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Original Article

Parental understanding of intoeing gait — A preliminary study

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ABSTRACT

Objective: Evaluation of a child's intoeing gait is one of the most common referrals made to a pediatric orthopedist. Families may have difficulty understanding the often transient and usually benign nature of intoeing. The purpose of this study was to investigate parental perceptions of an intoeing gait both before and after consultation with an orthopedic practitioner.

Methods: 48 parents of children referred to pediatric orthopedic surgeons for evaluation of intoeing gait completed a 22-item questionnaire that assessed demographics, anxiety, and parental perceptions of intoeing. Questionnaires were administered before and after visits. Statistical analysis was performed using Wilcoxon signed-rank tests and Fisher exact tests.

Results: Before their visits, parents reported similar levels of anxiety and understanding regarding intoeing, independent of their age or education. After the visits, anxiety decreased ($P < 0.001$), and understanding increased ($P < 0.001$) although younger parents (18–25 years) reported higher post-visit anxiety compared to parents older than 25 ($P = 0.014$). Similarly, parents with a high school degree or less reported higher post-visit anxiety compared to parents who attended college ($P = 0.009$). Post-visit understanding was inversely correlated with post-visit anxiety ($r = -0.717$; $P < 0.001$). Additionally, parents who reported high anxiety post-visit stated they were more likely to seek additional care ($P < 0.001$).

Conclusions: Younger parents with lower education levels were more likely to leave visits with high anxiety and poor understanding. These parents were more likely to consider seeking further treatment for their child's intoeing, placing additional stress on their child, themselves and an overburdened healthcare system.

1. Introduction

The evaluation of an intoeing gait is one of the most common referrals made to a pediatric orthopaedic surgeon [1,2]. Large observational studies have shown that intoeing is a benign variant of development that resolves on its own in the vast majority of children [3,4]. Treatment for intoeing with specialized orthotics, shoes, braces and exercise regimens has been found to be unnecessary, costly, and potentially detrimental to children [3]. Unfortunately, the evidence supporting or refuting the non-surgical treatment of intoeing is weak and inconclusive [2,5–7]. A systematic review of studies evaluating non-surgical management options for intoeing showed five studies with small sample sizes and inconsistent results [2]. Surgery for intoeing is only considered for older children with persistent, extreme intoeing that causes functional or cosmetic abnormality.

During visits to orthopedic specialists, parents often have difficulty understanding the benign nature of intoeing. They request costly treatments and desire follow-up visits even after being informed of the benign nature of intoeing [3]. Unnecessary follow-up visits can be time consuming for the family and physician, and thus delay access to treatment for patients with other conditions [1].

Previous studies investigating parental understanding of pediatric medical issues including cystic fibrosis, congenital heart disease and obesity found connections between demographic factors and parental understanding of these conditions [8–11]. A study investigating the non-operative management of clubfeet showed that parental compliance, a surrogate of parental understanding, was influenced by geographic and demographic factors [12].

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To our knowledge, no other study has investigated parental understanding of intoeing. The purpose of this study was to investigate parental perceptions of intoeing before and after consultation with a pediatric orthopedic practitioner, and to identify patient populations who displayed poor understanding and high anxiety related to intoeing.

2. Material and methods

2.1. Participants

Following Institutional Review Board approval, the study was conducted at a single tertiary care referral center. Parents bringing their children to see pediatric orthopedic practitioners regarding an intoeing gait were included. Children with pain were excluded, as were families unable to read or write English or Spanish. Consenting parents completed a questionnaire before seeing the practitioner (pre-visit questionnaire), and immediately after seeing the practitioner (post-visit questionnaire). If both parents were present only one parent's participation was requested.

Patients were evaluated by one of two fellowship trained pediatric orthopedic surgeons using standard clinical practices. Once a diagnosis of non-pathologic intoeing was made, parents were given pertinent information regarding intoeing. A telephone translation service was used to communicate with parents who did not speak English.

2.2. Data collection

Questionnaires were developed by the investigators based on previous studies of parental understanding of conditions such as cystic fibrosis [8,13], childhood obesity [10], and neonatal congenital heart disease [11]. Face validity was established by piloting the questionnaire and discussing the clarity of the questions with five participants [14]. These represented different age groups, education levels and parental anxiety levels.

Parental anxiety regarding intoeing was assessed using a single item Likert scale ranging from 1 to 10. Single item Likert scales have been shown to be accurate in assessing anxiety due to their concordance with the standardized, validated State Trait Anxiety Inventory [15]. Additionally, previous studies assessing parental anxiety regarding pediatric medical issues used a similar single item Likert scale [8,10].

Parental understanding of intoeing was assessed using a quiz modeled after previous studies on parental understanding of pediatric issues [8,10,11,13]. The quiz contained six questions with answer choices of "yes", "no", or "I don't know." One point was awarded for each correct answer giving each parent a score between zero and six. A high score indicated that parents understood intoeing to be a benign variant of development that needs no treatment. The questions and their correct answers are shown in Table 1.

In the post-visit questionnaire, parents were asked if they were likely to continue to seek additional care for intoeing, and whether or not their referring pediatrician had explained intoeing.

2.3. Statistics

Wilcoxon singed-rank tests were used to compare pre-visit and post-visit quiz scores and anxiety scores. Fisher exact tests were used to compare differences in proportions between groups. Spearman correlation coefficient was used to assess the association between post-visit quiz scores and the post-visit anxiety scores.

Table 2
Demographic information of study participants.

Partcipants, *n*		48
Parent's gender, female, *n* (%)		41 (85)
Parent's age, *n* (%)		
	18–25 years	16 (33)
	26–40 years	26 (54)
	41 years or older	4 (8)
Parent's education, *n* (%)		
	Did not complete high school	2 (4)
	High school/GED	13 (27)
	Some college	21 (44)
	Bachelor's degree	7 (15)
	Master's degree	2 (4)
	PhD	1 (2)
Parent's first language, *n* (%)		
	English	23 (48)
	Spanish	22 (46)
	Arabic	1 (2)
	French	1 (2)
	Yiddish	1 (2)
Language survey was taken in, *n* (%)		
	English	33 (69)
	Spanish	15 (31)
Child's age, *n* (%)		
	7–11 months	7 (15)
	1 year	22 (46)
	2 years	10 (21)
	3 years	4 (8)
	4 years	2 (4)
	5 years	1 (2)
	6 years	1 (2)
	8 years	1 (2)
Child's ethnicity, *n* (%)		
	Black/African-American	7 (15)
	Hispanic	34 (71)
	White	2 (4)
	Native American	2 (4)
	Other	2 (4)
	Declined	1 (2)
First time parent, *n* (%)		24 (50)

3. Results

From August 2014 until April 2015 a total of 56 consecutive patients referred for intoeing were enrolled in the study. Six participants were excluded due to pain while walking; two participants were excluded due to incomplete questionnaires. 48 parents were included. Of these, 2 parents did not indicate their age and data on the effect of age on anxiety and understanding is based on responses of the remaining 46 parents.

The majority (85%) of parents completing the study were female. Approximately half of the parents spoke Spanish as their first language. 33% were between the ages of 18–25 years old and 54% were between the ages of 26–40 years old (Table 2). For the purpose of data analysis age was dichotomized into younger (< or equal to age 25) vs older

Table 1
Parental understanding quiz — questions.

Question	Preferred answer	Percent correct in post-visit questionnaire
Do you think your child needs treatment for the way he/she walks?	No	63%
Do you think your child will have trouble walking when he/she is 25 years old?	No	56%
Do you think your child's walk will get worse in the next two years?	No	50%
Do you think doctors consider your child's walk normal?	Yes	88%
Do you think braces may help your child's walk?	No	50%
Do you think surgery may help your child's walk?	No	79%

Table 3
Predictors of pre-visit and post-visit anxiety.

	Pre-visit anxiety, *f*		Post-visit anxiety, *f*	
	High	Low	High	Low
Age (years)				
18–25	13	3	10*	6*
26+	27	3	4*	26*
Education				
High school or less	15	2	9*	8*
Beyond high school	27	4	5*	26*

Note: *f* = frequency; high anxiety = Likert rating 1–5; low anxiety = Likert rating 6–10.
* $p < 0.05$ on a Fisher exact test, N = 48.

Table 4
Predictors of pre-visit and post-visit understanding.

	Pre-visit understanding, *f*		Post-visit understanding, *f*	
	High	Low	High	Low
Age (years)				
18–25	1	15	5*	11*
26+	2	28	23*	7*
Education				
High school or less	1	16	5*	12*
Beyond high school	2	29	23*	8*

Note: *f* = frequency; high understanding = quiz score 4–6; low understanding = quiz score 0–3.
* $p < 0.05$ on a Fisher exact test, N = 48.

(age > 25 years). Education was also divided between those parents who had completed high school or less (lower education) and those who had formal education beyond high school (higher education).

Anxiety was considered low when responses on the Likert scale were from 1 to 5 points and high when responses were from 6 to 10. Before visits, younger parents (18–25 years old) had similar anxiety scores to parents older than 25 years ($P = 0.405$) (Table 3, Fig. 1A). In addition, parents with lower education did not differ in anxiety when compared to parents with higher education ($P = 1$) (Table 3, Fig. 1B).

Understanding was considered low when quiz scores were from 0 to 3, and considered high when quiz scores were from 4 to 6. Younger parents had similar pre-visit understanding to older parents ($P = 1$) (Table 4, Fig. 1C). Parents with lower education had similar pre-visit understanding to parents with higher education ($P = 1$) (Table 4, Fig. 1D).

Changes in anxiety and understanding during visits were evaluated by comparing pre-visit and post-visit responses (Fig. 2). During visits, anxiety decreased (pre-visit median score vs post-visit median score; $P < 0.001$) and understanding increased (pre-visit median score vs post-visit median score; $P < 0.001$).

In the post-visit responses, 12% of the sample reported a maximum anxiety of 10, and 29% of the sample reported a high anxiety (Likert scale from 6 to 10). Post-visit anxiety was divided into low (1–5) and high anxiety (6–10) and assessed as an outcome using univariate analysis. Parents in the younger age group had higher post-visit anxiety than parents in the older age group ($P = 0.010$) (Table 3, Fig. 1A). Parents who completed high school or less had higher anxiety than parents who attended some college or earned other degrees ($P = 0.002$) (Table 3, Fig. 1B). Parents with a lower post-visit understanding (quiz score 0–3) had higher post-visit anxiety compared to parents with a high understanding (quiz score from 4 to 6) ($P < 0.001$). Parents who spoke English as their first language did not differ in post-visit anxiety from those who did not speak English as their first language ($P = 0.481$).

After their visits, 85% of participants responded that they did not plan on seeking further treatment regarding intoeing, 8% of parents responded, "I don't know," and 6% of parents responded "yes," indicating that they intended to seeking further treatment. Parents who did not plan on seeking additional treatment had significantly lower anxiety ($P < 0.001$) and a higher understanding ($P = 0.001$) than parents who reported either "yes" or "I don't know".

Approximately half of the participants reported that their pediatrician attempted to explain intoeing, and 62% of participants reported that their pediatrician was worried about intoeing. Whether or not the

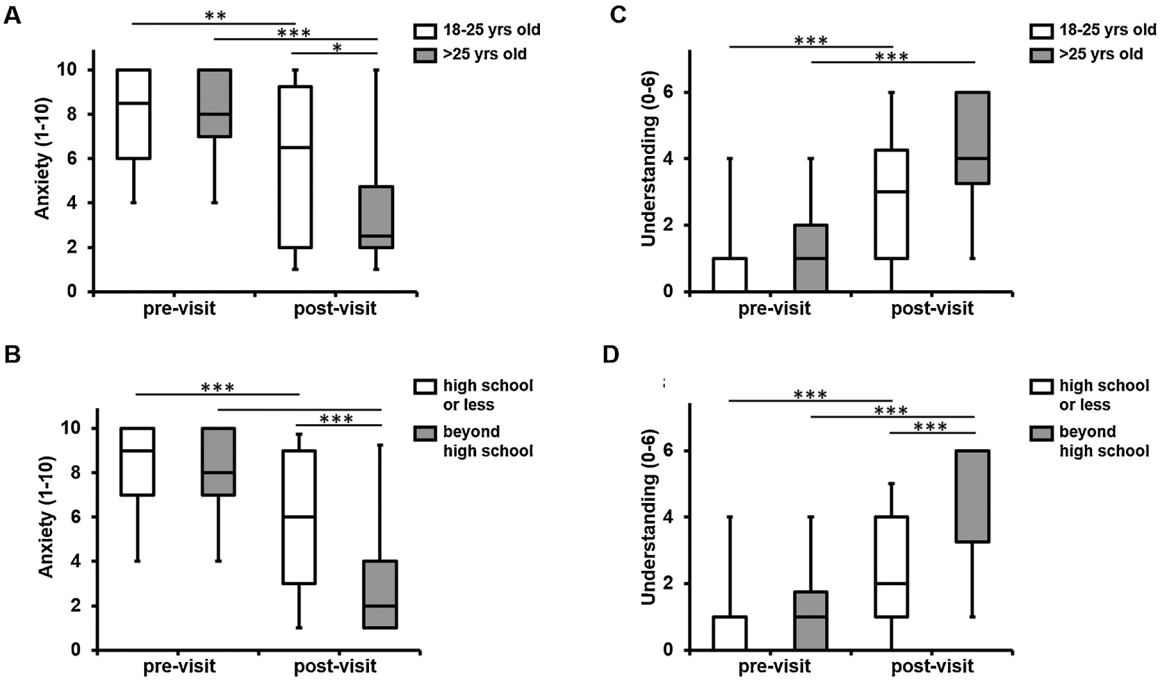

Fig. 1. Assessment of anxiety and understanding pre- and post visit. A & B, anxiety was assessed using a single item Likert scale ranging from 1 to 10. C & D, parental understanding of intoeing was assessed using a 6-question quiz. One point was awarded for each correct answer.
Graphs present median values, interquartile range and range. ***$p < 0.005$, **$p < 0.01$, *$p < 0.05$.

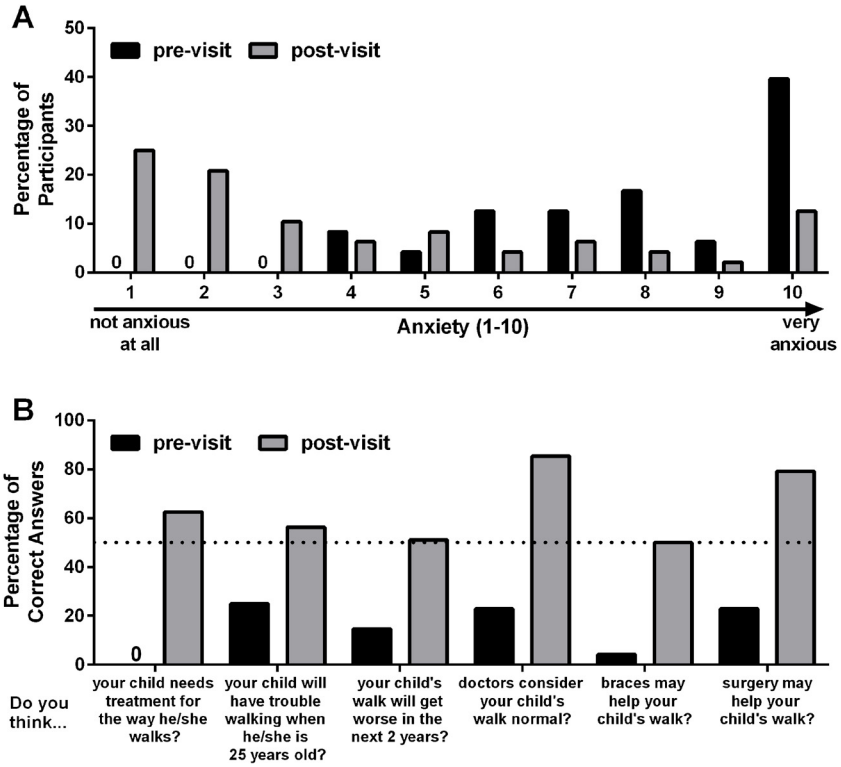

Fig. 2. Comparison of pre- and post-visit responses. After their clinical visit, parents were less anxious (A) and had an increase in understanding (B).

pediatrician discussed intoeing had no relationship with post-visit anxiety *(P = 0.756)* or post-visit understanding ($P = 0.394$). Whether or not the pediatrician was worried about intoeing had no relationship with post-visit anxiety ($P = 0.520$) or post-visit understanding ($P = 0.772$). Post-visit understanding was inversely correlated with post-visit anxiety ($r = -0.717$; $P < 0.001$).

4. Discussion

Intoeing causes parents anxiety despite its benign nature [1–4]. Although visits improved understanding and reduced anxiety in many parents, approximately one fourth of the parents left their visits with a poor understanding and high anxiety regarding intoeing. A majority of these parents were in the younger, less educated demographic groups.

Following visits, understanding of intoeing was inversely related to anxiety, thus improved communication could reduce anxiety. As neither age nor education level predicted parents' attitude towards intoeing prior to visits, it is unlikely that our data was confounded by pre-existing perceptions of intoeing.

Furthermore, our findings highlight the economic burden intoeing places on orthopedic practices. We found that parents who had difficulty understanding intoeing after their visits reported they were more likely to seek additional care regarding intoeing. These follow-up appointments are unnecessary [3,4], wasteful, and may delay treatment for those in need of surgery [1]. Better communication between practitioners and parents could improve understanding, reduce anxiety, and reduce follow-up appointments. Because our socioeconomically diverse population relies heavily on Medicaid, improved education could decrease unnecessary government costs. Our findings may be applicable to other diverse, urban areas. Because intoeing referrals are so common, reducing this patient volume could have large economic impacts [1,2].

Parents' responses to the post-visit understanding quiz suggest that there may be a discrepancy between the information parents understood and the information parents believed. After their visits, 88% of parents correctly responded that doctors considered their child's gait normal, yet only 63% responded that their children did not need treatment for intoeing (Table 2). This gap may be accounted for by parents who comprehended the orthopedist's explanation but did not believe it. Convincing a parent that intoeing is benign is more challenging than providing a clear explanation. Research on the public's perception of vaccines showed that scientific evidence alone is not enough to persuade people that vaccines are beneficial. Other factors that play a role include socioeconomic status, religious beliefs and political affiliations [16]. In order to improve communication during intoeing visits, further research on the relationship between parental understanding and socioeconomic status, religious, political and other cultural factors is needed.

Contrary to our expectations, parents' first language did not predict understanding or anxiety. Cultural differences and the use of a phone translation service did not make communication more challenging. One explanation is that the surgeons at the tertiary care center were experienced in communicating with Spanish speaking patients. Moreover, our findings are consistent with research on phone translation services, which showed them to be effective patient communication tools [17–19].

4.1. Limitations

Because there were no validated measures previously developed to assess parental understanding of intoeing, the understanding quiz was developed by the investigators. Similarly to the findings of previous studies on the parental understanding of pediatric medical issues, we found that anxiety was inversely related to parental understanding [8,13], and that parental education level was positively related to understanding [11,13]. Because our findings are consistent with the literature, it is likely that our measure of parental understanding of intoeing was valid. However, larger series are needed to confirm this.

Another limitation of our study design was the lack of follow-up. A previous study on the parental understanding of pediatric medical issues showed that understanding levels decreased significantly six

months after visits [20]. Despite attempts to ensure we had correct contact information (email, phone number) prior to them leaving the office, there was a limited response to follow-up during our study. Therefore, further research is needed to investigate how parental understanding of intoeing changes over time.

4.2. Future directions

Our results demonstrate the need for development of improved communication methods and tools to aid in parental understanding of intoeing. Studies have shown that educational videos, used as adjuncts to pamphlets and face-to-face visits with doctors, increase patient understanding of medical topics [21–24]. This tool is economically efficient as it can be shown to patients before, during, or after visits without the need for costly face-to-face time with healthcare professionals [24]. Furthermore, proper education of pediatricians and primary care providers on the normal development of lower extremity alignment and gait is needed to educate families, avoid unnecessary concern, and reinforce the specialist recommendations.

5. Conclusions

Younger, less educated parents had difficulty understanding intoeing, had higher anxiety, and were more likely to seek additional care after their visits. Focusing more energy on educating these parents may reduce costs and waiting time, an important issue in light of the high volume of intoeing visits. Further work is needed to delineate successful communication models so that parents and families leave visits satisfied with the care their children are receiving. This would also aid in ensuring that inappropriate treatment is not implemented and that resources are used efficiently and effectively.

What is already known

- One of the most common referrals made to orthopaedic surgeons is the evaluation of intoeing.
- Parents often have difficulty understanding its benign nature, request costly treatments and desire follow-up visits.
- This places an additional burden on parents and orthopaedic practices.

What this study adds

- Approximately one fourth of the parents left their visit to a pediatric orthopaedic practitioner for their child's intoeing with a poor understanding and high anxiety regarding intoeing.
- Younger, less educated parents had difficulty understanding intoeing, had higher anxiety, and were more likely to seek additional care after their visits.
- Focusing more energy on educating these parents may reduce costs and waiting time.

Declaration of interests

None.

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