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ORIGINAL ARTICLE

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A Behaviour Change Analysis of Safer Sleep Interventions for Infants at Risk of Sudden and Unexpected Death

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Abstract

Rates of sudden unexpected death in infancy have been found to occur disproportionately amongst families living in the most deprived neighbourhoods. This suggests that standard safer sleep messaging may not be effective for this population and that research is required to identify ways of working that are better associated with behavioural change in parents with children at increased risk of SUDI. In this study, we aimed to explore the behavioural change components and mechanisms of action of safer sleep interventions for families with children at increased risk of SUDI. We conducted an analysis of the literature on safer sleep interventions using the COM-B model, Theoretical Domains Framework and Behavioural Change Technique Taxonomy. All interventions targeted parents' *capability*; 15 interventions targeted parents' *opportunity*; and six interventions targeted parents' *motivation* to engage in safer sleep practices. Nineteen behavioural change techniques were identified. The focus of practitioners may need to shift from solely the delivery of safer sleep information towards working with parents to understand their capability, opportunity and, in particular, motivation to engage in safer sleep practices, identified as being a key driver of behaviour in this population.

KEYWORDS
behaviour change, COM-B model, infant sleep, social care, sudden infant death syndrome, sudden unexpected death in infancy

Key Practitioner Messages

- Practitioners may need to explain why safer sleep guidance is protective, and provide practical demonstrations of safer sleep practices.
- Practitioners may need to consider who is best placed to deliver guidance. Wider environmental concerns influencing parents' opportunities to engage in safer sleep practices may also need to be considered.
- Motivations should be addressed, such as emotions and parents' goals for themselves and their child, which may determine whether they engage in safer sleep practices.

INTRODUCTION

Sudden unexpected death in infancy (SUDI) is defined as the death of an infant up to 1 year of age, which was not foreseen as a significant possibility 24 h before the death. Following investigation, these deaths are either found to be 'explained SUDI', which includes medical diagnoses, accidents and homicides or, if the death remains unexplained,

they are described as 'unascertained' or 'Sudden Infant Death Syndrome' (SIDS) (Beckwith et al., 1970). Rates of SIDS declined steeply in the 1990s and continued to decline until 2014 (ONS, 2022), largely as a result of the 'Reduce the Risks' campaign and the advice to place infants on their back to sleep (Blair et al., 2006). However, there were 711 sudden and unexpected deaths in England between April 2019 and March 2021, with rates of SUDI found to occur disproportionately amongst families living in the most deprived neighbourhoods. This indicates that a different approach, in addition to the population-based advice, may be warranted for this group (National Child Mortality Database, 2022). Therefore, research is required to identify intervention components that are better associated with behavioural change in parents with children at increased risk of SUDI.

The Out of Routine report was commissioned following the national review of 568 serious incidents where a child had been injured or died in 2018–19 and abuse or neglect was suspected. One of the largest groups of children amongst the 568 serious incidents (The Child Safeguarding Practice Review Panel, 2020) included 40 infants who died suddenly and unexpectedly. The Child Safeguarding Practice Review Panel (2020) aimed to identify what could have been done differently and investigate how safer sleep messaging could be better embedded with families with infants at increased risk of SUDI. It was concluded that interventions that focus on the provision of information alone do not always lead to behaviour change in this group, particularly in 'out of routine' instances (The Child Safeguarding Practice Review Panel, 2020). However, it remains unclear which behavioural change techniques may be most important for interventions to incorporate (Pease et al., 2020). It was suggested that theories of behavioural change be explored for their potential to promote safer sleep practices and the COM-B model was identified as being potentially relevant when developing interventions to promote safer sleep amongst higher risk groups (The Child Safeguarding Practice Review Panel, 2020). Synthesising information on the behavioural change components of interventions and their mechanisms of action allows for an evidence base of 'what works' to be developed so that promising interventions can be replicated and gaps can be identified (Michie et al., 2011). Therefore, this study sought to address the following research question: What are the mechanisms of action and behavioural change components of safer sleep interventions for families with children at increased risk of SUDI?

METHODS

Study design

We conducted a component analysis of 21 safer sleep interventions for families with infants at risk of SUDI examined in a recent systematic review by Ellis et al. (2022). The primary studies used various definitions of 'at risk', thus there was variation in the populations who received the safer sleep interventions. Studies of various designs from Western Europe, North America or Australasia, published in the last 15 years, were included.

Due to the high level of heterogeneity in the study designs and the outcomes used, we were unable to compare the effectiveness of the interventions, but they were included in this analysis if authors reported an impact on one or more of their outcomes of interest.

Coding the interventions using the COM-B model, theoretical domains framework and behavioural change technique taxonomy

We coded the 21 interventions using the COM-B model and theoretical domains framework (TDF) (Michie et al., 2014) to identify the inferred mechanisms of action for each intervention. Whilst principally developed as tools to enable developers of behaviour change interventions to 'identify appropriate targets' (West & Michie, 2020), the COM-B model and TDF have also been used as a framework with which to conduct a retrospective coding of the theoretical content of behaviour change interventions (McParland et al., 2018).

The COM-B model identifies three components—capability, opportunity and motivation—and states that one or more must be modified in order to bring about behaviour change. Capability is defined as the physical and psychological capacity to carry out a behaviour. Opportunity refers to the external factors that might influence whether an individual can or cannot carry out the behaviour, and motivation is defined as reflective or automatic brain processes that may influence behaviour (Michie et al., 2014). The Theoretical Domains Framework (TDF) was developed as an integrative framework of behavioural change theories and provides a more granular explanation of the COM-B model (Atkins et al., 2017), shown in Figure 1.

Each theoretical domain was first defined by authors KS, SB, HC using the TDF construct examples given by Michie et al. (2014) to guide the process. Adapted definitions are provided in Appendix S1. We used the Behavioural Change Technique Taxonomy v1 (BCTT) (Michie et al., 2014) as a coding framework to identify the techniques (BCTs) incorporated into the interventions. The coding process involved extracting the descriptions of interventions and intervention materials, which were then read line-by-line and coded using Adobe Reader to highlight domains and BCTs. Two authors independently coded the interventions three times and compared results. The lead author made the final decision.

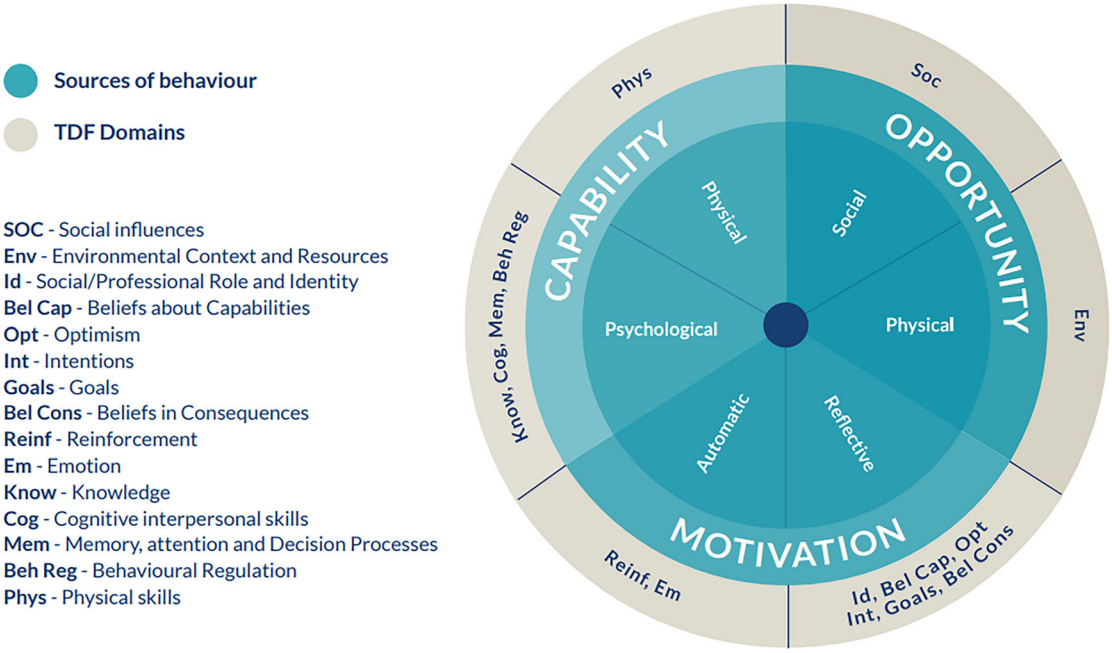

FIGURE 1 The three components of the COM-B model and the corresponding TDF domains (Atkins et al., 2017).

Mapping the BCTs with the theoretical domains

For the final stage of the analysis, we assessed congruence across theoretical domains and BCTs using the expert consensus table (Michie et al., 2014). For those BCTs which have not yet been linked with theoretical domains, discussions were held amongst the whole team in order to decide on the most logical connection.

Ethical considerations

Ethical approval was not required for this study as no participants were involved and only secondary data were used.

RESULTS

Twenty-one studies reported an impact on one or more of the outcomes being targeted. For instance, a statistically significant increase in knowledge of safer sleep was reported following an education intervention (Hauck et al., 2014). Two studies (Carlin et al., 2018; Moon et al., 2016) did not report any effect of the interventions and were excluded from the coding process.

Interventions were most commonly delivered by nurses or midwives ($n = 5$, 24 per cent) and most often delivered in both the antenatal and postnatal period ($n = 6$, 29 per cent), whereby parents received the intervention at least twice. Appendices S2–S4 show the frequency of COM-B components and theoretical domains targeted by the interventions, and the incorporated BCTs. Appendix S5 shows the results of the mapping of the BCTs with the theoretical domains and describes the interventions. Below, we summarise the results of the coding of the interventions according to the COM-B components.

Capability

All interventions targeted parents' *capability* to engage in safer sleep practices through three theoretical domains. Interventions ($n = 21$) most commonly targeted parents' *knowledge* by incorporating the BCT 'Instruction on how to perform the behaviour' (BCT 4.1) through verbal and/or written information, and public health campaigns (Dillon, 2012; Rienks & Oliva, 2012). The second-most commonly targeted domain linked to capability was *memory, attention amd decision processes* ($n = 14$), most often through the BCT 'Information about health consequences' (BCT 5.1) ($n = 11$),

whereby a rationale for safer sleep guidance was provided. The BCT 'Prompts or cues' (BCT 7.1) ($n = 3$) was also used, such as a baby blanket printed with the risk factors for SIDS (Burd et al., 2007). Six interventions targeted the domain *skills* using the BCT 'Demonstration of the behaviour' (BCT 6.1), with practical demonstrations of safer sleep practices (Ahlers-Schmidt et al., 2014; Ahlers-Schmidt et al., 2018; Cowan, 2015; Cowan & Pease, 2008; Engel et al., 2019) and a home-visiting intervention supporting parents to provide responsive care of their infants (Olds et al., 2014). One intervention (Hutton et al., 2017) incorporated the BCT 'Habit formation' (BCT 8.3) as a baby book with pictures demonstrating the safe sleep position and environment, designed for parents to read to their infant regularly.

Opportunity

Fifteen interventions (71 per cent) were found to target parents' opportunity to engage in safer sleep practices. The domain *environmental context and resources* was most targeted ($n = 12$) usually through the BCT 'Adding objects to the environment' (BCT 12.5) ($n = 10$) with the provision of cots or other infant sleep spaces. Two interventions addressed the wider environmental context by incorporating the BCT 'Restructuring the physical environment' (BCT 12.1) where issues with housing or the wider physical environment were addressed (Dillon, 2012; Olds et al., 2014). The BCT 'Pharmacological support' (BCT 11.1) was included in one intervention (Dillon, 2012). The domain *social influences*, which states that behaviour can be influenced by various interpersonal processes including social pressures or societal norms (Michie et al., 2014) was targeted by five interventions (Ahlers-Schmidt et al., 2014; Cowan, 2015; Cowan & Pease, 2008; Gilchrist, 2016; Young et al., 2018). These aimed to empower parents to challenge pressures pertaining to unsafe sleep through the BCT 'Identification of self as a role model' (BCT 13.1) with parents provided with opportunities to manage challenges to safer sleep information (Cowan & Pease, 2008; Gilchrist, 2016), or invited to share safer sleep messages within their communities (Ahlers-Schmidt et al., 2014; Cowan, 2015; Young et al., 2018). Two interventions incorporated the BCT 'Credible source' (9.1) whereby it was believed that training parents to pass on safer sleep information would make it easier to start conversations with other parents as they had something in common (Cowan & Pease, 2008), with advice seen as more realistic than coming from health professionals (Gilchrist, 2016).

Motivation

Six interventions (29%) targeted parents' *motivation* to engage in safer sleep practices through four theoretical domains. The domain *beliefs about capabilities* was most often targeted ($n = 3$) using the BCT 'Verbal persuasion about capabilities' (BCT 15.1). For instance, the MECSH programme sought to build women's confidence during their first weeks as mothers (Olds et al., 2014). Two interventions were found to address parents' *beliefs about consequences*. First, through the BCT 'Salience of consequences' (BCT 5.2) with a social marketing campaign warning of the consequences of unsafe sleep practices (Rienks & Oliva, 2012) and secondly using 'Comparative imagination of future outcomes' (BCT 9.3) as part of a high school educational programme where students were asked to reflect upon factors that might increase the risk of SIDS (Ostfeld et al., 2005). Parents' *goals* were addressed by using various BCTs. The vulnerable baby service intervention (Dillon, 2012) facilitated meetings with families in order to address their holistic needs and mobilise resources, targeting the BCTs 'Goal setting (behaviour)' (BCT 1.1), 'Goal setting (outcome)' (BCT 1.3) and 'Action planning' (BCT 1.4). Health professionals reviewed this plan 'Review behaviour (goals (BCT 1.5) and measured outcomes 'Review outcome (goals)' (BCT 1.7). The MECSH programme also incorporated the BCT 'Goal setting (outcome)' (BCT 1.3), with the prenatal intervention strongly focused on the mother's goals for themselves and their babies (Olds et al., 2014). Finally, one intervention (Salm Ward et al., 2018) was found to target the influence of parents' *emotion* on their motivation to follow safer sleep guidance using the BCT 'Framing/reframing' (BCT 13.2), suggesting alternative ways that mothers could bond with their infants other than co-sleeping.

DISCUSSION

The findings of the original review used to identify interventions concluded that such interventions were moving from 'information giving' towards 'information exchange' (Ellis et al., 2022). The findings of the current study have provided further insight into this shift, in terms of the specific techniques that are being used to facilitate this change. For example, our findings suggest the importance of identifying the most appropriate professional to deliver safer sleep information, with peers also playing a potentially important role. In the wider literature, it has been found that some parents felt unable to discuss safer sleep guidance as a result of poor interpersonal relationships with health professionals (Barrett et al., 2023), and this may be more common for families who have had regular contact with social services.

However, one of the key findings of this paper is that the COM-B domain of *motivation* was least likely to be targeted by existing safer sleep interventions. This is important in terms of supporting safer sleep practices in parents with a social worker because recent evidence shows that this component may play a significant role in determining the behaviours of parents facing multiple life challenges (Barrett et al., 2023; Pease et al., 2021). For example, some mothers in contact with Children's Social Care Services report choosing to co-sleep in order to breastfeed more easily, to bond with their child or to reduce anxieties (Barrett et al., 2023; Pease et al., 2021). This suggests the need for an approach that enables parents to explore their motivations in terms of sleep practices, whilst identifying potential risks and planning for these in such a way that is consistent with existing guidance in the UK and other global contexts, including NICE (2013), The Lullaby Trust (n.d.), and the Queensland Government guidance (2017). These guidelines prioritise infant safety whilst respecting parents' wishes. Addressing parents' motivation to engage in safer sleep practices may also entail eliciting their beliefs about consequences. Research into decision-making has shown that some parents do not follow safer sleep guidance because of erroneous beliefs (i.e. they believed that the side or prone position was needed to prevent choking) (Cole et al., 2021; Pease et al., 2021).

Ways of working which explore parents' *opportunities* to implement safer sleep advice may need to consider the influence of their wider environment. For example, while many interventions included the provision of a cot, research has shown that this alone may be insufficient to lead to behaviour change (Pease et al., 2021). For example, parents might co-sleep despite being given a cot because their accommodation is too small for a cot to be placed in the parents' bedroom (Pease et al., 2021). In addition, co-sleeping is an established and valued practice within some cultures, such as First Nations communities (Young et al., 2017). Practitioners may need to consider working with parents to empower them to challenge unsafe sleep information in their communities; evidence from the decision-making literature suggests this may be important, especially where previous generations of parents adhered to now out-of-date advice, for example, to place babies on their side or front for sleep (Pease et al., 2021).

Core aspects of parental *capabilities* that were included in models of working were the repeated sharing of safer sleep messaging, beginning in the antenatal period and continuing into the postnatal period, and the provision of an explanation as to why the recommended practices are protective against SUDI. The latter is consistent with existing research (Cole et al., 2021; Pease et al., 2021) showing that parents with infants at risk of SUDI do not always follow safer sleep advice if they do not understand why it is protective. Interventions also targeted the development of *skills*, which is again consistent with wider research showing that modelling of safer sleep guidance by health professionals whilst the mother and baby are still in hospital was an important factor in influencing parental behaviour (Landsem & Cheetham, 2022).

The Prevent and Protect practice model (The Child Safeguarding Practice Review Panel, 2020) outlines the need for practitioners to develop authentic relationships based on trust, maintaining an authoritative approach when needed, particularly when supporting families at risk of abuse or neglect. Practitioners may need further training to develop the skills to work in this way with families with children at increased risk of SUDI, as well as sufficient time and organisational support to engage with families at this level.

STRENGTHS AND LIMITATIONS

Using the COM-B model, the current study has provided an analysis of the way in which safer sleep interventions promote safer sleep practice amongst parents with children at increased risk of SUDI; nine theoretical domains and 19 behavioural change techniques were identified. Regarding limitations of this study, despite recent guidelines such as the TIDieR checklist (Hoffmann et al., 2014), which prompt authors to provide comprehensive, transparent descriptions of interventions, many of the included studies gave limited descriptions of the interventions. BCTs were only coded if explicitly described; as such it is possible that we did not identify all BCTs in the interventions. Second, whilst studies included in this paper reported an effect on one or more of their outcomes of interest, it is still not possible to know for certain whether the interventions did lead to a change in behaviour. For instance, whilst participant knowledge may have increased following an education intervention, we cannot say for sure that participants went on to engage in safer sleep behaviours. Third, as we were unable to compare effectiveness of the included interventions, we were unable to draw firm conclusions as to the behavioural change components and mechanisms of action that were associated with effective interventions.

CONCLUSION

Safer sleep interventions for families with children at increased risk of SUDI address a range of behavioural factors that influence decision-making. Therefore, when working with this population, the focus of practitioners may need to shift

from solely the delivery of information about safer sleep to incorporating behavioural change techniques that better target parents' capability, opportunity and motivation to engage in safer sleep practices. For instance, practitioners may need to explain why guidance is protective, as well as assist parents to develop skills by providing practical demonstrations of safer sleep practices. Practitioners may need to consider who is best placed to deliver guidance, as parents may have poor interpersonal relationships with some health professionals. Wider environmental concerns influencing parents' opportunities to engage in safer sleep practices may also need to be considered. In the current study, BCTs associated with motivation in particular were found to be lacking from many interventions despite motivation being shown to be a key driver of behaviour in the wider literature. Therefore, practitioners should also consider addressing motivating factors, such as conflicting goals or emotions, that could determine whether parents engage in safer sleep practices.

AUTHOR CONTRIBUTIONS

Kate Shiellsa, Anna Peasec, Ruth McGovernd, Jenny Woodmanb and Jane Barlow planned the study. Kate Shiellsa and Hannah Cannb extracted and analysed the data. Kate Shiellsa led on writing the manuscript, supervised by Jane Barlow, with all authors providing input into the writing process. All authors critically reviewed the manuscript.

CONFLICT OF INTEREST STATEMENT

Dr Anna Pease is a member of Lullaby Trust Grants committee, Chair of Lullaby Trust Scientific Advisory group and co-Chair of ISPID Education working group.

ETHICS APPROVAL STATEMENT

Ethical approval was not required for this study as no participants were involved and only secondary data were used.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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