International Journal of Language & Communication Disorders
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713393930

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First Published on: 31 December 2008

To cite this Article Annaz, Dagmara, Van Herwegen, Jo, Thomas, Michael, Fishman, Roza, Karmiloff-Smith, Annette and Rundblad, Gabriella(2008)'Comprehension of metaphor and metonymy in children with Williams syndrome',International Journal of Language & Communication Disorders,
To link to this Article: DOI: 10.1080/13682820802525005
URL: http://dx.doi.org/10.1080/13682820802525005

INT. J. LANG. COMM. DIS.
2008, iFirst Article, 1–17

informa
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Comprehension of metaphor and metonymy in children with Williams syndrome

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(*Received 31 May 2008; accepted 26 September 2008*)

Abstract

Background: Figurative language, such as metaphor and metonymy, is very common in daily language use. Its underlying cognitive processes are sometimes viewed as lying at the interface of language and thought. Williams syndrome, which is a rare genetic developmental disorder, provides an opportunity to study this interface because individuals with this disorder have relative strengths in vocabulary and syntax against a background of low general cognitive ability. Few studies have investigated metaphor comprehension in Williams syndrome and none has investigated metonymy.

Aims: This is the first study to investigate metaphor and metonymy comprehension in Williams syndrome and to compare their performance with a group of typically developing children.

Methods & Procedures: Ten children with Williams syndrome were compared with eleven typically developing children in a novel metaphor–metonymy comprehension task. Cross-sectional trajectory analyses were used to compare the development of metaphor and metonymy using a child-friendly story picture task. Trajectories were constructed linking task performance either to chronological age or to measures of mental age (receptive vocabulary, visuospatial construction).

Outcomes & Results: The performance of children with Williams syndrome was significantly poorer than the typically developing group. The comprehension of metonyms was in line with receptive vocabulary, but comprehension of metaphors fell below this level.

Conclusions & Implications: Metonyms may be part of vocabulary and treated as synonyms in Williams syndrome, while metaphor engages additional cognitive mechanisms outside language that develop atypically in this disorder. Despite earlier reports that emphasize good language skills, the Williams syndrome language system shows anomalies compared with typical development.

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International Journal of Language & Communication Disorders
ISSN 1368-2822 print/ISSN 1460-6984 online © 2008 Royal College of Speech & Language Therapists
http://www.informahealthcare.com
DOI: 10.1080/13682820802525005

Keywords: Williams syndrome, metaphor, metonymy, figurative language.

What this paper adds

The comprehension of figurative language in Williams syndrome is poorly understood. By combining a developmental model with current cognitive linguistics theory, this study fundamentally extends current knowledge of figurative language comprehension, revealing for the first time that understanding of metaphors and metonyms is delayed in children with Williams syndrome. This finding has clear implications for current educational practice. Furthermore, it casts doubts over traditional accounts of good language abilities, thus arguing that language abilities need to be carefully assessed in this clinical population. Finally, this study adds further support for the use of the new test material, which has been successfully used with a large number of typically developing individuals, thus having potential as a tool for assessing pragmatic abilities.

Introduction

In daily conversations, people often use expressions that refer to something other than what is literally said. For example, the expression 'there is a new face in the office' refers to a new person rather than literally to a face. Metaphor and metonymy are two types of figurative language that are thought to be fundamental aspects of conceptual thinking (Lakoff and Johnson 1980). Metaphor and metonymy are similar in that they both refer to a different concept by means of figurative extension rather than the one literally stated. They differ, however, in that metonymy relies on contiguity within one conceptual domain. Thus, in the opening example, 'face' can refer to the whole person since both are part of the domain 'animate being'. By contrast, metaphor relies on a resemblance between two different concepts, such as 'the face of a clock' where the appearance of the clock is made to resemble an animate being. Similarity between two concepts is hard to assess unless contiguous relations within each of the two concepts (or some common ground) have been determined, thus allowing comparison of such relations across concepts (for example, Barcelona 2000). If the cognitive relations underlying metonymy are more basic than those for metaphor, it is likely that children come to understand metonyms before metaphors.

In this paper, we focus on the developmental profile of metaphor and metonymy in children with Williams syndrome (WS) compared with the typically developing (TD) control group. WS is of particular relevance to the study of metaphor and metonymy since individuals with this disorder display receptive vocabulary skills that can be in advance of their mental age (against a background of learning disability). The language profile of individuals with this disorder has been hotly debated in recent years (for a recent review, see Brock 2007) but what is clear is that the disorder has the potential to illuminate the interface between linguistic and other cognitive abilities. The present study is one of the first to investigate figurative language in WS, and in particular metonymy. To focus on the development of figurative language abilities, we employ a methodology that highlights change over

time through the construction of cross-sectional developmental trajectories, contrasting typical and atypical pathways of development (Karmiloff-Smith *et al.* 2004, Thomas *et al.* forthcoming 2008). In the following sections, we briefly review the research on figurative language development and then consider the development of this ability in WS.

Development of metaphor and metonymy in typical children

Surprisingly, relatively few studies have examined the development of figurative language processing in TD children, and these have generally been limited to metaphor. Existing research has yielded inconsistent data regarding the age at which figurative language comprehension emerges during development. Some early research claimed that metaphor is one of the last facets of language to develop after overall cognitive prerequisites are in place, such as Piaget's formal operations (Billow 1975). However, new, less meta-cognitively demanding tasks such as picture selection and enacting have shown that children as young as four and five have some understanding of non-literal language (Vosniadou 1987), and that comprehension steadily improves throughout childhood (Siltanen 1989). Rundblad and Annaz (submitted) tested 45 TD individuals (age range=5;3–37;1) on metaphor and metonymy comprehension. They reported that TD understanding of metonymy exceeds metaphor comprehension at all points in time throughout childhood to adulthood and that metonymy comprehension develops at a faster rate (for a review on metaphor, see also Nippold 1998).

Development of figurative language in Williams syndrome

WS is a rare genetic disorder caused by a hemizygous microdeletion of some 28 genes on chromosome 7q11.23 (Tassabehji 2003). The incidence of WS is approximately one in 20 000 live births (Donnai and Karmiloff-Smith 2000). The main cognitive characteristics of WS include overall IQ levels from 40 to 90 with the majority scoring between 55 and 69 (Searcy *et al.* 2004), a 'hyper-social' personality profile, relatively good language and face recognition skills compared with overall mental age, but poor visuo-spatial skills (for example, Mervis and Bertrand 1997, and Annaz *et al.* in press).

Language abilities in WS have been a focus of debate in recent years and have been reported by some to be normally developing albeit with a delay in onset, with relatively good auditory memory and vocabulary skills together with some evidence of syntactic and morphological difficulties (Thomas and Karmiloff-Smith 2005, Brock 2007). However, recent studies have shown that the relatively good performance of individuals with WS on language tasks may result from different underlying processes, and thus be the product of atypical developmental pathways (Stevens and Karmiloff-Smith 1997, Laing *et al.* 2002, Nazzi and Karmiloff-Smith 2002). For example, in TD children, referential pointing appears before the vocabulary spurt; in WS, the order is reversed, implying vocabulary growth without the normal semantic underpinnings (Laing *et al.* 2002). Moreover, children with WS do not show certain normal constraints in word learning, such as fast mapping (Stevens and Karmiloff-Smith 1997, Nazzi and Karmiloff-Smith 2002).

Some aspects of pragmatic language in WS also exhibit atypicalities. For example, relatively poor performance has been reported in initiation of interactions, with stereotyped conversations and overall problems in conversational skills (Laws and Bishop 2004, Stojanovik 2006, Lacroix *et al.* 2007). Laws and Bishop (2004) used a parental questionnaire, the Children's Communication Checklist (Bishop 1998) to compare the pragmatic language skills of 19 individuals with WS (age range between 6;05 and 25;02) to 24 individuals with Down's syndrome (age range between 10;02 and 22;09), 17 children with Specific Language Impairment (age range between 4;05 and 7;2), and 31 TD children (age between 4;11 and 6;8). The authors reported that individuals with WS showed a specific communicative profile that included poor social relationships, restricted interests and overall pragmatic language impairments in comparison to the control group (Laws and Bishop 2004, see also Rice *et al.* 2005). Furthermore, Sullivan and colleagues compared children with WS with matched groups of adolescents with Prader–Willi syndrome and a group of individuals with non-specific mental retardation. This study showed that few children with WS were able to differentiate between lies and jokes, judging almost all of them to be lies. When the participants were asked to justify their responses, the WS group differed from the other two disorder groups in that they used fewer references to mental states (Sullivan *et al.* 2003). Finally, Mervis and colleagues investigated the understanding of idioms in adolescents and adults with WS in relation to conversation abilities, using the Familiar and Novel Language Comprehension Test. Overall, the participants performed very well on the measure of comprehension of literal language, comprehending a mean of 12.95 of the 16 literal sentences, while comprehension of idioms involving the same syntactic constructions was much weaker (Mervis *et al.* 2003).

Figurative language abilities in WS, such as metaphor and metonymy understanding, have received little assessment to date. Karmiloff-Smith and colleagues tested a small group of individuals with WS (9–23-year-olds) on a battery of standardized first-order and second-order false-belief task, and a task involving the interpretation of metaphors and sarcasm (Karmiloff-Smith *et al.* 1995). The results showed that only half of WS individuals were able to provide the correct meaning of what was meant by the person making the metaphorical or sarcastic statements in the story.

There is indirect evidence that understanding of figurative language might be an area of difficulty in WS, given that figurative language understanding depends upon the understanding of intent, the use of mental states and an understanding of broad semantic categories, among other abilities. Studies looking at theory-of-mind abilities of WS have shown that, although the social–perceptual component in WS appeared to be in line with mental age, individuals with WS revealed impairments on the social–cognitive component of the theory of mind, such as in the false-belief task and unexpected context task (Tager-Flusberg and Sullivan 2000). However, a recent study in children with autism failed to find a link between theory-of-mind tasks and understanding of metaphor and metonymy (Rundblad and Annaz forthcoming).

In sum, current research indicates that the comprehension of non-literal language in WS may either be delayed or develop differently compared with TD children. The aim of the current study was to investigate the understanding of metaphors and metonyms using a child-friendly picture task in a sample of children with WS between the ages of six and eleven. We addressed three questions. (1) Is the

ability of children with WS to understand metaphors and metonyms comparable to that of TD children of the same chronological age? (2) If the children with WS demonstrate poorer ability, is performance nevertheless in line with their receptive vocabulary abilities, as assessed by a standardized test? And (3) do children with WS show any differential impairment in comprehending metaphors versus metonyms; that is, to the extent that metaphor is a more cognitively demanding construction involving two conceptual domains rather than one, do children with WS demonstrate an additional impairment in this respect?

To answer these questions, we chose an analytical approach that focuses on the construction of cross-sectional developmental trajectories (Thomas *et al.* forthcoming 2008). This methodology emphasizes the relationship between performance and age, commensurate with the study of development. It also encourages the study of developmental relations, that is, those aspects of atypical cognitive systems that develop in harness versus those that appear to dissociate. It is therefore particularly apposite for the study of developmental disorders that exhibit uneven cognitive and linguistic profiles, such as the case of WS.

Methods

Participants

Ten children with WS (three male, seven female; age range=6;0–10;08 years old; mean=8;5) and eleven TD children (four male; seven female; age range=6;4–11;00, mean=8;6) participated in the current study. Children in the WS group were recruited via the Williams Syndrome Foundation, UK. All had been diagnosed clinically as well as by means of the fluorescence *in-situ* hybridization (FISH) genetic test for the microdeletion of specific gene markers. Children from the TD group were sampled from mainstream schools in North London. The experimental protocol was approved by Birkbeck, University of London, Ethics Committee and King's College Ethics Committee before the recruitment of participants. Both parental informed consent and the child's assent were obtained before participation.

All participants had English as their first language. Participants were given two standardized tests to assess their verbal and non-verbal ability. The British Picture Vocabulary Scale (BPVS) for receptive vocabulary (Dunn *et al.* 1982) was used to assess verbal ability. The Pattern Construction task from the British Ability Scale (BAS II, Elliott *et al.* 1996) was used as a measure of non-verbal ability. Details of both participant groups and their mean scores on the standardized tests can be found in table 1.

Materials

Comprehension of metaphor and metonymy was tested using a newly designed experimental task in which ten lexicalized metaphors and ten lexicalized metonyms were incorporated into 20 short, simple picture-stories (for examples, see appendix A). The narratives had on average 14.5 (standard deviation (SD)=2.6) clauses per story and 6.5 (SD=1.0) words per clause. Each story was accompanied by three to four simple, hand-drawn coloured pictures in order to limit memory demands and aid comprehension of the story. The stories comprised everyday situations that

Table 1. Standardized tests and experimental study results per group

Group (sample size)	Statistic	CA (months)	BPVS (age-equivalent score; months)	PC (age-equivalent score, months)	Metaphor	Metonym
Typically developing (TD) (n=11)	Mean	103	104	108	2.9	4.6
	SD	15	18	25	0.8	1.3
	Minimum	77	78	64	1	3
	Maximum	132	131	135	4	7
Williams syndrome (WS) (n=10)	Mean	102	78	42	0.8	3.7
	SD	18	22	20	1.0	1.7
	Minimum	72	38	21	0	1
	Maximum	129	113	69	3	6

SD, standard deviation; TD, typically developing; WS, Williams syndrome; CA, chronological age; BPVS, British Picture Vocabulary Scale (Dunn *et al.* 1982); PC, pattern construction subtest of the British Abilities Scale II (Elliott *et al.* 1996).

either ended with a metaphor or a metonym. Following each story, the child was asked an open-ended question about what this expression referred to (for examples, see appendix A). A total of five story-specific prompts were constructed (for examples, see appendix B). In the event that the child did not respond, three prompts (A1–A3) were available, whereas if the child repeated the target word or gave an inconclusive answer, two prompts could be used (B1–B2). The final prompt (see prompts A3 and B2 in appendix B) contain a relative pronoun that clearly relates to the intended figurative meaning (for example, the pronoun *what* in 'What is the Robbie Williams' where *Robbie Williams* means 'a CD'). Participants' responses show that children from both groups usually did not reflect on the pronoun. In those cases where a child did notice the pronoun, they would comment on it, yet would persist with their chosen literal or figurative interpretation. The materials had already been successfully used in the study of TD children (Rundblad and Annaz forthcoming).

Each child was tested in a quiet room where the investigator read the stories, section by section, while presenting the child with one picture per section. The stories were presented in a pseudo-randomized order, avoiding more than two stories with the same type of figurative language in a row.

Scoring

For the purposes of quantitative analysis, the children's responses were classified as either literal or figurative interpretations of the target word. Only in those cases where the child's response clearly demonstrated the comprehension of a figurative meaning for the target word did the child score a pass and was awarded one point. In cases where the child merely repeated the target word, gave an idiosyncratic answer, gave a literal interpretation of the target expression or did not respond at all, s/he scored zero. After completion of the study, children who scored zero and whose answer was inconclusive with regard to whether the target word had been

understood were asked to describe the meaning of the word to ensure that s/he did not fail the test due to lack of comprehension.

In order to ensure reliability in coding of the participants responses, each testing session was videotaped for subsequent scoring and analysis. A second rater coded all testing sessions and was blind to the diagnosis of each participant. This rater's codes were then compared with the first rater's codes, yielding an inter-rater reliability score of 86%, indicating a high level of coding stability.

Results

In the first phase of the analysis, two linear developmental trajectories were constructed for each group, one assessing the relationship between metaphor performance and increasing chronological age, the second assessing the relationship between metonymy performance and increasing chronological age. A repeated-measures design was used to compare the two trajectories within each group to test for effects of task difficulty. The groups were then directly compared in a mixed design to examine whether the relationship between the development of metaphor and metonymy comprehension was the same for WS and TD groups. In the second phase of the analysis, this process was repeated but with the trajectories now constructed according to measures of mental age, either on the BPVS as a test of receptive vocabulary or on Pattern Construction as a test of non-verbal ability. The first phase employing chronological age-based analyses tests for the presence of any deficit in the WS group compared with the TD group, while the second phase employing mental age-based analyses reveals potential developmental relations between metaphor comprehension, metonymy comprehension, and different cognitive abilities in the WS group.

Children could achieve a maximum score of 10 correct for each construction. Figure 1 depicts the developmental trajectories linking performance and chronological age for the TD and WS groups on metaphor and metonymy comprehension, respectively. For the TD group, the children's accuracy on both metonyms and metaphors improved reliably with increasing age (metaphors: $R^2=0.72$, $F(1, 10)=22.99$, $p=0.001$; metonyms: $R^2=0.47$, $F(1, 10)=7.96$, $p=0.020$).

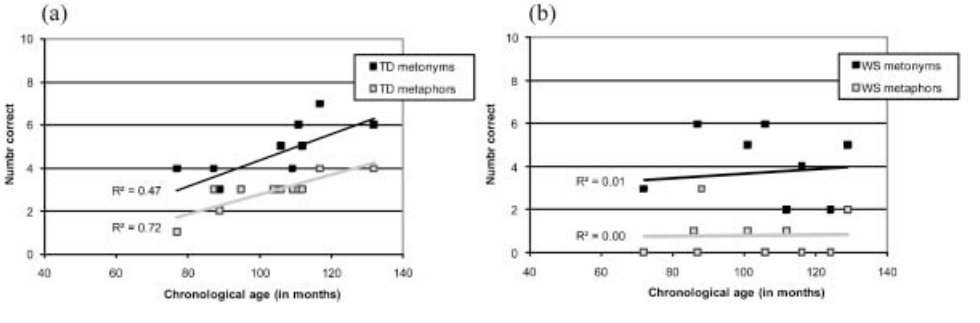

Figure 1. (a) Typically developing (TD) and Williams syndrome (WS) groups developmental trajectories for accuracy scores on the *metonymy* task. R^2 values indicate the proportion of variance explained by each trajectory. (b) TD and WS groups' developmental trajectories for accuracy scores on the *metaphor* task. R^2 values indicate the proportion of variance explained by each trajectory.

A comparison of the tasks indicated that onset of performance (scores were acquired by the youngest children tested) on metaphor and metonymy was at similar level on metaphor and metonymy stories ($F(1, 10)=0.41$, $p=0.540$, $\eta_p^2=0.043$) but rate of development on the two tasks developed differently (interaction of task by age: $F(1, 10)=23.48$, $p=0.001$, $\eta_p^2=0.701$), with metaphors increasing significantly slower.[1]

By contrast, performance in the WS group did not improve reliably with age on either task (metaphors: $R^2=0.001$, $F(1, 9)=0.01$, $p=0.947$; metonyms: $R^2=0.012$, $F(1, 9)=0.10$, $p=0.764$). Nevertheless, the advantage for metonyms over metaphors was still present ($F(1, 9)=17.64$, $p=0.002$, $\eta_p^2=0.662$). Because age did not predict performance in the WS group and the mean chronological ages of the two groups are matched (TD: 8;8, WS: 8;6; independent samples *t*-test: $t(19)=0.19$, $p=0.848$), comparison of overall level of performance in TD and WS groups can be evaluated by collapsing it over age in a mixed design analysis of variance (ANOVA). The comparison revealed that overall performance was lower in the WS group than the TD group ($F(1, 19)=12.20$, $p=0.002$, $\eta_p^2=0.391$). The children with WS were therefore performing below chronological age level expectations. Although the children with WS exhibited a numerically larger disparity between metaphor and metonym comprehension (mean TD disparity=1.6, mean WS disparity=2.9), this difference was not statistically reliable (group by task: $F(1, 19)=2.87$, $p=0.107$, $\eta_p^2=0.131$). For both groups, metaphor was harder than metonymy.

There are three reasons why increasing chronological age might not predict improving performance in the WS group. Firstly, performance may be at floor or ceiling. This was partly the case for metaphors but not for metonyms. Second, individuals with WS sometimes differ in the severity with which the disorder has affected them. Since variations in severity are randomly assigned across the age range, this may disrupt correlations between age and performance in a cross-sectional design. Third, performance may be random with respect to age, in the sense that it is predicted by factors which we have not measured. Trajectories constructed according to mental age allow us to distinguish the latter two possibilities.

Figure 2 demonstrates the mental ages achieved by children in each group for the standardized tests of receptive vocabulary (BPVS) and non-verbal ability

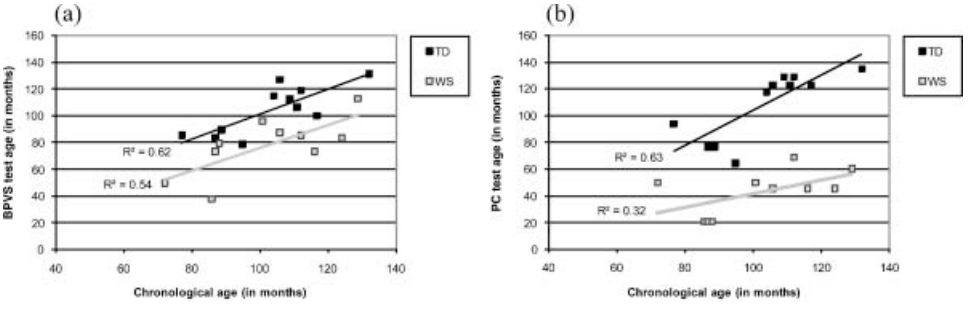

Figure 2. (a) Relationship between chronological age and mental age on the standardized test of verbal ability (receptive vocabulary; BPVS; Dunn *et al.* 1982) for typically developing (TD) and Williams syndrome (WS) groups. R^2 values indicate the proportion of variance explained by each trajectory. (b) The equivalent trajectories linking chronological age and mental age on the standardized test of non-verbal ability (Pattern construction; BAS II; Elliott *et al.* 1996).

(Pattern Construction) plotted against chronological age. In the TD group, there was a reliable relationship between mental age and chronological age on both tests ($p<0.005$). For the WS group, BPVS test age was reliably related to age ($p=0.016$) but Pattern Construction ability was not ($p=0.091$). Vocabulary ability in the WS group developed with a marginally significant delay in onset compared with the TD group ($F(1, 17)=4.22$, $p=0.056$, $\eta_p^2=0.199$) but at an indistinguishable rate ($F(1, 17)=0.04$, $p=0.847$, $\eta_p^2=0.002$). For Pattern Construction, the WS group was both delayed in onset and improved at a slower rate compared with TD, although the latter only emerged as a trend (main effect of group: $F(1, 17)=11.27$, $p=0.004$, $\eta_p^2=0.399$; interaction of group by age: $F(1, 17)=3.56$, $p=0.076$, $\eta_p^2=0.173$). A comparison of abilities within the WS group revealed that performance on Pattern Construction was significantly poorer than that on BPVS ($F(1, 9)=32.71$, $p<0.001$, $\eta_p^2=0.784$). This uneven profile, with a relative strength in receptive vocabulary compared with non-verbal ability, replicates the characteristic pattern for WS (for example, Annaz *et al.* forthcoming).

Trajectories were constructed linking the children's comprehension of metaphor and metonymy with their mental ages on the standardized tests and the two groups were compared. Figure 3 shows the trajectories constructed against BPVS test age. For the WS group, BPVS test age proved a reliable predictor of metaphor and metonymy comprehension ($F(1, 8)=6.29$, $p=0.036$, $\eta_p^2=0.440$). When the two groups were compared, the WS group performed at a similar level to the TD group (main effect of group: $F(1, 17)=0.00$, $p=0.952$, $\eta_p^2=0.000$). However, for metaphors, the WS group performed at a lower level than the TD (main effect of group: ($F(1, 17)=7.04$, $p=0.017$, $\eta_p^2=0.293$). That is, for their level of receptive language ability, the children with WS were performing as expected on metonyms but worse than expected on metaphors.

Figure 4 depicts the equivalent data for the trajectories constructed according to Pattern Construction ability. For the WS group, non-verbal ability was not a reliable predictor of metaphor and metonymy comprehension [($F(1, 9)=0.01$, $p=0.920$, $\eta_p^2=0.001$); ($F(1, 9)=0.01$, $p=0.842$, $\eta_p^2=0.001$)]. When the two groups were compared, once more metonymy performance was indistinguishable between the groups ($F(1, 17)=0.40$, $p=0.534$, $\eta_p^2=0.023$) while metaphor performance was

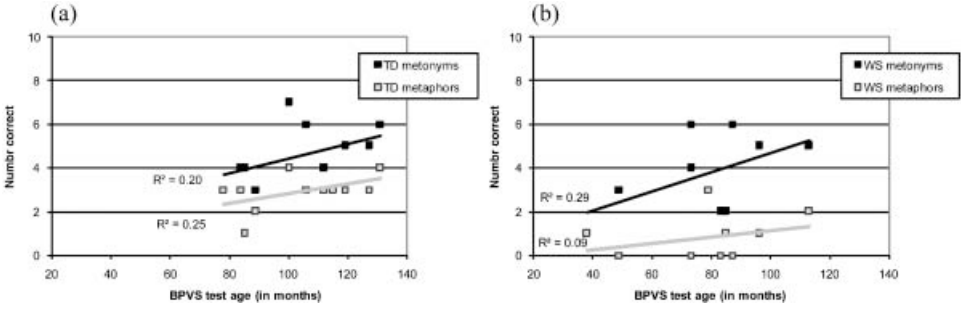

Figure 3. (a) Typically developing (TD) and Williams syndrome (WS) groups developmental trajectories for accuracy scores on the *metonymy* task against BPVS age scores (*x*-axis). R^2 values indicate the proportion of variance explained by each trajectory. (b) TD and WS groups developmental trajectories for accuracy scores on the *metaphor* task BPVS age scores (*x*-axis). R^2 values indicate the proportion of variance explained by each trajectory.

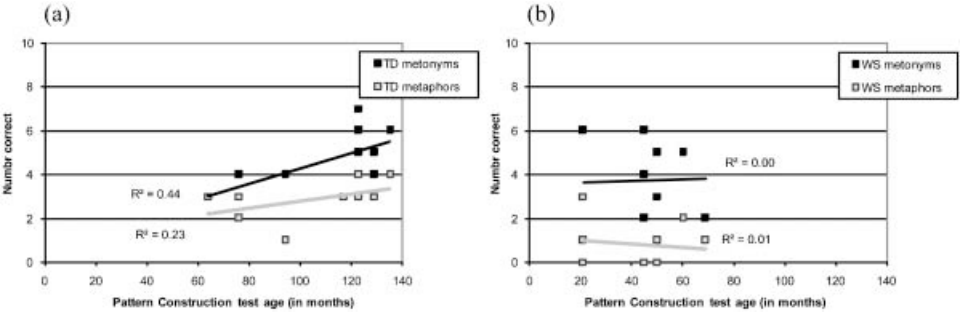

Figure 4. (a) Typically developing (TD) and Williams syndrome (WS) groups developmental trajectories for accuracy scores on the *metonymy* task against pattern construction (PC) age scores (*x*-axis). R^2 values indicate the proportion of variance explained by each trajectory. (b) TD and WS groups developmental trajectories for accuracy scores on the *metaphor* task PC age scores (*x*-axis). R^2 values indicate the proportion of variance explained by each trajectory.

poorer in the WS group albeit at a marginal level of significance ($F(1, 17)=4.29$, $p=0.054$, $\eta_p^2=0.202$).

In sum, the quantitative analyses indicated that the metaphor–metonymy task was a sensitive measure of developing language abilities in TD children. They also revealed a difficulty effect, with metonymy comprehension superior to metaphor comprehension. This effect was observed in both the TD and WS groups. Metonymy comprehension for children with WS was in line with their receptive language ability (which was slightly delayed in onset compared with their chronological age). However, metaphor comprehension was significantly delayed in these children, both with respect to their verbal and non-verbal abilities.

Discussion

The aim of the current study was to investigate whether children with WS develop the ability to comprehend metaphors and metonyms and how their performance compares with that of the TD children. This study is one of the first to investigate empirically metaphor and metonymy comprehension in children with WS. The present authors have emphasized a methodological approach that encourages a theoretical focus on developmental change as it applies to typical and atypical development (Thomas *et al.* forthcoming 2008).

Compared with other aspects of language, there has been relatively little empirical research on metaphor and metonymy in the typical development and developmental disorders, so the conclusions reached here are necessarily tentative. Beginning with our TD sample of children, we observed a developmental change with chronological age on both metaphor and metonymy comprehension. By contrast, despite relatively strong expressive language skills, children with WS showed deficits in metaphor and metonymy comprehension skills. Our findings revealed that performance on metaphor and metonymy did not increase with chronological age, likely due to varying levels of severity in the cross-sectional sample. When WS trajectories were constructed according to mental age on the British Performance Vocabulary Scale, overall performance on metonymy was

found to improve in line with receptive vocabulary ability. However, performance on metaphor was slower and less accurate than would be expected for receptive vocabulary. Indeed, the data indicate that around 50% of children with WS were at floor level on metaphor comprehension regardless of their chronological or mental level. It could be argued that children who failed metaphor tests simply did not understand or remember the context of the story. However, the methodological approach employed in this study used probe questions and follow-up conversation with each child in order to verify the presence of this knowledge.

Poor metaphor comprehension is in line both with the findings of Karmiloff-Smith *et al.* (1995) and the recent data of Thomas *et al.* (forthcoming2008) on emergence of non-literal similarity, and category knowledge. It remains unclear whether our findings will generalize to older individuals with WS. Comprehension on the metaphor–metonymy task is very delayed and perhaps will fail to develop at all, because of cognitive deficits in individuals with WS. Several factors can concurrently contribute to children's poor performance in metaphor and metonymy comprehension. These include a low capacity for developing, maintaining and updating a situation model of the text, and reduced ability to take textual coherence into account. One of the striking findings of the current study was that, in contrast to metonymy, metaphor comprehension was out of step with the development of receptive vocabulary in WS. It could be argued that metaphor comprehension is an ability that spans cognition and language, while metonymy falls more squarely within the language domain. Thus, it is possible that low cognitive abilities in WS might impact on metaphor comprehension or may start to develop very late in adolescence. Thus, these two figurative language constructions — at least in WS — might be handled by (at least some) separate mechanisms. Metonyms may be part of vocabulary and treated as synonyms, while metaphor appears to engage additional cognitive mechanisms, for comparisons across concepts that may be developing atypically in WS.

The current study adds to a growing body of evidence of subtle differences in the development of language abilities in WS. Individuals with WS have also been shown to follow an atypical developmental trajectory on aspects of pragmatic language use, including social conversational skills (for example, Stojanovik 2006). Interestingly, the current data also show similarities to the pattern of behaviour found in individuals with autism (for example, Lord and Paul 1997, Rundblad and Annaz forthcoming). It is clear that most individuals with WS do not have autism, yet there are interesting parallels to be found between the disorders. Traditionally researchers tend to look for differences between developmental disorders but more and more studies report similarities between disorders. For instance, certain pragmatic difficulties faced by individuals with WS are found in autism. Also, face and emotion recognition have been reported to be processed in a similar manner by individuals in both disorders (Annaz *et al.* forthcoming).

Our knowledge of the development of the language system in WS is as yet piecemeal. A major omission to date has been systematic research to uncover the mechanisms that are involved in figurative language comprehension in the disorder. In part, this is due to a wider lack of work that explores mechanisms of metaphor and metonymy comprehension in TD individuals, let alone the way that these mechanisms may vary in individuals with developmental disorders. Comparison and contrast within and between disorders at multidimensional levels of analysis should be a key facet for both future scientific inquiry and clinical application. Future

research work needs to concentrate on the development of pragmatic tests to find most optimal intervention strategy in clinical and educational settings.

Acknowledgements

The authors would like to thank the Williams Syndrome Foundation, UK, for putting them in touch with the families. They are grateful to all children and teachers from Livingstone School in North London for their continuing collaboration in this research. Special thanks to Anna Fendezie. This research was supported by Seedcorn Grant, King's College, University of London, to Gabriella Rundblad, and MRC Career Establishment Grant No. G0300188 to Michael Thomas, an European Commission grant NEST-029088. **Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

Notes

1. The two trajectories were compared using a fully factorial repeated-measures analysis of covariance (ANCOVA) with age as the covariate. Age was scaled to count in months from the youngest age of the group. Scaling age in this way permits the task comparison to be carried out at the onset of the two trajectories; the interaction of age and task then assesses whether the two tasks develop at a similar rate. Group comparisons used mixed-design ANCOVAs.

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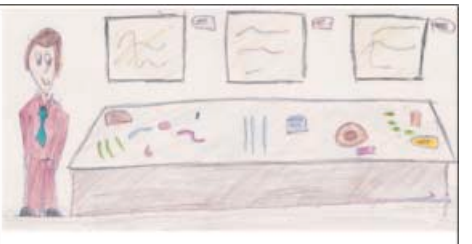
Appendix A

An example of a metaphor story: *flood* (meaning 'lots of people')

1. Stuart works at a museum. The museum is in the middle of town near a big river.

2. It is a small museum and not so many people come to the museum.



3. Stuart's boss wants more people to come to the museum. So Stuart prepares a very special exhibition. Stuart's boss tells lots and lots of people about Stuart's exhibition.

4. It is Monday morning and Stuart is at home. Suddenly, the phone rings — it is Stuart's boss. Stuart's boss says: 'You did it Stuart! There is a flood outside the museum.' Stuart runs to the museum to look. What does Stuart see?

An example of a metonymy story: *Robbie Williams* (meaning 'CD')

1. Kate and Anne are listening to music in Kate's room. Kate has a lot of CDs with songs on.

2. Kate wants to play her favourite song to Anne. Kate looks for the CD with the song on.

3. But Kate cannot find the CD. She says: 'Maybe my favourite CD is in another room'. Kate goes to look for the CD in the other rooms. Anne stays in Kate's room.

4. After a while, Kate calls: 'Come and look Anne! I found Robbie Williams in the lounge'. Anne goes to the lounge to look. What does Anne see?

Appendix B

An example of prompts for a metaphor story: *flood* (meaning 'lots of people')

PROMPT A1

Stuart's boss says: 'You did it Stuart! There is a flood outside the museum.' Stuart runs to the museum to look. What does Stuart see?

PROMPT A2

Stuart's boss says: 'There is a flood outside the museum.' Tell me about the museum and the flood!

PROMPT A3

Who is the flood?

PROMPT B1

Tell me about the museum and the flood!

PROMPT B2

Who is the flood?

An example of a metonymy story: *Robbie Williams* (meaning 'CD')

PROMPT A1

Kate calls: 'Come and look Anne! I found Robbie Williams in the lounge'. Anne goes to the lounge to look. What does Anne see?

PROMPT A2

Kate calls: 'I found Robbie Williams in the lounge.' Tell me about Kate and Robbie Williams!

PROMPT A3

What is the Robbie Williams?

PROMPT B1

Tell me about Kate and Robbie Williams!

PROMPT B2

What is the Robbie Williams?