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Abstract

This study used Q-methodology to explore systematically parental judgements about infant immunisation. Forty-five parents completed a 31 statement Q-sort in English. Data was collected after vaccination in GP practices or a private day nursery. Q factor analysis revealed four distinct viewpoints: a duty to immunise based on medical benefits; child-orientated protection based on parental belief; concern and distress; and surprise at non-compliance. Additionally, there was a common view amongst parents that they did not regret immunising their children. Implications of these results are discussed in terms of healthcare policy and future research.

**A Q-methodology study of parental understandings of infant immunisation:
Implications for healthcare advice.**

Vaccinations prevent two to three million infant deaths each year (World Health Organisation, 2013), making them one of the most important international health interventions. However, in order to benefit from this protection, infants must undergo a number of painful injections (Taddio et al., 2009) which many find distressing (Cohen et al., 2005).

Parents of infants in the UK are offered a course of primary vaccinations at two, three and four months of age to protect them from eight of the most harmful diseases (Public Health England, 2013). However, because vaccine uptake is not compulsory in the UK (Samad et al., 2006; Tickner et al., 2006), parents must decide whether or not to immunise their child (Coyer, 2002). The outcome of the decisions made in infancy impact on health throughout the lifespan. For example, the recent Measles outbreak in unvaccinated UK adolescents may be a consequence of parental decisions made after the 1998 Measles, Mumps and Rubella (MMR) controversy caused by Wakefield et al. (1998), that resulted in a 10% drop in immunisation rates (Wise, 2013). Although MMR uptake is currently higher than it was in 1998 (91.2% vs. 88.3%; Health and Social Care Information Centre, 2012), this example demonstrates the influence of parental beliefs on decision outcomes. Parents who are concerned about vaccine safety may leave their

child unvaccinated (Tickner et al., 2007), whereas those who believe in the protective benefits of immunisation may make pro-vaccination decisions (Heininger, 2006; Tickner et al., 2007; Benin et al., 2006).

Social science studies have previously used qualitative methods to identify parental concerns about vaccines that prevent immunisation compliance. Barriers include: a lack of awareness about the immunisation schedule and procedure (Mills et al., 2005), and concerns about infant harm (Mills et al., 2005), vaccine safety (Samad et al., 2006; Wroe et al., 2004), and side effects (Mills et al., 2005; Sporton and Francis, 2001). However, this focus has led to a paucity of understanding of the views of parents who have made pro-vaccination choices.

Research that has examined the decision-making processes of vaccinating parents cite several reasons for uptake; namely, the protection against disease gained by the child (Tickner et al., 2007; Hilton et al., 2006), a sense of duty to attend to increase population immunity (New and Senior, 1991; Tickner et al., 2007; Brownlie and Howson, 2006; Benin et al., 2006), trust in the National Health Service (NHS), and a positive experience of previous immunisation (Tickner et al., 2007). As such, parents who had vaccinated their child expressed surprise that that others left their children unvaccinated (New and Senior, 1991). However, not all immunising parents have reported such confidence in vaccinations as some parents remain concerned about the

side-effects of vaccinations despite their appointment attendance (New and Senior, 1991; ; Raithatha, Holland, Gerrard & Harvey, 2003). Furthermore, first-time parents have reported less confidence in their immunisation decisions than parents with more than one child (Tickner et al., 2007).

Previous research has found that both infants and their parents experience severe discomfort in relation to immunisations (e.g., Mills et al., 2005; Tickner et al., 2007; ; Raithatha et al., 2004). Despite a desire to protect their infant from disease, many parents have reported feelings of fear, responsibility and guilt (Tickner et al., 2007) for distress experienced by infants in anticipation of infant immunisation. Mothers believed that these feelings would be exaggerated by concerns about the effectiveness of their soothing responses (Ritov & Baron, 1990; Raithatha et al., 2004) and felt they would regret their decision to immunise (Wroe et al., 2004). However, whilst these studies highlight the emotional expectations of vaccinating parents, their reactions were not followed up after the procedure. With this in mind, the present study will use Q-methodology to explore parental understandings of immunisation *after* the administration of 2-month-old infant vaccinations (Van Exel and de Graaf, 2005). Furthermore, the design of this study differs from a number of studies (e.g., Mills et al., 2005; Harrington et al., 2000; Samad et al., 2006; Tickner et al., 2006), as it will examine the views of parents who opted *for* infant immunisation. Hence, this study will aim to understand factors that influenced parental decisions, viewpoints about the

immunisation procedure, and reactions to infant pain behaviours. Findings will be discussed in terms of their potential implications for health policy and in particular, immunisation advice.

Method

Q-methodology

Q-methodology permits the scientific study of similarities and differences in understanding regarding a specific topic. Participant views are expressed by means of a Q-sort, the organisation of a number of statements into a quasi-normal fixed response grid in terms of agreement or disagreement. The distribution of each response is then used to group participants in terms of their shared and distinct viewpoints. The grouping of participants is analysed through the inversion of traditional factor analytic techniques (Stephenson, 1935), such that sorted statements become the study sample, and participants become the variables between which correlations in opinion are established (Stephenson, 1936b). As such, Q-methodology is an ideal technique with which to investigate points of view related to health (Risdon, Eccleston, Crombez, & McCracken, 2003). Q-methodology has been repeatedly applied to health related processes, particularly those surrounding chronic pain (Aldrich & Eccleston, 2000; Eccleston et al., 1997; Risdon et al., 2003; McParland, Hezseltine, Serpell, Eccleston & Stenner,

2011), but has not yet been used to investigate attitudes towards acute pain such as routine infant immunisation.

Sampling the concourse and defining the Q-set

The first stage in any Q-methodological study is to define the concourse. The concourse is a set of all the possible statements that can be devised surrounding a topic (Van Exel & de Graaf, 2005). In this study, items were generated from a literature review of material regarding parental views on infant immunisation and pain expression. Additional items were added from five informal interviews conducted with mothers after the immunisation of their 2-month-old infants. Mothers were asked to comment on dyadic interaction during three videos of infant immunisation. After the transcription of voice-recordings, key themes were added to the concourse. Ninety-seven statements were generated from academic literature and parental comments. Statements that duplicated key themes were removed. Statements were then sorted into 12 categories (e.g., vaccine safety, awareness of distress, emotional response to pain) whereby a subset of 31 statements, the Q-set, was obtained based on each item's ability to convey the overriding theme of the category. Each statement was then transcribed onto a set of numbered cards to be used in the Q-sort procedure.

Participants

Because Q-methodological studies aim to explore diverse viewpoints within a particular set of people, they do not employ formal experimental designs. In the present study, parent-infant dyads were purposefully selected based on their recent experience of 2-month old infant immunisation.

The study was granted ethical permission by the local NRES and university ethics committees. Parents were recruited from one of two medical practices, a drop in Well-baby clinic or a private day nursery. Potential participants recruited from medical practices were sent a letter one week before their scheduled appointment informing them of the study's commencement. Participants recruited from the private day nursery and drop-in Well-Baby clinic were approached by the primary author upon arrival at the setting after the verification of infant age and immunisation status. Of the 70 parent-infant dyads asked to participate in the study, 48 gave written informed consent of which three did not complete the Q-sort because of time constraints. Thus, a total of 45 parents were included in the final sample: 22 from medical practices, four from the Well-Baby clinic, and 19 from the private day nursery. The majority of parents were mothers (4 fathers) with a mean age of 29.07 years ($SD = 4.99$). Infants (22 male) about whose immunisation the Q-sort was based, had a mean age of 10.29 weeks ($SD = 2.88$).

Procedure

All Q-sorts were conducted independently. First, participants read an instruction sheet detailing the Q-sort process. Participants read through the 31 statements and sorted them into three roughly equal piles ranging from +4 (strongly agree) through zero (neutral/ unsure) to -4 (strongly disagree). Participants then sorted the statements again, placing the two statements they most agreed with in the +4 column of the response grid (figure 1), followed by the two they least agreed with in the -4 column. Participants continued to alternate between the agree and disagree piles until all statements were sorted into the relevant columns. As participants neared the centre of the grid (0), they were encouraged to combine the remaining statements with the neutral pile to aid statement placement.

INSERT FIGURE 1 HERE

During the procedure, participants placed the statement cards onto an enlarged response grid to allow them to visualise their Q-sort more clearly. Participants were given the opportunity to rearrange statements before its completion. The number of each statement in the completed Q-sort was then transposed into the corresponding location on the response sheet. Finally, participants were asked to complete a demographic questionnaire before being fully debriefed.

Statistical analysis

All data were analysed using PCQ (Stricklin, 1987). The 45 Q-sorts in the final data set were entered into the program. A by-person correlation (Watts & Stenner, 2005) of each Q-sort with every other was computed. The resulting correlation matrix was then subject to centroid factor analysis. Extracted factors were orthogonally rotated using varimax. Rotation was stopped after the computation of a five-factor solution because no Q-sorts loaded significantly onto a sixth factor. A factor array was then computed for each factor. Each factor denotes a shared viewpoint. The factor array identifies the average ranking assigned to each item by the participants significantly associated with each factor, and therefore represents an idealised Q-sort that characterises the shared viewpoint of participants on each factor (figure 1 shows the factor array for factor A). There is therefore a similarity between the configuration of one factor array and the associated Q-sorts that varies with how strongly one Q-sort loads on its factor. The number of statements in the Q-set ($n = 31$) determined the significance level of the correlation value such that a Q-sort loaded significantly onto one factor if it had a correlation greater than .46 at $p < .01$ level.

A statistical report was generated for the two, three, four and five factor solutions. After all solutions were examined, the four-factor solution was selected because it provided additional viewpoints to those identified in the two and three-factor solutions, and because no further viewpoints were evidenced in the five-factor solution. The four-factor solution accounted for 63% of the variance in parental understandings

of infant immunisation and explained the views of 36 participants. Three of the remaining nine Q-sorts were confounded, thereby denoting a broader view of infant immunisation because they correlated significantly with more than one factor. The six remaining sorts did not significantly load onto any factor.

Results

Factors were interpreted using three sources of information: factor arrays (table 1) to determine statements placed in the strongly agree (+4, +3) and strongly disagree (-4, -3) columns; statements that distinguished one factor from another because they were sorted at least three piles apart, and the demographic characteristics of parents who significantly loaded onto each factor.

INSERT TABLE 1 HERE

In the interpretations that follow, statements will be identified in brackets by (number and: ranking). Initial factor interpretation was carried out by the primary author. Interpretations were then discussed in detail with the co-authors to develop a detailed and cohesive account of each factor.

Factor A. *Because the Doctor told me to.* Factor A explained 24% of the variance in parental understanding of infant immunisation and was exemplified by 15 Q-sorts; 14 mothers (8 primiparous) aged 20-36.

Parents focused on the medical benefits of immunisation, believing that accepting the protection offered by vaccinations was part of their job as a parent (7; +4) and duty as a good citizen (6: +3). Parents followed medical advice when deciding whether or not to immunise their infant (9: +3), and hence believed that vaccinations provided an unrivalled protection against disease (3: -3). Consistent with this view, parents strongly believed that immunisations were safe (13: +4), did not worry about their side-effects (11: -3) and felt that vaccinations caused relatively less distress than the diseases themselves (12: -5). Because of their reliance on medical advice, parents completed the decision-making process without stress (4: -3), felt prepared for the immunisation (14: -1), were not scared about attending the appointment (10: -2) and so did not regret their decision after the procedure (5: -4).

Parents were less concerned by infant distress (15: 0), and instead felt confident in their ability to cope with their infant during the procedure (31: +3). Hence, parents did not worry about their infant's ability to communicate their feelings during the appointment (28: -2) and showed little concern for the identification of behaviours indicative of distress (16: -1; 20: 0; 21: -1; 22: -1; 23: 0). For these parents, pain-related distress was a short-lived consequence of the broader protection offered by immunisations (27: +2) and as such, they felt relatively little guilt (25:0) or distress (24: 0) in response to the observation of infant pain.

Factor B. *I know what's best for my baby.* Factor B explained 17% of the study variance and accounted for the views of 11 parents (8 mothers) aged 24-28 of which seven had other children.

Parents were not concerned about external influences upon their vaccination decision; their decisions were neither influenced by medical advice (9: 0) nor that of family and friends (8: +1). Parents did not have strong views on the compulsory immunisation uptake (2: 0) suggesting that parents made an independent decision to immunise based on the protective benefits offered to their child alone. Correspondingly, parents believed that taking their child to be vaccinated fulfilled the protective role of parenthood (7: +4), but were not especially concerned about the additional protection vaccines offer the wider community (9: 0). Nevertheless, parents had a positive view of immunisation built on sufficient information (14: -3) that made their decision straightforward (4: -4). Parents felt that immunisations provided the only form of protection against disease (3: -3), were safe (13: +3), without side-effects (11: -1) and caused less distress to infants than the diseases vaccinated against (12: -2).

Parents were particularly confident in their ability to cope with their infant (31: +3). They were not worried about their infant's ability to communicate distress (28: -2), or the effectiveness of their resulting soothing strategies (30: +3); parents knew that infant distress would be short-lived (27: +4) and were prepared for it. As such, parents

did not find the procedure especially distressing to watch (24: 0) or relate infant distress to pain (17: +2). Consistent with their child-orientated view, immunisations were viewed as a necessary form of protection from disease, and infant distress an outcome that did not warrant feelings of guilt (25: -2) or regret (5: -4).

Factor C. *Will they really be OK?* Factor C explained 13% of the variance, accounting for the views of eight participants; seven mothers (5 primiparous) aged 26-38. Infants (5 female), were aged 8-24 weeks.

Parents followed the advice of medical professionals when making their immunisation decision (9: +4). They felt it was their 'job' to protect their child from harmful diseases (7: +3) and felt they had a duty to aid the protection of others by attending the appointment (6: +3). Despite this however, parents believed that immunisation uptake was a matter of choice (2: -3) and were not surprised that others opted against vaccination (1: -1).

Despite being confident in the protection offered by immunisations (3: -2), parents seemed unsure about vaccine safety (13: 0); and hence, worried about possible side effects (11: +2). This suggests that, although parents had sufficient information before their appointment (14: -1), the medical advice received did not instill parental confidence in all aspects of the immunisation procedure (10: 0).

Yet, whilst parental decisions were assured (4: -4; 5: -4), their responses to infant pain expression were less positive. Although parents recognised that the immunisation caused less distress to infants than the diseases being vaccinated against (12: -4), parents believed that infants felt pain because of the injection (15: +2; 17: -2). As such, they found the injection extremely distressing to watch (24: +4) – perhaps because they did not feel particularly able to respond to (29: 0), or cope with (31: -1) their infant during the procedure. Nevertheless, parents were not concerned about their infant’s ability to communicate their distress (28: -3), using general behaviour (16: +2), facial expressions (22: +1), and sounds (20: +3) to identify pain-related distress.

Factor D. *Why wouldn’t you protect them?* Factor C explained 9% of the variance of parental views of immunisation and was exemplified by two first-time mothers aged 21 and 27.

Parents believed that immunisations should be compulsory (2: +3). They were surprised that some infants were not immunised (1: +4) because they believed that it was one’s job as a parent to protect infants from harm (7: +2). Owing to the protection offered by vaccines, the decision making process was not stressful (4: -3), and was therefore made with little influence from medical professionals (9: 0), or family and friends (8: +1).

Parents thought that vaccinations provided the best form of protection against disease (3: -3) and did not worry about any potential side effects (11: -3). Parents strongly believed that vaccinations caused less distress than the diseases they protected against (12: -4), and recognised that although unpleasant, infant pain was a necessary consequence of immunisation (15: 0) that was soon soothed (27: +3). Therefore, whilst parents did not regret their decision (5: -4), they showed great concern for the short-term distress experienced by their infants during the procedure. Parents found the procedure very distressing to watch (24: +4) and felt guilty for the distress the injection inflicted upon their infant (25: +2). Furthermore, parents did not feel very confident in their ability to cope with their infant during the procedure (31: -1), and were unsure about their ability to respond to infant distress (29: 0) and effectiveness of their soothing strategies (30: 0).

Discussion

The present study investigated the distinctive shared viewpoints of a group of parents who had vaccinated their 2-month-old infants. Four accounts were identified that reflect different understandings of infant immunisation. Whilst these factors are not representative of all possible views about infant immunisation, the findings from the present study demonstrate a structured understanding of the overriding views that emerged from the current study sample. Furthermore, as the views discussed were

purposefully selected from a representative sample of parents who had completed the decision-making process, it is reasonable to assume that they can be generalised to other parents who have experienced 2-month-old infant immunisation. Importantly, although the analysis of the four factors was shaped by distinct viewpoints, there were also some areas of commonality between the views expressed; namely that vaccines provided the best form of protection against disease, and that parents did not regret their pro vaccination choice.

All factor solutions included the shared view that vaccinations provided unrivalled protection against disease. This view is in line with the primary reason for vaccine uptake cited by Tickner et al. (2007). This shared view seems unsurprising given the purposeful selection of participants in terms of their pro-vaccination decision. Yet, whilst this shared view suggests a positive view of the protective outcome gained by immunisation, there were differences between parents regarding their view of the vaccines themselves. Consistent with Tickner et al., (2007), parents significantly associated with factors A, B and D shared the view that vaccinations were safe and without any side-effects. However, parents in factor C were distinguished by feelings of uncertainty surrounding vaccine safety and worry about side-effects. The distinction between factor C and the rest of the sample highlights one of the advantages of investigating health related views using Q-methodology. The unique view of factor C would have been overlooked if parental understandings of immunisation had been

studied using traditional methodologies and their ‘one size fits all’ approach. This more cautious view corresponds to that cited by New and Senior (1991) and Raithatha et al., (2003). Despite their decision to fully immunise their infants, parents were mindful of potential side-effects. New and Senior (1991) reported that this mindfulness made the decision making process more complex. However, in contrast to New and Senior (1991), such difficulty was not corroborated by parents in the current study. This finding suggests that the benefits of protection from disease outweighed concerns about vaccine safety to initiate a simple pro-vaccination decision. This shared view supports findings by Tickner et al. (2007), who reported that decisions surrounding vaccination uptake were stress-free because infant immunisation was “the normal thing to do” (p. 6). However, the results by Tickner et al. (2007) that first-time parents were less confident in the outcome of their decisions compared to parents with more than one child were not replicated. The demographic composition of the factors in the present study suggested that all parents, regardless of parity, found their decision stress-free. These findings thus support the notion that immunisation uptake has become a social norm (Tickner et al., 2007) in *all* parents, and suggest that there may have been a conceptual shift since the early 1990s in the way parents view immunisation uptake and thus, the complexity of the decision-making process.

However, the confidence shared by parents in their decision making was not felt by all parents during the procedure. Parents in factors C and D were less confident in

their ability to cope with their infant during the procedure and the effectiveness of their soothing strategies than those associated with factors A and B. This finding suggests that previous experience may increase parental confidence in their ability to identify and respond to infant pain behaviours (Pillai Riddell and Racine, 2009). Yet, despite varying opinion on the effectiveness of parental sensitivity, in contrast to the anticipated regret reported by Wroe et al. (2004) parents did not regret their decision to immunise their infant. Findings from the current study therefore highlight a shared view that was not identified by prospective studies of parental opinion. This view suggests that feelings of regret are reduced by actual immunisation experience so that feelings of regret are not realised when parents are asked about their opinion after the immunisation.

Implications and future directions

The views of infant immunisation highlighted in the present study have implications for the medical advice given to parents during their decision-making process. In particular, health care professionals need to take account of the different views about vaccination that parents may have when giving immunisation advice. Parents may benefit from the recognition and normalisation of any regret anticipated during their discussions with medical professionals during the decision making process. Furthermore, future research could examine whether parental regret expressed after the

immunisation procedure can be used as a marker for incomplete fulfillment of the recommended immunisation schedule.

Strengths and limitations

This study is the first to use Q-methodology to explore distinct parental understandings of routine infant immunisations. All participants included in the study had attended the 2-month old infant immunisation appointment, meaning that the use of Q-methodology was able to highlight previously unidentified differences between views on immunisation amongst parents who had chosen to vaccinate their children.

However, whilst the use of Q-methodology highlighted elements of diversity within the group, it also identified areas of consensus that are reflected in the degree of correlation between the factors. Nevertheless, these views were different enough to facilitate the computation of four distinct factors representing four distinct viewpoints about infant immunisation.

Conclusion

This study demonstrates that parents who have decided to immunise their infants have different understandings about the vaccination process. This has implications for health care policy. In particular, there is a need for health care professionals to tailor the advice given to parents during their decision making process, so that it augments pre-

existing ideas about immunisation. This strategy may prevent negative views of immunisation post-administration that could impact upon future immunisation uptake.

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