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BRIEF REPORT

Walking Drawings and Walking Ability in Children With Cerebral Palsy

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Objectives: To investigate whether drawings of the self walking by children with cerebral palsy (CP) were associated with walking ability and illness perceptions. ***Method:*** This was an exploratory study in 52 children with CP (M:F = 28:24), mean age 11.1 years (range 5–18), who were attending tertiary level outpatient clinics. Children were asked to draw a picture of themselves walking. Drawing size and content was used to investigate associations with clinical walk tests and children's own perceptions of their CP assessed using a CP version of the Brief Illness Perception Questionnaire. ***Results:*** Larger drawings of the self were associated with less distance traveled, higher emotional responses to CP, and lower perceptions of pain or discomfort, independent of age. A larger self-to-overall drawing height ratio was related to walking less distance. Drawings of the self confined within buildings and the absence of other figures were also associated with reduced walking ability. ***Conclusion:*** Drawing size and content can reflect walking ability, as well as symptom perceptions and distress. Drawings may be useful for clinicians to use with children with cerebral palsy to aid discussion about their condition.

Keywords: patient drawings, illness perceptions, cerebral palsy, children, walk tests

Cerebral palsy (CP) is the most common motor disorder in children, affecting approximately five children per 2,000 live births. The condition affects predominately motor functions, such as the ability to walk and perform daily tasks; therefore, children are typically assessed by measures of gross motor function and gait (Stanley, Blair, & Alberman, 2000). Recently there has been a shift to explore the social or wider impact of interventions on the child and the family (Livingston, Rosenbaum, Russell, & Palisano, 2007). Clinicians may be better able to manage psychosocial aspects of the condition if they know children's own views of their walking ability and the impact on their lives.

Leventhal's Common Sense Model describes how people actively make sense of illness and form both emotional and cognitive responses (Petrie & Weinman, 2006). Illness perceptions include identity (the name of the condition and the symptoms associated with it), perceived time line of the condition, causal beliefs, perceived consequences of the condition, and cure/control beliefs (how personal actions and treatments can control the condition). Asking patients to draw their illness can be a useful way to assess how individuals make sense of illness. Drawing content can predict outcomes; for example, myocardial infarction (MI) patients' drawings of damage to their heart were associated with slower return to work and poorer perceptions of recovery (Broadbent, Petrie, Ellis, Ying, & Gamble, 2004). Drawing size is important; larger drawings of the heart have been associated with poorer recovery following MI, including higher cardiac anxiety and activity restriction (Broadbent, Ellis, Gamble, & Petrie, 2006) and higher cardiac anxiety in people with heart failure (Reynolds, Broadbent, Ellis, Gamble, & Petrie, 2007). Larger headache drawings have been related to worse perceived consequences, higher emotional responses, worse symptoms, and activity restriction (Broadbent, Niederhoffer, Hague, Corter, & Reynolds, 2009).

In pediatric populations, the content of drawings has been shown to reflect experiences of patients with asthma (Gabriels, Wamboldt, McCormick, Adams, & McTaggart, 2000) and events while in hospital (Kortesluoma, Punamaki, & Nikkonen, 2008; Stefanatou, 2008). Children tend to draw themselves participating in physical activities that they find enjoyable (Walker, Caine-Bish, & Wait, 2009). The inclusion of family members has been shown to suggest perceived levels of social support and family involvement in day-to-day behavior (Golley, Magarey, Baur, Steinbeck, & Daniels, 2007). To date, studies in children with illness have not analyzed how figure size and drawing content are related to functional limitations. This investigation may help to broaden our understanding of how children with CP perceive their condition.

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We investigated the size of drawings in children with CP and hypothesized that larger drawings would be associated with poorer walking ability and increased CP-related distress. The study also aimed to examine the content of the drawings to see if this could be a useful indicator of walking ability and illness perceptions.

Method

Participants

Participants were selected based on an inclusion criterion for age (5–18 years), diagnosis with CP, and the ability to walk 10 m. Only one of the families approached refused consent. There were 52 participants (28 male, 24 female) with a mean age of 11.1 years (SD = 3.0). Forty-three children (who were over the age of 8 years, mean 14.0 years, SD = 1.9) completed a questionnaire in addition to the drawing task. All children were classified as having spastic CP, except one (who had athetoid type CP). Sixty-two percent of the participants had undergone previous orthopedic surgery for correction of musculoskeletal deformity.

Procedure

The study was granted approval by the Northern X Regional Ethics Committee, and the Auckland District Health Board. Recruitment was based on consecutive sampling of children attending a local orthopedic clinic at the Wilson Centre for Children, Auckland, New Zealand between February and November 2009. Separate participant information sheets were given to both child and parent(s) to obtain written informed consent. Both the study drawing and questionnaire were completed after assessment of walking distance in the clinic.

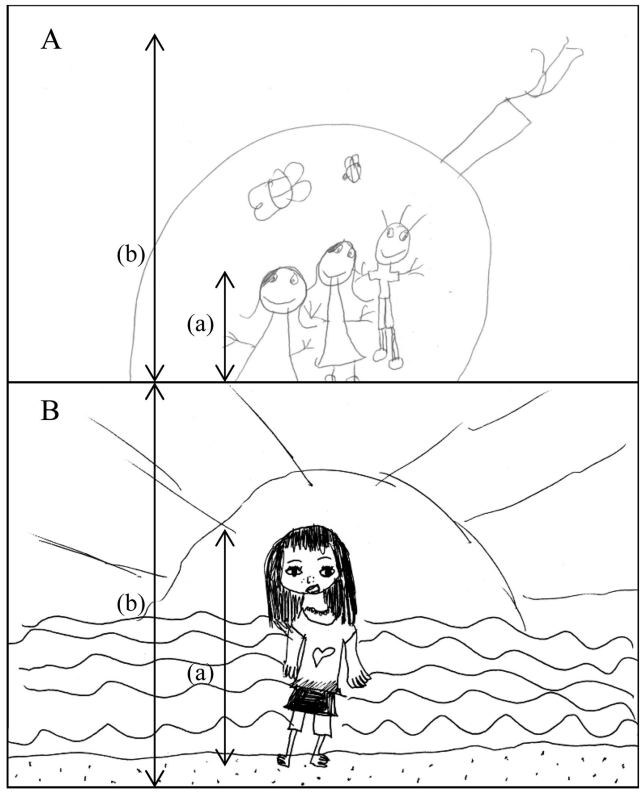

Figure 1. Two participants' drawings. Drawing A is an example of a figure drawn inside with other people. Drawing B shows an isolated figure drawn outside. The added vertical lines show the measurement of (a) figure height, (b) total height. Figure-to-total height ratio = a/b.

Measures

Children were asked to draw on a piece of white paper within a printed 185 × 120-mm rectangle. The instructions were modified from Broadbent et al. (2004): "Please draw a picture of yourself walking somewhere. We are not interested in your drawing ability—a simple sketch is fine. We are interested in your ideas about your walking." Children were asked to describe what they had drawn. Analysis of drawings was performed by one author through measurement by hand of figure height, total drawing height, and ratio of figure height to total drawing height, at the end of the study. Where multiple images of self were drawn, the largest figure was measured. The drawings were examined by all authors for content and properties that could group them into categories, including activity portrayed, setting, and the inclusion of other people (see Figure 1).

Children's perceptions of their CP were assessed using a CP version of the Brief Illness Perception Questionnaire (Broadbent, Petrie, Main, & Weinman, 2006). This nine-item questionnaire assesses illness perception dimensions on 0–10 single-item scales, with end anchors, *not at all* to *extremely*. The questionnaire has demonstrated test–retest reliability, concurrent validity, and predictive validity and has been cited in 118 studies to date. Although mostly used with adult populations, the scale has been found to predict the extent to which children find positive experiences after receiving a diagnosis of cancer (Michel, Taylor, Absolom, & Eiser, 2010). For the CP version, the word illness was replaced with cerebral palsy; the identity question focused on pain and discomfort; the treatment control item was repeated for surgery and physiotherapy; and the causal item was removed. Each item assesses a separate dimension, and items are analyzed individually.

As part of regular assessment, children performed the 1- and 6-min walk tests (Chong, Mackey, & Stott, 2008) and were classified on the 5-point Gross Motor Function Classification System (GMFCS), a measure of physical impairment (Palisano et al., 1997). Type of CP, motor involvement, history of orthopedic surgery, age, sex, and ethnicity were recorded.

Statistical Analysis

Data were analyzed using SPSS version 16.0 (SPSS Inc., Chicago, IL), Prism 5.0, and Instat 3 (GraphPad Software Inc., San Diego, CA). In this sample, drawing size reflected a positively skewed distribution, and most illness perception items showed a skewed spread toward the direction of less-perceived severity. Thus, nonparametric analyses were used. Spearman's correlation coefficient (rho) was conducted, and Mann–Whitney U tests were used to assess differences in walking tests between drawings categories.

Results

Children's drawings varied both in total height (median 158 mm, range 27–187 mm) and figure height (median 60 mm, range 10–120 mm). Larger figure height was associated with shorter distances achieved in both the 1-min ($\rho = -.30$, $p < .05$) and 6-min walk test ($\rho = -35$, $p < .05$). Similarly, a larger figure height-to-total height ratio was seen in children who achieved less distance in both the 1-min ($\rho = -.34$, $p < .05$) and 6-min ($\rho = -.37$, $p < .05$) walk tests. Children who experienced more frequent and severe pain or discomfort drew smaller figures of themselves (rho $= -.31$, $p < .05$). In contrast, larger figures of the self were drawn by children who reported higher emotional impact (rho $= .38$, $p < .05$).

Drawings could be classified as participation in an activity either within a building (23% of all pictures) or outdoors (see Figure 1). Children who drew themselves confined within buildings achieved less distance in both the 1-min (median = 59 m) and 6-min walk tests (median = 280 m), compared with children who drew themselves outdoors (1-min walk test median = 95 m, Mann–Whitney $U = 122.5$, $r = .31$, $p < .05$; 6-min walk test median = 494 m, Mann–Whitney $U = 120.0$, $r = .32$, $p < .05$). There was no significant difference in walking distance between children who drew a background versus no background. One in five drawings contained other people within the scene. Where children drew other figures as well as themselves, CP had a lower emotional impact on the child (Mann–Whitney $U = 79.00$, $r = .31$, $p < .05$). There were no significant correlations between figure size or drawing categories with age, GMFCS, or other illness perceptions. Controlling for age and GMFCS in regression analyses did not change the significance of the results.

Discussion

The purpose of this study was to explore the relationships between drawings, illness perceptions, and walking ability in children with CP. Larger figure height was related to less walking distance achieved and greater emotional impact relating to CP. Similar to previous work, the size of the drawing seemed to suggest how much the individual focused on the subject. For example, larger drawings of the heart have been associated with higher heart-focused anxiety, reduced exercise, and higher activity restriction in MI patients (Broadbent, Ellis, Gamble, et al., 2006). In this case, walking ability may take on increased salience to the individual when it is impaired, so that children with impairment draw larger pictures of themselves walking. Children with greater limitations of walking ability tended to draw themselves within a building. This may reflect their lack of normal outside activity and is similar to hospitalized children, who often illustrate medical procedures and rooms (Kortesluoma et al., 2008). Inclusion of other people in a drawing was predictive of greater walking distance.

There is increasing awareness of the need to take into account children's perceptions of their CP and their influence on overall quality of life (Dickinson et al., 2007). This has posed challenges in measuring these constructs, such as communication barriers and difficulties obtaining self reports rather than parental views (Livingston et al., 2007). This study found that drawings can be completed quickly and easily by children with CP in a clinic setting and reflect measures of physical function and the impact of CP. Assessment of figure size was useful when made alongside other indicators of the child's perceptions of their condition using the CP version of the Brief Illness Perception Questionnaire.

Limitations include a small sample size, cross-sectional design and heterogeneity in participants' age. Developmental differences could not be examined. Future research could examine how drawings change over time as a result of maturation or after treatment, as well as a more in depth analysis of the relation with measures of functional impairments. Future research could take into account the effect of difficulties with postural instability on fine motor control, as this has previously been associated with greater drawing inaccuracy (Miyahara, Piek, & Barrett, 2008). The instructions could be varied to investigate how specific instructions may affect drawings.

Drawings may be useful for health professionals to assess children's views of their walking ability in an enjoyable and nonthreatening way. They may serve as a starting point for discussion of treatments and psychological support. It is important that clinicians use standardized instructions such as those given here and discuss the content of drawings with the child to further understand the child's views.

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