that excessive crying of an infant causes stress in parents and disturbs the health and dynamics in the family in several ways (4), the subject has recently been researched further. Therefore, a larger picture of the consequences of infant crying in current scientific literature needs to be outlined and updated.

This integrative review synthesizes empirical research findings to improve the understanding of the many consequences a crying infant has on the family and on him or herself. Additionally, it highlights the need to prevent problems and to raise awareness of the families that need an intervention. It is imperative for health care professionals to understand what the complex life with a colicky infant entail and provide concrete help. Furthermore, the costs of health care can be reduced by giving parents skills to manage with their crying infant and thus avoid unnecessary and stressful visits to the emergency department (2, 3, 21). The understanding of the risks of excessive crying might save infants' lives (22).

The review

Aim, design and search methods

The aim of this article was to identify, describe and synthesize previous studies on the consequences of having an excessively crying infant in the family. A systematic literature search was conducted according to the PRISMA statement (23). The identified literature was evaluated and appraised by two reviewers and its results were synthesized to develop common themes. An integrative literature review of 31 research articles and their findings was performed. An integrative review method (24) allowed the use of original studies with different methods, thus making possible in-depth understanding of this complex phenomenon. The review process consisted of five stages: identifying the research problem, literature search, data evaluation, data analysis and presenting the synthesis of the results.

The search was conducted in five databases during April 2018. Medline, CINAHL, PsycInfo, Medic and Journals@Ovid were consulted to include refereed journal articles. Search terms are in Table 1.

Table 1. Study search terms

The search was limited to time between 1/2008- 4/2018 to consider most recent research, and articles published in English only. Studies were excluded if they were not relevant to the review or the crying could not be separated from a cluster of regulatory problems, such as infants' eating or sleeping difficulties.

The studies, where infant crying was presented to the research objects by a recorded cry sound only, were excluded. A recording of crying does not present an authentic picture of an excessively crying infant and therefore will not measure consequences reliably.

Search outcome

Robust review methodology was used to identify studies describing the consequences of having an excessively crying infant in the family. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) framework was used to search, identify and screen studies (23). The search and selection process of this review are outlined in Figure 1.

After removal of duplicates, the titles and abstracts of all identified papers were initially screened against the inclusion and exclusion criteria by two independent reviewers, who discussed the results of the initial screening process to achieve consensus. In total, 28 studies met the criteria for inclusion. Three additional studies were found in the reference lists of the included studies. Finally, the integrative review included 31 studies. The included studies comprise both quantitative and qualitative empirical studies.

Figure 1 Flow chart of study selection

Quality appraisal

The quality of each research article was evaluated using CASP tools (25-27). The studies that used cross-sectional design were evaluated by JBI checklists (28), since a CASP checklist is not available for cross-sectional studies. All chosen articles were of good quality, but there were some limitations in reporting bias in measurement or in clarity of confounders. It was not seen to affect the results compromisingly.

Some studies reported only parts of a larger research, leaving other parts unexplained. None of the studies were excluded because of the above minor limitations or of inadequate scientific quality. A strength of this review and its nature is that 11/31 included studies that were of large cohort longitudinal design. Longitudinal studies add to the value of this review, as long-term consequences of having an excessively crying infant in the family are addressed.

Data extraction and synthesis

Data were extracted from primary sources and analyzed using thematic analysis as described by Braun and Clarke (29). Thematic analysis is a tool for rich, detailed and complex description of collected data. The steps of the thematic analysis were familiarizing with the data, generating codes, searching for themes and naming the themes descriptively. In each step, the data corpus was re-examined to make sure no meaning was lost.

Table 3. Characteristics of included studies

Findings

Thirty-one articles were included in the final review (see Table 3). The overall quality of the included studies was good. Ten themes were identified from the included papers: The consequences of having an excessively crying infant in the family creates desperation. It ruins everyday life, impairs breastfeeding, isolates and casts into loneliness, strains and breaks family relationships and brings feelings of failure as a parent. The excessively crying infant in the family brings a struggle that can lead to physical and mental exhaustion. It places the infant at risk for danger and problems later in childhood and adolescence. Parents are actively trying to solve the problem and adjust. Time allows emerging survival with traces of negative symptoms, feelings and memories.

Summary of themes

The excessively crying infant creates desperation in the family

The excessively crying infant causes feelings of distress, helplessness, hopelessness, anxiety and worry in his or her caretakers (5, 7, 30-33). Feelings of shame and guilt burdens the parents (7, 34). The fathers of the crying infants are feeling both frustrated and angry (31, 35). Both parents are feeling unprepared for the situation and must process their failed expectations (30, 31, 36). The parents' feelings might also be ambivalent (30, 35-37).

Excessive crying ruins everyday life

Having an excessively crying infant in the family lowers the general quality of life (38) and creates sleeping problems for the parents (31, 35, 39). The stressful life at home can disrupt both work and sex-life (31). Dealing with inconsolable crying can result in an unhealthy escape where a parent returns to a former addiction, like smoking (34, 40, 41).

Excessive crying impairs breastfeeding

Trying to breastfeed the infant that cries with no apparent reason is difficult. Consequently, it causes a decrease in exclusive breastfeeding and breastfeeding duration (42-44).

Inconsolable crying isolates and casts the parents into loneliness

The excessively crying infant can bring the family into social exclusion, isolation and loneliness (7, 31, 36, 37). They might seek and fail to get support from people and professionals around them (30, 35, 37). The parents are disappointed and disillusioned with health professionals, expecting them to change in how they work (30, 37).

The excessively crying infant strains and breaks family relationships

The excessively crying infant strains and changes family relationships by causing marital stress, arguments and feelings of resentment towards the partner (30, 31, 37, 39). The strain of having an excessively crying infant may even advance divorce (45).

Caring for a colicky infant brings feelings of failure as a parent

The parents of an inconsolably crying infant experience feelings of incompetence, inability and inadequacy (5, 33, 34, 36, 37, 41). The stressful situation in the family forces the parent to renegotiate his or her identity (30, 36); assuming the role of a mother or father is not what they thought it would be like. The parent can become exceedingly self-critical (41) and may experience feelings of failure (30, 33). Moreover, the infant that cries inconsolably appears to impair parental self-efficacy (33, 46).

A struggle that can lead to physical and mental exhaustion

Caring for an excessively crying infant brings exhaustion to the limits (7, 31, 34, 37). Life can turn into a burdensome struggle that affects everything else (7, 33, 37, 38). It can ultimately lead to maternal or paternal depressive symptoms (9, 35, 38, 39, 47, 48).

Excessive crying might place the infant at risk for danger and problems later in childhood and adolescence

Longitudinal studies indicate that excessive crying in infancy might precede antisocial behavior and conduct problems later in childhood and adolescence (49, 50). Excessive crying might also precede risks for hyperactivity or inattention problems later in childhood (50, 51). In addition, excessive crying might precede problem behavior later in childhood (50, 52).

Infant colic might propose a risk for mental health and emotional problems, such as anxiety, later in childhood (50, 53). On the other hand, the fact that the child was colicky in infancy does not predict developmental coordination disorders in childhood (54). The most dangerous consequence for the infant is that excessive crying places him or her at risk for abuse and even mortal danger. According to Talvik et al. (22), almost all parents in their study group had contacted their physicians or other specialists because of excessive crying prior to admission to a hospital with Shaken Baby Syndrome (SBS) or death.

Parents are actively trying to solve the problem and adjust

Parents are trying everything to understand and help the excessively crying infant (7, 34, 37, 55, 56). Parents are moving forward in daily life by trial and error (7, 36, 37). Parents are suffering together and sharing the burden (7) and taking actions to create hope in the situation (31).

Time allows emerging survival with traces of negative symptoms, feelings and memories

Parents describe emerging feelings of survival later, over time (31). Parents may start to regain confidence in parenthood as knowledge and experience builds up, and the crying is left behind. Despite this, families are left with a fading residual of negative symptoms, feelings and memories (37). Families do find relief, hope and healing with time (7, 37).

Discussion

This review unveils the consequences of having an excessively crying infant in the family. Prior reviews have shed light on the matter (4, 57) but this review, besides updating the most current research, also discovers the consequences on the infant, him or herself. The consequences of having an excessively crying infant in the family are devastating. It creates desperation in everyday life as sleeping and feeding become struggles. Crying isolates the family to the home. Excessive infant crying strains and breaks relationships between mother and father and between parent and infant (4).

Hours, days and weeks of inconsolable infant crying creates a struggle that can lead to exhaustion and ultimately – to parents' depressive symptoms. The consequences of prolonged stress and fatigue on health and wellbeing are evident (58, 59). Responsibility for

a new life, mixed with exhaustion, is a challenging combination. The infant is fully dependent on the parent. In addition to caring for the infant's every basic need, close interaction is equally and vitally important. Early interaction includes eye contact, cheerful chats, gentle holding, skin-to-skin contact and cherishing new life (60), which are all endangered if the parent is exhausted or feeling depressed (61). Moreover, depression may increase the use of health care services (62).

The birth rate is decreasing in many countries (63) as people critically consider whether becoming a parent is worth the struggle. Stories and pictures of inefficacy and feelings of failure overshadow the thought of starting a family and having children or not. This gives even more reason to take the consequences of having a colicky infant in the family seriously and actively find ways to bring back the joy to parenthood.

Excessive crying places the infant at risk for danger of abuse and problems later in childhood and adolescence. Recent longitudinal research points out that waiting it out is not optimal advice for parents with an excessively crying infant in the family. For example, Smarius et al. (50) has proven that there might be previously unknown consequences for the infant in later childhood. Excessive crying might precede emotional and mental health problems later in the child's life.

Parents will go to great lengths to help their crying infant. True and false information, solutions and advice is available online and in social media. Faceless peer support may help, but it may also harm. Parents may get confused in the information overload and acquire unhelpful and even damaging advice from strangers. The professional is in a unique position to be of help. If the professional does not step up, parents will look elsewhere for advice.

The excessively crying infant increases the health care costs in the society – monetary and other. Untimely ER and other visits to the GP takes time and costs money. According to Calado et al. (3) and Halpern & Coelho (2), excessive crying is one of the most common reasons that parents bring their infant to the hospital, mostly because they do not know what else to do. An untimely hospital visit might also mean that it is too late. Excessive crying is a known trigger for infant shaking that can lead to lethal head trauma (22, 64). Preventing parents from reaching the point of serious abuse is vital.

There are ways that health care professionals can support and help the family amid this chaotic time. Firstly, the issue needs to be brought up during the child's clinic visits, and not to measure and count how long the infant cries at the time or how many times a week, but emphasize on the parents' experience on how burdening it is (9). If the parent feels that the infant is inconsolable, then concrete, evidence-based advice and teaching of baby calming skills are in place. Secondly, listening and validating the issue, ensuring the parents' opportunity to discuss the situation, are also helpful. Thirdly, the parents need to be warned of danger. They need to be advised on what to do in case they approach their own limits to harm the infant.

Strengths and limitations

The strengths of this review are that two reviewers made the study selection independently. Data extraction and thematic analysis was made in cooperation with all authors. The included literature was evaluated with checklists according to research design. Moreover, the fact that the included literature consists of heterogeneous methodology made the amount of included studies broad and therefore the results rich. In addition, 11 out of 31 research articles had a longitudinal cohort design, which strengthens the cause-effect perspective of this literature review. When researching infants and parents, it is more common to have mothers as the target group, but in many of the included studies fathers were either included in good balance or even the only subject of the research.

Nevertheless, this integrative review has limitations. The searches may not have found all the relevant studies. Some literature was excluded when excessive crying was not researched separately, but as a part of a variety of regulatory problems, such as eating and sleeping problems. This may result in some lost information.

Conclusion

This literature review found evidence that excessive infant crying has vast, lasting and far-reaching consequences. In the light of this evidence, a serious health problem as this, should gain more attention amongst health professionals working with families. These consequences may affect the early interaction between parent and infant and therefore negatively affect the growth and development of the child. The relationship between the parents becomes strained and the health of everyone in the family at risk. Inconsolable crying of an infant in the early months of new life becomes chaotic instead of a happy, content and satisfying experience and may affect the families' plans to have more children in the future.

It is imperative that all advice and help from health professionals, who are in a unique position to help the families of crying babies, are based on evidence. Therefore, there is a further need to research and report interventions that can help excessively crying infants and their families in the future. A strategy for an early intervention to alleviate the burden of having an excessively crying infant has potential to strengthen the health of families from the earliest beginning. How the siblings of the excessively crying infant experience the situation, has not been researched and is a suggestion for future research.

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Table 1 Study search terms

Keywords	Search terms (* = truncation)
Family	famil*, mother*, father*, maternal*, paternal*, parent*, sibling*
Crying	colic*, fuss*, cry*, irritab*
Infant	infant*, newborn*, bab*, neonate*, "three month*"

Table 3 Characteristics of included studies

Authors, year and country	Purpose	Design & Measure	Sample
Abacı, Gökçe, Tuygun, Karacan, Öner (2013) Turkey	To measure the psychosocial status and quality of life in mothers of babies with infantile colic (IC).	Quantitative, cross-sectional, randomized control trial. BDI to measure depression, STAI-1 and STAI-2 for level of anxiety (stait and trait) and quality of life (Short Form-36).	78 mother-infant dyads (Group 1: n= 39, Group 2: n= 39). Mean age in group 1 was 26 years and 25.3 years in group 2.
Bobevski, Rowe, Clarke, McKenzie, Fisher (2015) Australia	To examine 1. The psychometric properties of the Demoralization Scale in a community setting and 2. The prevalence of demoralisation symptoms among primiparous women in the community and 3.	Quantitative, cross-sectional study that based on a cluster randomised control trial. Telephone questionnaire interview using the Demoralisation Scale.	400 primiparous women attending community maternal health centers. Mean age: 31.0 years.

	Factors that are uniquely associated with demoralization in the early postnatal period.		
Brand, Furlano, Sidler, Schulz, Holsboer-Trachsler (2014) Switzerland	To examine the link between cortisol secretion, crying and sleeping of infants characterized by infantile colic and mothers' psychological well-being and own sleep.	Quantitative, correlational study. Questionnaires regarding the infant's crying and sleeping patterns. Infant's sleep was objectively assessed with actigraphs. Cortisol secretion was measured by saliva samples in the mornings. After 4 weeks, infants were assessed again. Mothers completed questionnaires assessing their psychological well-being and sleep.	24 mothers and infants (mean age 8 weeks). Mean age: 35.04 years.
Brown, Heine, Jordan (2009) Australia	To examine the physical and mental health outcomes at school-age of a cohort of children who participated in a randomised clinical trial of treatments for persistent crying in infancy.	Quantitative, longitudinal follow-up study to a prior randomised clinical trial. Participants were compared to community samples. Participants and parents, who were hospitalized for persistent crying in infancy, attended a physical examination and clinical mental health assessment of the children. Parents completed a number of questionnaires that assess child utilization of health services, sleeping habits, mental health problems, well-being, child vulnerability and recent life events etc.	75 infant-parent dyads participated. Children aged 5-8 years old.
Cook, Giallo, Petrovic, Coe, Seymour, Cann, Hiscock (2017) Australia	To examine the relationship between unsettled infant behaviour and fathers' depressive symptoms, cognitions surrounding infant sleep and personal sleep in a community cohort.	Quantitative, community cohort study. Measures included father report of infant sleep and crying problems, depressive symptoms, cognitions about infant sleep and own sleep quality and quantity.	102 fathers of healthy infants at 4 weeks, 4 months and 6 months of age. Mean age: 35,7 years.
Cox, Roos (2008) South Africa	To describe the experiences of first-time mothers who seek	Qualitative, exploratory, descriptive and contextual. In-depth, semi-structured, phenomenological	6 participants. Purposive sampling of first-time mothers between

	medical help for their colicky infants.	interviews, which were analysed by descriptive analysis.	25-35 years of age, that sought help for their infant's crying. Infants were between 0-12 months of age.
Ellett, Appleton, Sloan (2009) USA	To describe fathers' experiences of living with a colicky infant.	Qualitative, interpretive phenomenological research. In-depth interviews.	10 fathers between the ages of 19-45.
Fallesen, Breen (2016) Sweden	To study how a temporary life change, such as having a child with infantile colic, may affect the timing of divorce.	Quantitative, longitudinal study, developing and testing a Bayesian learning model on data of couples who had a child in 1995, and following up their relationship status until 2006.	4920 randomly sampled couples from a Danish longitudinal survey of Children (DALSC) who lived in the same address and both registered as parents.
Gaffney, Beckwitt, Friesen (2008) USA	To describe mothers' reflections of perceived infant irritability and postpartum tobacco use.	Qualitative, descriptive study of mother's who participated in a mixed-methods study of smoking relapse in women postpartum. This adds qualitative data to the prior study (Gaffney et. al. 2008). Semi-structured interviews.	86 mothers who intended to stay smoke-free postpartum. Ages between 20-30 years.
Gaffney, Henry, Douglas, Goldberg (2008) USA	To extend knowledge of tobacco use triggered by mothers or infants.	Quantitative, descriptive, correlational and cross-sectional design. Comparative analyses were made for 3 groups formed based on their intentions to be nonsmokers after delivery and actual smoking behavior 2 weeks after birth.	130 mothers of infants from a study of smoking relapse. Mean age: 23.2 years.
Goodnight, Donahue, Waldman, Hulle, Rathouz, Lahey, D'Onofrio (2016) USA	To gain understanding of genetic and environmental contributions to associations between temperamental fussiness and ASB (Antisocial Behaviour) in childhood and late adolescence.	Quantitative, longitudinal, cohort study. Comparison of siblings and bivariate biometric modeling, to reduce familial confounding and examine genetic and environmental influences.	Participants came from a prospective cohort (9237 at 4-9 years and 7034 at 14-17 years), the children of a national sample of US women.
Howell, Mora, DiBonaventura, Leventhal (2009) USA	To identify modifiable factors associated with postpartum depressive symptoms.	Quantitative, longitudinal, observational prospective cohort telephone study. Mothers answered questions on demographic factors,	563 mothers were interviewed at 2 weeks and 6 months

		physical and emotional symptoms, daily function, infant behavior, social support and skills in managing infant and household.	postpartum. Mean age: 31 years.
Karaçam (2008) Turkey	To determine the factors that affect exclusive breastfeeding on healthy infants aged 0-4 months.	Quantitative, cross-sectional design. Questionnaire included independent variables, background questions, EPDS, the Multidimensional Scale of Perceived Social Support (MSPSS) and baby's form of nutrition.	514 mothers, selected by convenience sampling method among mothers who visited the health care centre for baby checkups and immunizations. Mean age: 26 years.
Kaymaz, Uzun, Cevizci, Yildirim, İlçin, Topaloğlu, Binnetoğlu, Tekin, Gökten (2015) Turkey	To investigate the relationship between infantile colic, attention deficit and hyperactivity disorder due to possible common etiological factor as maldevelopment in the neurochemical process.	Quantitative, case-control study. Parents and teachers answered CPRS and CTRS and patients were evaluated with DSM-IV.	114 children who were medically diagnosed with ADHD and 149 healthy children as the control group (same hospital's pediatric clinic). Mean age of ADHD group was 10.14 years and 9.94 years in the control group.
Landgren, Hallström (2011) Sweden	To bring forward the meaning of what it is like to be a parent of an infant with colic.	Qualitative, phenomenological hermeneutic study using qualitative inductive interview with narrative analysis.	23 parents (12 mothers and 11 fathers) looking for help for excessive crying at the child health clinic. Mean ages: Babies: 9.6 weeks. Mothers 29.8 years. Fathers 31.7 years.
Landgren, Lundqvist, Hallström (2012) Sweden	To describe parent's experience of having had a baby with colic four years prior and of how the colic and care influenced the family in a long-term perspective.	Qualitative, longitudinal, inductive follow-up research. Interview narratives were analysed with content analysis. 13 individual and 1 focus group interview with 4 parents.	10 mothers and 7 fathers (representing 12 families who were interviewed 4 years earlier during their baby's colicky period). Parents ages ranged between 26-56 years.

Megel, Wilson, Bravo, McMahon, Towne (2011) USA	To describe mothers' experiences of parenting an irritable infant.	Qualitative, grounded theory, interviews with open-ended questions.	12 mothers. Mean age: 27 years.
Milidou, Lindhard, Søndergaard, Olsen, Henriksen (2015) Denmark	To investigate whether children with a history of infantile colic showed impaired motor development at age 7 years compared with unaffected peers.	Quantitative, cohort, longitudinal, follow-up study. Comparing the DCDQ'07 scores in children with and without colic after adjustment for intrauterine exposure, feeding type, parity, maternal age etc.	27940 children from the Danish National Birth Cohort (1997-2002), including 1879 with a history of infant colic.
Nash, Morris, Goodman (2008) UK	To describe mothers' opinions of the crying behavior of infants under one year of age.	Qualitative, descriptive study using semi-structured interviews.	24 mothers and 2 fathers visiting a child health clinic. Parents age ranged between 18-42 years. Infants age ranged between 3-12 months of age.
Okamoto, Matsuoka (2009) Japan	To understand causal factors associated with emotional unrest among first-time mothers with a persistently crying infant.	Quantitative, cross-sectional survey. Causal factors for emotional unrest were explored using structural equation modeling.	217 first time mothers with infants aged 6-7 weeks. Mean age: 30.57 and 29.71 years.
Poskey, Pizur-Barnekow, Hersch (2014) USA	To explore parents' thoughts, feelings, behaviors and actions in response to inconsolable infant crying.	Qualitative, ethnographic study observing parents and crying infants in their homes. Data by field notes (7 observations in participants homes) and brief questionnaire.	4 parents (2 males and 2 females from different households) chosen by convenient sampling. Mean age: 34.75 years. Infants average age were 11 weeks.
Radesky, Zuckerman, Silverstein, Rivara, Barr, Taylor, Lengua, Barr (2013) USA	To quantify the extent to which maternal report of inconsolable crying is associated with maternal depressive symptoms.	Quantitative, nested, retrospective, longitudinal, cohort study based on a prior RCT. Data from Baby's Day Diary when the infant was 5-6 weeks of age. EPDS scores administered at enrollment and 8 weeks postpartum.	587 mothers. Mean age: 31 years.
Santos, Matijasevich, Capilheira,	To assess the prevalence of excessive crying at the age of 3 months and to test the	Quantitative, population-based, birth cohort perinatal study. Information collected during the perinatal study	3674 mothers, who replied that their baby cries excessively.

Anselmi, Barros (2015) Brazil	hypothesis that excessive crying at this age is associated with behavioral problems when children are 4 years old.	and at 3-month and 48-month follow-up visits. Infants whose mothers perceived them as crying more than other babies of the same age during the 3-month visit were included in this study. Child behavior was assessed with the Child Behavior Checklist (CBCL).	
Smarius, Strieder, Loomans, Doreleijers, Vrijkotte, Gemke, van Eijsden (2017) The Netherlands	To examine if excessive infant crying is a determinant of emotional and behavioral problems at age 5-6 years.	Quantitative, longitudinal study that is based on a large prospective, observational, population-based multiethnic birth cohort. Questionnaire included SDQ, PAS and SMFQ.	3369 participants answered all 3 measurements (which is 41% of the original research data from 2003) on pregnancy, infancy and early childhood.
Tabuchi, Shimada, Kameda, Sekizuka, Sakai (2008) Japan	To clarify the nature of mother's distress and its related factors resulting from the crying of her one-month-old infant.	Quantitative, descriptive, self-report survey. A correlation design was used and data were collected through a non-probability sampling survey using a self-administered questionnaire. Questionnaire included questions on characteristics of the infant's crying, states of mother's sleep, feeding and receiving support related to her distress about her infant and its associated factors.	630 mothers who answered the survey. Mean age: 29 years.
Talvik, Alexander, Talvik (2008) Estonia	To investigate the relationship between crying of an infant and inflicted head injury by shaking and/or impact.	Retrospective and prospective population hospital record study.	26 identified cases of shaken baby syndrome (SBS) in children under 1 year old, between 1997-2003, in Estonia. Mean age of children: 3.9 months.
Taut, Kelly, Zgaga (2016) Ireland	To investigate associations between infant difficult temperament and breastfeeding duration.	Quantitative, cross-sectional nationally representative study based on a longitudinal cohort of Irish 9-month-old infants. Mothers completed questionnaires in infant temperament (ICQ), breastfeeding duration etc.	5955 breast-fed, normal birth-weight singletons from the Infant Cohort of the Growing Up in Ireland Study.

Troutman, Moran, Arndt, Johnson, Chmielewski (2012) USA	To examine the development of maternal Parenting Self-Efficacy (PSE) in mothers of infants with high negative emotionality (NE).	Quantitative, longitudinal prospective study. Observer assessment of infant (NE and NBAS) at 3-4 weeks postpartum to find irritable infants, then domain general and domain specific assessments of PSE at 8 and 16 weeks postpartum.	24 irritable and 29 nonirritable infants were sampled in two screening sessions, from a group of 111 infants. Mean age: 31.1 years.
Vik, Grote, Escribano, Socha, Verduci, Fritsch, Carlier, von Kries, Koletzko (2009) Germany	To study if infant crying is associated with maternal postnatal depression.	Quantitative, cross-sectional, longitudinal, prospective study based on a European randomized controlled multicenter study. Mothers completed the Edinburgh Postnatal Depression Scale (EPDS), child's behavior (crying) and child behavior.	Original study with a total of 1678 mothers that were recruited at 11 study sites in five European countries between 2002-2004. This study included 1015 mothers.
Worobey, Peña, Ramos, Espinosa (2014) USA	To examine whether greater infant difficulty elicits more feeding, which in turn leads to more rapid weight gain in early infancy.	Quantitative, longitudinal study. Instruments were anthropometric measures, mother-kept diary, infant temperament assessment (ICQ) and sleep duration. Home visits with interviews.	154 mother-infant dyads who from enrollment and for whom home visits were made. Infants were exclusively formula-fed. Mean age: 26.6 years.
Yalçin, Kuşkonmaz (2011) Turkey	To determine the effect of maternal and infant characteristics on breastfeeding scores.	Quantitative, descriptive study. Questionnaire, which included background information, parental concern about crying and colic etc. Breastfeeding was evaluated and scored according to the World Health Organization/UNICEF breast Feeding observation form.	82 mothers with healthy 2-month-old infants. Mean age: 30.2 years.

Figure 1 Flow chart of study selection