

# Measuring Parent Satisfaction with a Neonatal Hearing Screening Program

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## Abstract

The primary aim of the present study was to investigate parent satisfaction with a neonatal hearing screening program through use of a valid and reliable questionnaire developed for this purpose (Parent Satisfaction Questionnaire with Neonatal Hearing Screening Program; PSQ-NHSP). Eighty parents whose children had received hearing screening participated in this study. High levels of satisfaction were reported with more than 90% of parents satisfied with all aspects of the program. The PSQ-NHSP was analyzed for validity and reliability and demonstrated excellent internal consistency reliability ( $\sigma = 0.94$ ) and excellent test-retest reliability ( $\rho = 0.97$ ). Content validity of the PSQ-NHSP was partially established by reviewing available literature on parent satisfaction studies in other pediatric health-care service programs. Construct validity of the PSQ-NHSP was indicated by a significant positive relationship between overall satisfaction and the three specific dimensions in the questionnaire. The satisfaction questionnaire was found to be a useful instrument for identifying service shortfalls, and routine use of the PSQ-NHSP in other neonatal hearing screening programs is recommended.

**Key Words:** Neonatal hearing screening, parent questionnaire, parent satisfaction

**Abbreviations:** JCIH = Joint Committee on Infant Hearing; NHSP = neonatal hearing screening program; PSQ-NHSP = Parent Satisfaction Questionnaire with a Neonatal Hearing Screening Program

## Sumario

El objetivo primario del presente estudio fue investigar la satisfacción de los progenitores con un programa de tamizaje auditivo neonatal utilizando un cuestionario válido y confiable, desarrollado para este propósito (Cuestionario de Satisfacción de los Padres con un Programa de Tamizaje Auditivo Neonatal: PSQ-NHSP). Ochenta progenitores cuyos niños habían sido evaluados con un tamizaje auditivo participaron en el estudio. Se reportaron altos niveles de satisfacción con más del 90% de los progenitores complacidos con todos los aspectos del programa. El PSQ-NHSP fue analizado en cuanto a validez y confiabilidad y demostró una excelente consistencia interna ( $\sigma = 0.94$ ) y una excelente confiabilidad test/re-test ( $\rho = 0.97$ ). La validez de contenido del PSQ-NHSP fue establecida parcialmente revisando la literatura disponible sobre estudios de satisfacción de los padres en otros programas pediátricos de

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servicios de salud. La validez de estructura del PSQ-NHSP fue indicada por una relación significativamente positiva entre la satisfacción global y las tres dimensiones específicas del cuestionario. Se encontró que el cuestionario de satisfacción era un instrumento útil para identificar fallas en el servicio, y se recomienda el uso rutinario del PSQ-NHSP en otros programas de tamizaje auditivo neonatal.

**Palabras Clave:** Tamizaje auditivo neonatal, cuestionario de los padres, satisfacción de los padres

**Abreviaturas:** JCIH: Comité Conjunto sobre Audición Infantil; NHSP = Programa de tamizaje auditivo neonatal; PSQ-NHSP = Cuestionario de Satisfacción de los Padres con un Programa de Tamizaje Auditivo Neonatal

**E**arly identification and intervention of hearing loss in neonatal populations have been shown to improve speech and language outcomes significantly (Markides, 1986; Ramlakawan and Davis, 1992; Moeller, 2000). Therefore, in 1994, the Joint Committee on Infant Hearing (JCIH) in the United States of America endorsed that the goal of neonatal hearing screening programs (NHSPs) is to identify neonates with hearing loss before three months of age and to begin an intervention program before six months of age (JCIH, 1994). To date, NHSPs have been widely implemented in the United States (Tharpe, 2002) and have begun to be implemented in other countries such as Australia (Bailey et al, 2002).

In addition to advocating neonatal hearing screening, the JCIH has stated the importance of measuring parent satisfaction when evaluating and monitoring the success of NHSPs (JCIH, 2000). Measuring patient satisfaction is not a new concept in health-care service programs. It has received increased attention in the last decade as a reliable and valid assessment of outcome in a range of health-care service programs such as in children's mental health (Brannan et al, 1996), neonatal care (Blackington and McLauchlan, 1995; Conner and Nelson, 1999), emergency services (Brown et al, 1995; Magaret et al, 2002), physiotherapy (Unwin and Sheppard, 1995), and pediatric intensive care units (McPherson et al, 2000). There are several reasons for this increasing emphasis on measuring satisfaction in health-care service programs. According to Bragadottir and Reed (2002), there is

evidence that satisfied parents will cooperate more effectively, show greater compliance with their child's treatment, and are more likely to return to the service. Moreover, information about parent satisfaction and dissatisfaction can be used to develop better services and prevent program rejection, and to convince other audiences or parties (e.g., funding agencies or administrators) of the usefulness of a program (Lanners and Mombaerts, 2000).

Although measuring parent satisfaction has been recommended as one of the important outcome measures in assessing the effectiveness of NHSPs, surprisingly, at the present time, there appears to be only one published study investigating this issue. Watkin et al (1998) included a measurement of parent satisfaction in their study of maternal anxiety. This study was conducted on 288 mothers whose infants received newborn hearing screening at Whipps Cross Hospital in London. A close-ended questionnaire, with a Likert-type response scale ranging from very satisfied to very dissatisfied, was utilized to measure mothers' satisfaction with the explanation given by the screeners, the information leaflet, and the time taken to carry out the screening test. The questionnaire had three items about satisfaction, and results indicated that, in general, the majority of parents (>90%) reported high levels of satisfaction with the explanation given by the screeners and the time taken to carry out the test. In regard to satisfaction with the information leaflet, only 64% of mothers were satisfied with the information included in the leaflet with a

further 34% admitting that they had not read the information leaflet. Unfortunately, the data available from this study is limited, because assessing maternal anxiety was the main aim. There have been several other investigations assessing parents' perspectives toward NHSPs but not their satisfaction with the programs. For example, Barringer and Mauk (1997) conducted a survey of 169 parents whose newborns received an NHSP at a regional hospital in Logan, Utah. Parents indicated acceptance of newborn screening for their infants, with 98.2% saying they would give permission for screening, 95.3% stating they would still prefer screening even if the baby failed, and 84.9% reporting that anxiety caused by failing a screening test would be outweighed by the benefits of early detection.

In another survey of non-NICU infants who failed hospital screening, 46 of 49 (94%) parents of infants who had false-positive screening test results approved of UNHS (Clemens et al, 2000). Abdala de Uzcategui and Yoshinaga-Itano (1997) utilized a survey of seven questions that was designed to assess parental experience resulting from the NHSPs conducted at two Colorado hospitals. Results of this study indicate that parents generally reported positive emotions toward NHSPs with 81% felt informed, 62% felt comforted, 59% felt encouraged, and 68% felt satisfied with their child's first hearing test.

Due to the lack of published results on parent satisfaction, there has been little information available to assess the outcomes of NHSPs in this regard. Furthermore, there is currently no available measurement instrument for the comprehensive evaluation of parent satisfaction with NHSPs. The primary purpose of this study was to evaluate parent satisfaction with an NHSP and to develop a questionnaire to achieve this purpose. Specifically, the aims of this study were to:

1. Determine the level of overall parent satisfaction with a NHSP.
2. Determine the level of parent satisfaction with the specific dimensions of the NHSP.
3. Determine the relationship between overall satisfaction and the specific dimensions of satisfaction.
4. Evaluate the psychometric properties of a questionnaire developed by the researchers to evaluate parent satisfaction with NHSPs.

## METHOD

### Development of the Parent Satisfaction Questionnaire with Neonatal Hearing Screening Programs (PSQ-NHSP)

The development of the PSQ-NHSP began with an extensive literature review of existing parent satisfaction studies with various health-care services, including studies of parent perspectives on NHSPs. The purpose of this phase was to identify the relevant dimensions of satisfaction, reported by parents, for inclusion in the PSQ-NHSP. From this literature review, several dimensions were identified as impacting on parent satisfaction with health-care services in general. In order to identify dimensions that were relevant to NHSPs specifically, redundant or similar dimensions identified from the literature review were grouped into a single dimension, and then dimensions that were irrelevant to NHSPs were eliminated. Following these processes, four dimensions of satisfaction were identified as relevant and significant enough to potentially impact on parent satisfaction with an NHSP. The four dimensions were information, personnel in charge of the hearing testing, appointment activities, and overall satisfaction.

The next step involved the construction of items for the PSQ-NHSP (see Appendix 1). Twenty-two Likert-type, close-ended items were constructed and grouped into the four, aforementioned dimensions of satisfaction. All 22 items were constructed into simple statements. To reduce the possibility of participants tending to agree with the items regardless of their content, items in each dimension of satisfaction in the PSQ-NHSP were randomly formatted into positive and negative statements. Five response options, from strongly disagree to strongly agree, were provided for these close-ended items. Scoring of the items ranged from 1 to 5, with 1 being attributed to the most negative response, and 5 to the most positive.

The first item on the PSQ-NHSP is a multiple-choice item, where participants were asked to choose one answer on how they knew about the NHSP. The second item is a dichotomous item where participants were asked whether they received any written

pre-appointment information brochure before attending the program. If parents responded positively to this item, they were directed to respond subsequently to items 3, 4, and 5.

For the information dimension, three items that assessed parent satisfaction with the pre-appointment information leaflet or brochure given to parents before attending the NHSP were constructed (items 3–5). For the dimension related to the personnel in charge of the hearing testing, eight close-ended items (items 9–16) were constructed to assess three aspects of satisfaction (communication, competency, and caring). Three aspects of the appointment activities dimension (access, participation, and environment) were assessed with a total of seven close-ended items (items 8, 17–22). The final dimension of satisfaction measures overall satisfaction with the hearing screening program using four relevant items from the Client Satisfaction Questionnaire-8 (Nguyen et al, 1983) (items 23–26). Relevant items from the CSQ-8 were chosen because this instrument has been shown to have a high degree of internal consistency (values ranging from 0.86–0.93), and it has been regularly used in measuring parents' satisfaction in a range of health-care services (Blackington and McLauchlan, 1995; Stallard, 1996; Conner and Nelson, 1999; Varni et al, 2000; Ygee and Arnetz, 2001). The relevance of choosing items from the CSQ-8 to measure overall satisfaction is further supported by a study conducted by Byalin (1993). The author found that the CSQ-8 was an effective and easily employed instrument for assessing parent satisfaction, and the author also maintained that the CSQ-8 appeared to be applicable without major modification for measuring parent satisfaction in any health-care service.

Finally, the PSQ-NHSP also contained three open-ended items with the aim of giving participants the opportunity to express or to identify areas of the programs with which they were less and more satisfied, and suggestions for improving the program (items 27a, 27b, 28).

### Participants

The participants were the parents of children who had attended the Infant Hearing Screening Program at the Hear and Say Centre, Brisbane, Australia. The Infant

Hearing Screening Program is a service provided to newborns and infants who are at risk of hearing loss. The target hearing loss is one that can interfere with the normal development of communication skills, that is, a permanent, unilateral or bilateral, sensorineural hearing loss of greater than 35 dB HL. This program was started in 2000 and promoted to expectant mothers attending a private hospital obstetric and gynecology department. In addition, brochures about the program were mailed out to other possible referral sources such as child health clinics, ear, nose, and throat clinics, and other maternity hospitals. This program was also promoted through radio and television advertisements, and through health and lifestyle exhibitions. Hence, children participating in the program came from a wide variety of sources. Although some children were referred, no referral is required for inclusion in the program.

The cost of the screening is 40 Australian dollars per session, and the cost is not refundable through any government or private health scheme. This cost covers the follow-up testing for those children who fail the initial hearing screening testing. The average test time per baby is five minutes. However, this test time does not account for other duties such as setting up the equipment, the patients, and completing documentation. Appointments typically take 30 minutes.

The Natus Algo-3 Newborn Hearing Screener Automated Auditory Brainstem Response (AABR) was used as the hearing screening tool. This test was performed by trained volunteers and overseen by a pediatric audiologist. Babies who did not pass the screening in one ear or both ears were scheduled for a further diagnostic evaluation using the full conventional ABR, otoacoustic emissions, impedance audiometry, and steady-state evoked potentials. If results on the follow-up audiological assessments are consistent with sensorineural hearing loss in one or both ears, referral for ear, nose, and throat examination and rehabilitation consultation are made. If an infant passes the initial screen, he or she is considered to be at minimal or no risk of significant hearing loss and is discharged from the program. Those discharged from the program are given the recommendation that retesting is advised if concerns arise in the future.

No selection criteria were used to restrict

participation, and all participation was voluntary. Data for this study were collected from April 2004 to September 2004. One hundred and sixty-six questionnaires were distributed during the five-month data collection period, and 80 parents (48%) responded: 79 mothers and 1 father. In response to item 1 on the PSQ-NHSP, 43 participants (54%) stated that they knew about the program from physicians, 5 from friends and relatives, and the remaining 32 from other sources (e.g., antenatal classes, word of mouth).

The mean age of children at the time of testing was 7 weeks (SD = 4.72), ranging from 1 week to 24 weeks. Forty-three (53.8%) were male, and 37 (46.3%) were female. The majority (95%) of the children were full-term babies with an uneventful birth history and free from any risk factors for hearing loss listed in the JCIH position statement (2000). However, three children were identified as at risk due to family history of hearing loss. Of 80 children assessed in the NHSP, 77 passed the initial screening; 3 failed the initial screening but passed the follow-up assessment.

### Procedures

This study was approved by the human ethics committees of the Hear and Say Centre and the University of Queensland. Participants were approached to participate in this study by a clinician (either volunteer or audiologist) only after completion of all appointments (hearing screening and follow-up diagnostic, if necessary). The clinician described the survey study to all potential participants and provided them with the survey packet documents. Participants were asked to complete the questionnaire at home and return it with a signed consent form in a reply paid envelope to the researcher. Participants were also informed that their participation was voluntary and that their decision would not affect their babies' future management. Other information such as demographic details of the children were collected from children's files kept at the center after obtaining signed consent forms from the parents. To assess the test-retest reliability, a sample of 30 participants who returned the first questionnaire were mailed out another copy one to four weeks after the first questionnaire was returned.

### RESULTS

The mean scores for items 23 to 26 related to overall satisfaction ranged from 4.70 to 4.78 (SD range = 0.45–0.53). This represents a level of satisfaction in the range between satisfied and very satisfied. Furthermore, the majority of participants (>95%) responded "strongly agree" or "agree" to each of the overall satisfaction items, indicating high levels of parent satisfaction with this program. In regard to the information dimension, only 55 participants (68.8%) reported that they received the brochure before attending the program. Mean scores for information items 3, 4, and 5 ranged from 4.20 to 4.49 (SD range = 0.54–0.67). Although the majority of participants (>90%) showed high levels of satisfaction with all the information items, two participants disagreed that "the content of the information was sufficient."

Mean scores for the personnel in charge of hearing testing items 11 to 16 ranged from 4.45 to 4.78 (SD range = 0.42–0.57). The majority of participants (>95%) responded strongly agree or agree to all items. Three items (item 13, 15, and 16) measuring competency and caring of personnel in charge of hearing testing received 100% agreement from all of the participants. In general, caring aspects represented by items 15 and 16 demonstrated the highest mean scores (4.78 and 4.72, respectively). Specifically, item 15 received the highest rating, indicating participants were very satisfied or satisfied that "the tester was approachable."

Mean scores for items 17 to 22 in the appointment activities dimension ranged from 4.54 to 4.72 (SD range = 0.45–0.55). More than 95% of parents responded "agree" or "strongly agree" to all items. Item 21 received the highest mean score among all the items (4.72), indicating that participants were very satisfied with the waiting time of the appointment.

Results of bivariate Pearson's product-moment correlations analyses between overall satisfaction and the three specific dimensions of satisfaction in the PSQ-NHSP indicated that all three specific dimensions were significantly positively correlated with overall satisfaction ( $p < 0.001$ ). The correlation between general satisfaction and information was .59, between general satisfaction and personnel in charge of testing was .41, and

between general satisfaction and appointment activities was .62.

Responses to the open-ended items were analyzed manually, which involved organizing the responses into words or sentences corresponding to the same concept. Where possible, all comments were grouped into the dimensions of information, personnel in charge of the hearing testing, and appointment activities. Those responses that were not associated with any of the dimensions of satisfaction included in the PSQ-NHSP were categorized as other comments. Sixty-seven participants (87%) made at least one comment in response to the open-ended items, and 13% made more than one comment.

A total of 99 comments were received for the open-ended item relating to one area that participants were satisfied with when attending the NHSP (item 27a). Participants were particularly satisfied with personnel in charge of hearing testing and appointment activities, and personnel in charge of the hearing testing received the most comments with 65 participants responding positively about this. Participants also expressed 18 positive comments that were not related to any of the PSQ-NHSP dimensions. A total of 37 comments were offered by participants in regard to any dissatisfaction with the NHSP (item 27b). Most comments (16) were about appointment activities, and the least related to personnel in charge of hearing testing. Participants also expressed dissatisfaction with aspects that were not related to any of the dimensions in the PSQ-NHSP. For example, seven comments related to dissatisfaction with "lack of awareness of this program by other parents." Two participants who disagreed with items in the information dimension expressed their dissatisfaction that "no information was given in the brochure stating that the baby needed to be asleep or still during the testing process."

In regard to participants' suggestions for changes and improvements (item 28), a total of 53 suggestions were made. Participants offered positive suggestions in respect of all three specific dimensions of satisfaction included in the PSQ-NHSP (i.e., information, personnel, and appointment activities). Most common suggestions related to the information dimension. "More detailed information about the program in the

brochure" and "update the information brochure" were examples of suggestions for the information dimension.

### **Psychometric Evaluation of the PSQ-NHSP**

Testing for internal consistency was employed to assess the extent to which items within a dimension were interrelated. The alpha for the total PSQ-NHSP (0.94) indicated high internal consistency. Alphas for all dimensions in the PSQ-NHSP ranged from 0.75 to 0.90 and fell within the moderate to high range. Thus, these alpha coefficients suggest that items on each of the dimensions of satisfaction are internally consistent and measuring a unitary construct.

Test-retest reliability was investigated using intraclass correlation coefficients to compare the same items that were measured more than once. As stated previously, 30 participants were sent the questionnaire again, and a final sample of 25 (83%) participants responded. The correlation for the total PSQ-NHSP was 0.97, indicating that participants' scores were very similar at different points in time. Three of the four dimensions of satisfaction demonstrated high agreement between test and retest scores ( $\rho = 0.90$  to  $0.94$ ), and a moderate correlation was found for the information dimension ( $\rho = 0.79$ ).

### **DISCUSSION**

The present study is the first that has comprehensively evaluated parent satisfaction with an NHSP. The results suggest that parents were generally satisfied with the quality of the services, with the majority of them (>95%) expressing high levels of satisfaction on items related to overall satisfaction. In previous studies of other health-care services, between 60% and 90% of parents reported that they were either satisfied or very satisfied (Byalin, 1993; Unwin and Sheppard, 1995; Brannan et al, 1996). Thus, the overall satisfaction levels in the present study compare very favorably with those obtained for other pediatric health-care service programs. The fact that satisfaction with the NHSP was at the high end of reports of satisfaction may be because the NHSP was just a single assessment for

most of the children, whereas the other services involved assessing satisfaction in parents of children who required more long-term contact with the services. Parents may be more satisfied with such a service that is less demanding on their time and resources.

Parent satisfaction within the specific dimensions of the PSQ-NHSP (information, personnel in charge of hearing testing, and appointment activities) was also very good with 90% or more parents reporting satisfaction with these aspects of the NHSP. It was not possible, however, to directly compare results from these dimensions of satisfaction with results from other hearing screening programs, as satisfaction surveys of these areas have not been conducted. The only similar work is by Watkin et al (1998). They found high levels of parent satisfaction with the contents of an information leaflet and the explanation of the hearing testing procedure in their study, with more than 90% of 265 parents responding that they were satisfied or very satisfied with these aspects of the service.

Results from the present study showed that the data were positively skewed, indicating that parents generally reported high levels of satisfaction with the service, which is consistent with other health-care satisfaction studies. There are several possible explanations for the consistently high levels of reported parent satisfaction in the present study. First, it is possible that the majority of the participants attending this program were satisfied with the services provided to them. Second, it is possible that dissatisfied parents were less likely to be included because previous dissatisfaction with the service made them less likely to return the questionnaire than satisfied parents. Finally, it is possible that parents may be reluctant to report dissatisfaction for fear of being identified later. However, in the present study, participants were reassured that their responses were confidential and would not be shared with service providers.

The open-ended items were considered to be valuable in that they gave parents the opportunity to mention issues other than those included in the PSQ-NHSP. Other issues that emerged in the satisfied comments were the technology used for testing, availability of the test, and ease of testing. Dissatisfaction, when present, was largely related to the lack of awareness of the

program by other parents and the unavailability of NHSPs in birthing hospitals. Such issues were not directly related to the specific NHSP that participants attended but, rather, to general concerns about neonatal hearing screening. Some other comments in this section also helped to identify areas for further improvement, for example, the need to give parents more information prior to the testing session. Information elicited from open-ended items highlights the importance of personnel in charge of hearing testing and appointment activities in influencing parent satisfaction. In addition, the inclusion of more comprehensive information on the NHSP in the written pre-appointment information brochure and the dissemination of these brochures is suggested to increase parent satisfaction with the NHSP.

The results of the correlation analyses in the present study demonstrated significant moderate positive relationships between overall satisfaction and the three specific dimensions of satisfaction. Although there was a relationship between overall satisfaction and the various dimensions, the fact that the correlations were only moderate indicates that the dimensions measure different underlying constructs and are not the same as overall satisfaction. Interestingly, the highest correlation of .62 was found between parent overall satisfaction and satisfaction with appointment activities. The present finding is consistent and comparable with other studies conducted in pediatric health-care service programs. For example, a correlation value of 0.65 was obtained between overall satisfaction and appointment waiting time in a study conducted by Magaret et al (2002) on parents' satisfaction with emergency department services. In addition, the current study validates the importance of participation, access, and environmental aspects of appointment activities, which has been evident in previous studies of other health services (Charney, 1990; Baine et al, 1995; Magaret et al, 2002).

The positive relationship between overall satisfaction and the information dimension identified in this study is consistent with studies conducted in other pediatric health-care service programs (Stallard, 1996; Conner and Nelson, 1999; Hasnat and Graves, 2000; Varni et al, 2000), although previous studies have obtained higher *r* values (>0.7). This

may be due to the fact that these other pediatric service programs involved more ongoing care of the child. In such services, the provision of information may be an even more important aspect of satisfaction with the service than it is in an NHSP.

Likewise, other studies on pediatric health-care service programs have shown that satisfaction with personnel running a service is related to overall satisfaction, although they obtained higher correlations than the present study. For example, Hasnat and Graves (2000) reported  $r > 0.7$  for parents whose children attended a developmental disabilities clinic; Varni et al (2000) reported an  $r$  of 0.89 in a pediatric cancer unit; and Conner and Nelson (1999) found  $r > 0.7$  in a neonatal intensive care service. Again, the limited nature of contact between personnel and parents in an NHSP compared to other health-care programs may explain the lower correlation in the present study.

The final aim of the study was to investigate the psychometric properties of the PSQ-NHSP. High internal reliability consistency was evident with a Cronbach's alpha of 0.94. Nunally (1978) states that the acceptable level of Cronbach's alpha to indicate a good internal reliability is 0.70 or above. However, modest reliabilities with an alpha of 0.50 to 0.60 are considered acceptable, especially for a newly developed questionnaire (Pascoe, 1983). Therefore, an alpha of 0.94 indicates that the PSQ-NHSP is a reliable instrument for measuring parent satisfaction with an NHSP. In general, the internal reliability consistency obtained in this study was similar to results reported in other pediatric health-care service programs. For example, an internal consistency of 0.96 was obtained for the Pediatric Hematology/Oncology Parent Satisfaction Survey (Varni et al, 2000). In children's mental health-care services, the Parent Satisfaction Questionnaire developed by Stallard (1996) demonstrated acceptable high internal consistency with a Cronbach's alpha of 0.82. Similarly, a Cronbach's alpha of 0.82 was obtained for a questionnaire developed to measure parent satisfaction with a pediatric intensive care unit (McPherson et al, 2000).

Test-retest reliability was excellent with a correlation of 0.97 between test-retest total scores. Parents gave similar answers to all items in the PSQ-NHSP when administered

the questionnaire again one to four weeks after responding the first time. Therefore, this finding suggests that the PSQ-NHSP is comparatively stable over the time period assessed. Other studies in pediatric health-care service programs also showed similar patterns when conducting test-retest reliability of their questionnaires. For example, a correlation of 0.82 was shown for the Paediatric Satisfaction Questionnaire (Stallard, 1996) when retested at 41 days. Another study in the neonatal intensive care unit (Mitchell-DiCenso et al, 1996) yielded a correlation coefficient of 0.71 when tests were administered one week after the first questionnaire was returned.

Validity of a questionnaire can be assessed by content, construct, and criterion validity. Content validity measures the extent to which a measurement reflects the specific intended domain of content (Crombie and Davies, 1996). In order to establish the content validity of a measuring instrument, a content area is usually identified from several sources to make sure that the selected content area represents the information from all areas. Mitchell-DiCenso et al (1996), for example, established content validity of the dimensions of satisfaction included in their Neonatal Index of Parent Satisfaction (NIPS) questionnaire through literature review, findings from an expert clinical and parental panel, and results of pilot testing. The authors established that the identified dimensions in NIPS (communication, caring, and confidence) were consistent across these different sources, and thus the questionnaire contained valid content. Content validity in this study was established by utilizing dimensions of satisfaction from a literature review of other parent satisfaction studies with pediatric health care service programs. Content validity of the PSQ-NHSP could have been improved by including parents during the initial development of the item statements in the PSQ-NHSP.

Construct validity is a cumulative process of testing the theory underlying the construct or concept behind the measurement (Crombie and Davies, 1996). Further, construct validity is concerned with the degree to which the test measures the construct it was designed to measure. For example, Stallard (1996) assessed the construct validity of parent satisfaction with children's mental health services by examining the relationship



between "feeling understood" by the psychologist and overall satisfaction, and between length of appointment for first visit and satisfaction with waiting time. Construct validity of the PSQ-NHSP was indicated by positive relationships between overall satisfaction and the three specific dimensions of satisfaction in the PSQ-NHSP.

Criterion-related validity, also referred to as "instrumental validity," is used to demonstrate the accuracy of a measure or procedure by comparing it with another measure or procedure, which has been demonstrated to be valid (Crombie and Davies, 1996). Criterion-related validity has not been employed to date in parents' satisfaction studies due to the lack of a standard scale or questionnaire for comparative purposes. Criterion validity could not be assessed in the present study, because there were no preexisting NHSP parent satisfaction questionnaires to allow a comparison.

Despite the positive findings from the current investigation, several limitations have been identified. Firstly, parents who participated in the present study are not representative of the total population and, therefore, it is not possible to generalize the findings to other NHSPs. The parents are different in a number of ways. First, they are a particularly motivated group who arranged an appointment for hearing screening for their child after leaving hospital and were prepared to pay for this service. It is, therefore, likely that these parents are more positive about neonatal hearing screening than other parents. Secondly, the NHSP itself is not a typical program in that it is fee-for-service, not hospital based, and many children are beyond the neonatal period when assessed. The average age of babies tested in the program was seven weeks, considerably older than babies likely to be seen in a hospital-based program. The impetus for this project and for the development of the PSQ-NHSP was that universal NHSPs were soon to be implemented in Queensland, the state of Australia where this study was conducted. Unfortunately, the implementation of these wide scale NHSPs was delayed, and it was not possible to trial the PSQ-NHSP with this population. Therefore, although it was beyond the scope of the present study, it is important that the PSQ-NHSP is applied more broadly

as soon as possible.

The low response rate, with only 48% of participants returning the questionnaire, is another limitation in the present study. The use of mail survey design contributed to the low response rate. In order to increase the response rate in the future, the use of follow-up letters and phone calls to participants to remind them about the questionnaire is suggested. Although the approach used in the present study, where clinicians distributed the questionnaire after the hearing test and parents were asked to return it via mail, was reasonably successful, other approaches could be trialed in future studies. For example, it may be more practical and effective to have parents complete the questionnaire immediately postscreening and before they leave the hospital. Other possible approaches are face-to-face interviews and telephone surveying.

Given some of the limitations in the present study, it may be appropriate to consider this investigation as a "pilot study," upon which future studies can expand. However, these limitations do not overshadow the uniqueness of the present study and the importance of the outcomes, in particular the development of a valid and reliable parent satisfaction questionnaire for use in improving NHSPs. Audiologists and administrators should acknowledge the importance of parent satisfaction with neonatal hearing screening, and further widespread use of the PSQ-NHSP is recommended.

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## REFERENCES

- Abdala de Uzcatogui C, Yoshinaga-Itano C. (1997) Parents' reactions to newborn hearing screening. *Audiol Today* 9:23-24.
- Bailey HD, Bower C, Khrisnaswamy J, Coates HL. (2002) Newborn hearing screening in Western Australia. *Med J Audiol* 177:180-185.
- Baine S, Rosenbaum P, King S. (1995) Chronic childhood illnesses: what aspects of care giving do parents value? *Child Care Health Dev* 21:5291-5304.
- Barringer DG, Mauk GW. (1997) Survey of parents' perceptions regarding hospital-based newborn hearing screening. *Audiol Today* 9:18-19.
- Blackington SM, McLauchlan T. (1995) Continuous quality improvement in the neonatal intensive care

- unit: evaluating parent satisfaction. *J Nurs Care Qual* 9:72-78.
- Bragadottir H, Reed D. (2002) Psychometric instrument evaluation: the pediatric family satisfaction questionnaire. *Paediatr Nurs* 28:475-484.
- Brannan AM, Sonnichsen SE, Heflinger CA. (1996) Measuring satisfaction with children's mental health services: validity and reliability of the satisfaction scales. *Eval Program Plan* 19:69-72.
- Brown K, Sheehan E, Sawyer M, Raftos J, Smyth V. (1995) Parent satisfaction with services in emergency department located at a paediatric teaching hospital. *J Paediatr Child Health* 31:435-439.
- Byalin K. (1993) Assessing parental satisfaction with children's mental health services. *Eval Program Plan* 16:69-72.
- Charney EB. (1990) Parental attitude toward management of newborns with myelomeningocele. *Dev Med Child Neurol* 32:14-19.
- Clemens CJ, Davis SA, Bailey AR. (2000) The "false positive" in universal newborn hearing screening. *Pediatrics* 106:7-11.
- Conner JM, Nelson EC. (1999) Neonatal intensive care: satisfaction measured from a parent's perspective. *Paediatrics* 103:336-349.
- Crombie IK, Davies HTO. (1996). *Research in Health Care: Design, Conduct, and Interpretation of Health Services Research*. Chichester: John Wiley and Sons.
- Hasnat MJ, Graves P. (2000) Disclosure of developmental disability: a study of parent satisfaction and the determinants of satisfaction. *J Paediatr Child Health* 36:32-35.
- Joint Committee on Infant Hearing Position Statement. (1994) *Audiol Today* 6:6-9.
- Joint Committee on Infant Hearing Position Statement. (2000) *Am J Audiol* 9:9-29.
- Lanners R, Mombaerts D. (2000) Evaluation of parents' satisfaction with early intervention services within and among European countries: construction and application of a new Parent Satisfaction Scale. *Infants Young Child* 12:61-70.
- Magaret ND, Clark TA, Warden CR, Magnusson AR, Hedges JR. (2002) Patient satisfaction in the emergency department—a survey of paediatric patients and their parents. *Acad Emerg Med* 9:1379-1388.
- Markides A. (1986) Age at fitting of hearing aids and speech intelligibility. *Br J Audiol* 20:165-167.
- McPherson ML, Sachdeva RC, Jefferson LS. (2000) Development of a survey to measure parent satisfaction in a paediatric intensive care unit. *Crit Care Med* 28:3009-3013.
- Mitchell-DiCenso A, Guyatt G, Paes B, Blatz S, Kirpalani H, Fryers M. (1996) A new measure of parent satisfaction with medical care provided in the neonatal intensive care unit. *J Clin Epidemiol* 49:313-318.
- Moeller MP. (2000) Early intervention and language development in children who are deaf and hard of hearing. *Paediatrics* 106:e43.
- Nguyen TD, Attkison CC, Stegner BL. (1983) Assessment of patient satisfaction: development and refinement of a service evaluation questionnaire. *Eval Program Plan* 6:299-314.
- Nunnally JC. (1978) *Psychometric Theory*. New York: McGraw-Hill.
- Pascoe GC. (1983) Patient satisfaction in primary health care: a literature review and analysis. *Eval Program Plan* 6:185-210.
- Ramlakawan TW, Davis AC. (1992) The effects of hearing loss and age of intervention on some language metrics in young hearing-impaired children. *Br J Audiol* 26:97-107.
- Stallard P. (1996) Validity and reliability of the Parents Satisfaction Questionnaire. *Br J Psychol* 35:311-318.
- Tharpe AM. (2002) Beyond newborn hearing screening: the critical first few months. *Hear J* 55:13.
- Unwin J, Sheppard L. (1995) Parent satisfaction with the Minimal Motor Dysfunction Unit: a survey. *Aust Physiother* 41:197-202.
- Varni JW, Quiggins DJL, Ayala GX. (2000) Development of the Pediatric Hematology/Oncology Parent Satisfaction Survey. *Child Health Care* 29:243-255.
- Watkin PM, Baldwin M, Dixon R, Beckman A. (1998) Maternal anxiety and attitudes to universal neonatal hearing screening. *Br J Audiol* 32:27-37.
- Ygee BM, Arnetz JE. (2001) Quality of pediatric care: application and validation of an instrument for measuring parent satisfaction with hospital care. *Int J Qual Health Care* 13:33-43.

**Appendix 1. Parent Satisfaction Questionnaire with a Neonatal Hearing Screening Program (PSQ-NHSP)**

1. How did you hear about the infant hearing screening program? *(Please tick one of the boxes for your answer)*
  - a. Doctors in hospital       1
  - b. Family or relatives       2
  - c. Friends                       3
  - d. Others                         4      *(Please specify: \_\_\_\_\_)*
  
2. Did you receive any information about the infant hearing screening program before your child's first appointment? *(Please tick one of the boxes for your answer).*
  - a. Yes                             1      *(Please go to Question 3)*
  - b. No                               2      *(Please go to Question 6)*

*For the following questions please tick the box which best describes your satisfaction with the infant hearing screening program.*

SD = Strongly Disagree  
 D = Disagree  
 N = Neither agree nor Disagree  
 A = Agree  
 SA = Strongly Agree

QUESTION	SD	D	N	A	SA
3. The content of the information sheet (brochure or leaflet) was sufficient.					
4. The information about the infant hearing screening program was difficult to understand.					
5. The information about the infant hearing screening program was very useful before my child's first appointment.					

6. Please list any suggestions you have for improving written pre-appointment information.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

7. What were the results of your baby's hearing screening test? *(Please tick one of the boxes for your answer).*
  - a) Pass                             1      *(Please answer Question 11-26)*
  - b) Don't know                   2      *(Please answer Question 11-26)*
  - c) Referred for more testing    3      *(Please answer Question 8-26)*

For the following questions please tick the box which best describes your satisfaction with the infant hearing screening program.

- SD = Strongly Disagree
- D = Disagree
- N = Neither agree nor Disagree
- A = Agree
- SA = Strongly Agree

QUESTIONS	SD	D	N	A	SA
8. I was satisfied with the interval between appointments.					
9. The tester did not give clear information about the follow-up appointment.					
10. Now that I have had the follow-up appointment, I know what must be done next concerning my child's hearing.					
11. The information I received regarding the testing procedure was not sufficient.					
12. The information on the results of the test was sufficient.					
13. The tester was knowledgeable about the infant hearing screening program.					
14. The tester was skilful with the equipment.					
15. The tester was not approachable.					
16. The tester was gentle with my baby during the testing procedure.					
17. I had the chance to ask more about the infant hearing screening program.					
18. I had the chance to ask more about the test procedure.					
19. I had the chance to ask more about the results of the test.					
20. The length of the appointment was not appropriate.					
21. I was satisfied with the waiting time for the appointment.					
22. The testing site for this infant hearing screening program was not appropriate.					
23. Overall, I was satisfied with the infant hearing screening program.					
24. I was not satisfied with the test process.					
25. I will recommend this infant hearing screening program to friends or relatives.					
26. I will not use the same service in the future.					

27. During your period of contact with the infant hearing screening program, could you briefly describe:  
 a) *One thing which you were more than satisfied about.*

\_\_\_\_\_

\_\_\_\_\_

b) *One thing which you were less than satisfied about.*

\_\_\_\_\_

\_\_\_\_\_

28. Please list any suggestions you have for improving the infant hearing screening at your centre.

\_\_\_\_\_

\_\_\_\_\_