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Emotional Responsivity in Young Children With Williams Syndrome

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Abstract

The hypothesis that young children with Williams syndrome show higher rates of emotional responsivity relative to other children with developmental disabilities was explored. Performance of 23 young children with Williams syndrome and 30 MA-matched children with developmental disabilities of nonspecific etiologies was compared on an adaptation of Repacholi and Gopnik's (1997) "Yummy-Yucky" task. Results show that children with Williams syndrome were more likely to mimic and/or imitate facial affect and vocalizations than children in the mixed comparison group. Yet, this increased emotional responsivity did not substantially improve decision-making based on the affective display; children with Williams syndrome were more likely to attempt to convince the experimenter that the disliked food was likable. Implications of a social profile that includes enhanced emotional responsivity paired with impaired perspective taking are discussed.

Despite their cognitive impairments, individuals with Williams syndrome show strengths that involve orienting to and interpreting the nonverbal social behaviors of others (Karmiloff-Smith, Klima, Bellugi, Grant, & Baron-Cohen, 1995). They also show preferential attention to social stimuli (Jones et al., 2000; Mervis et al., 2003), and a fascination with human faces (Jones et al., 2000). Children with Williams syndrome evidence proficient dyadic interaction in the form of turn-taking and requests for continued interaction within social routines compared to typically developing MA-matched children (Laing et al., 2002). These behaviors provide evidence of the competent development of aspects of primary intersubjectivity (Trevarthen & Aitken, 2001) in individuals with

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Williams syndrome. Within the first few months of life, typically developing infants show primary intersubjectivity in the form of attraction to facial, vocal, or gestural emotional displays, and they respond with "synchronous rhythmic patterns of vocalizations, body movements, and gestures to match or complement" (Trevarthen & Aitken, 2001, p. 12) the feelings expressed by their social partner. Trevarthen and Aitken suggested that the absence of achieving early intersubjective milestones leads to delays in achieving later social and emotional milestones, such as those evidenced in individuals with autism.

Although competence in some aspects of primary intersubjectivity have been demonstrated in individuals with Williams syndrome, particularly in the form of orienting to and preferring social stimuli, there has been little focus on the complementary aspect of primary *intersubjectivity* (i.e., the ability to respond in synchronous ways to other people's emotional displays). This ability, termed here *emotional responsivity*, may be an important construct for understanding early social and emotional development in children with this complex developmental disorder.

There is currently little empirical research on whether individuals with Williams syndrome show synchronous responses that match or complement others' facial or vocal displays and, if they do, whether these responses are similar to those made by other children at similar developmental levels. However, there is evidence that individuals with Williams syndrome do make attempts to share their emotional states with others. Jones et al. (2000) reported that adolescents and adults with Williams syndrome enhance their narratives with affective prosodic changes that engage the listener and show conversational reciprocity during structured interviews. There is also anecdotal evidence of attempts at synchrony in a child with Williams syndrome; Jones et al. (2000) described a deaf experimenter's account of children with Williams syndrome who reported that these children seemed to be fascinated, continuing to smile and talk to me, all the time looking right into my face while they try to imitate my signs.

Our first goal in this study was to explore whether young children with Williams syndrome are responsive to others' emotional displays and whether their responses are similar to or heightened relative to children with other developmental delays. If children with Williams syndrome show competence (or even a pronounced ability) in the area of emotional responsivity, one could hypothesize that this might facilitate the development of subsequent milestones in the area of secondary intersubjectivity, such as joint attention and, later, theory of mind. Yet, there is evidence that the typical course leading from primary to secondary intersubjectivity in Williams syndrome may be disrupted (Laing et al., 2002). Laing and colleagues found that despite showing proficient primary intersubjectivity behaviors during administration of the Early Social Communication Scales (Siebert, Hogan, & Mundy, 1981), toddlers with Williams syndrome demonstrated impairment in certain secondary intersubjectivity behaviors, such as joint attention (Laing et al., 2002). Tager-Flusberg and Sullivan (2000) argued that social–perceptual components of theory of mind (e.g., ability to make quick judgments of others' mental states based upon their expressions and affect) remain relatively preserved in Williams syndrome, whereas the social–cognitive components (e.g., conceptual understanding of others' minds as containing potentially different thoughts) are impacted by the disorder. Thus, our second goal in this study was to

explore whether children with Williams syndrome show competence in the ability to take another person's perspective based on their affective display.

For the purposes of this study, *emotional responsivity* is operationalized as registering and reproducing another person's affect, either in the form of simultaneous or immediate mimicry (automatic, nonconscious process of reproducing affect) or intentional imitation (involving a mental representation and conscious reproducing of affect) of emotional displays made by an experimenter that are reproduced a short time after the experimenter is no longer making the emotional display. Reproduction of both facial and vocal displays were examined. We also posed children with a social decision-making opportunity to explore whether the emotional responsivity is linked to the ability to reason about others' perspectives. Consistent with the theory posited by Tager-Flusberg and Sullivan (2000), we hypothesized that young children with Williams syndrome would demonstrate (a) increased likelihood of showing emotional matching behaviors and (b) a failure of perspective-taking on the social decision-making task.

Method

Participants

Participants were 23 children with Williams syndrome and 30 children with developmental disabilities of nonspecific etiologies. No meaningful between-groups differences were observed for gender (see Table 1 for developmental and demographic information). The two groups were quite similar on chronological age (CA) and overall MA as measured by the Mullen Scales of Early Learning (Mullen, 1995). As expected, children with Williams syndrome had a mean verbal MA that was approximately 4 to 5 months ahead of the mean in the mixed comparison group, though this difference was not statistically significant. Two children in each group had incomplete data on the Mullen Scales of Early Learning, though their general profiles did not differ substantially from other children in their respective groups.

All children in the Williams syndrome group had a confirmed diagnosis via genetic testing. Within the developmental disabilities comparison group, there were 19 children with other genetic abnormalities (Down syndrome, velocardiofacial syndrome, Cochayne syndrome, Smith-Magenis syndrome, partial deletion on chromosome 18, Angelman's syndrome, abnormalities on chromosome 15), and 11 children with developmental delays of unknown etiology. Of the children with specific genetic syndromes, 9 were diagnosed with Down syndrome. Because there is evidence that young children with Down syndrome show relative strengths in some aspects of social relatedness in early development (Bressanutti, Sachs, & Mahoney, 1992; Fidler, Hepburn, & Rogers, 2005; Kasari, Freeman, Mundy, & Sigman, 1995), we conducted analyses both with and without the children who had Down syndrome in the mixed comparison group.

Parents of children in the mixed comparison group were significantly older than parents of children with Williams syndrome on average (see Table 1), and the majority of mothers and fathers in this study had completed some college. Families of children in this study were predominantly Caucasian; all child participants lived at home at the time of the study.

Procedures

This specific study was part of a larger study designed to characterize early development in Williams syndrome. Participants for this larger study were recruited through the Autism and Developmental Disabilities Research Group at the University of Colorado at Denver Health Science Center, JFK Partners University Center for Excellence in Developmental Disabilities, and parent support groups (Williams Syndrome Association; Mile High Down Syndrome Association; Rocky Mountain Chapter of the Williams Syndrome Association). As a part of this larger study, we conducted the present study under Institutional Review Board approval. Consent forms were reviewed with each family and all questions asked by parents regarding the procedures of the study were answered before consent was obtained and before any measures were gathered.

The test battery was administered in laboratory visits and at a national conference in a standardized fashion. All examiners were masters or doctoral level clinicians with several years of clinical experience working with young children who had developmental disabilities.

Measures

Analyses for this study were based on the following measures, which were administered as a part of the larger study of early development in Williams syndrome.

Mullen Scales of Early Learning—This measure, which is a standardized developmental test for children ages 3 months to 60 months, consists of five subscales: Gross Motor, Fine Motor, Visual Reception, Expressive Language, and Receptive Language. The Mullen Scales allows separate standard verbal and nonverbal summary scores to be constructed and demonstrates strong concurrent validity with other well-known developmental tests of motor, language, and cognitive development (Mullen, 1995). This instrument was administered to all participants according to standard instructions. When appropriate, administrators of the scales used reinforcers in the form of snacks or play with a favored toy in order to reward on-task behavior, regardless of whether the child performed a particular item correctly or incorrectly.

The child information sheet—Parents were asked about information regarding their age, education level, and child's ethnicity.

Yummy–Yucky task—This task, which was adapted from Repacholi and Gopnik, (1997) is administered during a snack, wherein the adult uses a nonverbal affective display (facial expression, vocal prosody) to indicate a strong liking for one food and a strong dislike for another. This task makes it possible to examine the child's responsivity or mimicry and intentional imitation of the adult's affect. The child is then provided with the opportunity to give one of the foods to the examiner. This probe taps the child's intersubjective understanding of the meaning of the adult's affective display. The child's affect, as well as the decision made, are recorded.

With the help of the child's parent, the experimenter chose two snack foods that the child liked equally well. The experimenter was seated opposite the child. A small amount of each snack food was placed in each of two bowls, which were placed in front of the child. The child was allowed to taste each of the two types of snack foods for 45 seconds or until they tasted both foods. At the end of the preliminary tasting, the food bowls were removed from the child's immediate reach, and the experimenter said, "Let me get you some more." The experimenter then filled each bowl with more of the same snack foods and, while filling each bowl, tasted each type of food and produced a classic emotional display (disgust or pleasure) during each tasting. The experimenter clearly indicated which food item they were tasting while producing the affective display. The experimenter then placed one hand, palm up, exactly midway between the two bowls, and requested some food (i.e., "Give me some?") as she moved the bowls toward the child. Thus, the request was made before the child had access to the bowls. If the child did not immediately give any food, the experimenter withdrew his or her hand.

This task was administered with a modification from Repacholi and Gopnik (1997) in that the experimenter first asked the child's parent to choose two snack foods from an array of choices for which the child had equal liking, whereas Repacholi and Gopnik used one food that was thought to be universally disliked by children (broccoli). This change was made because we were concerned that the children with Williams syndrome, because of documented feeding issues, would not attend to a food that they found distasteful.

Emotion displays by experimenter—For the disliked food object, the facial display instructions included eyebrows drawn down and together causing vertical furrows or bulging between the brows; nasal root and nasal bridge broadened or bulged; eyes narrowed or squinted; mouth opened, lips tensed, and lower lip lowered (Ekman & Friesen, 1978). The experimenter was also instructed to say "Eww" and name the food item, combined with a mild head shake. For the liked food object, the facial display included eyebrows slightly raised, the corners of the mouth drawn obliquely (into a smile), and cheeks raised. The experimenter was also instructed to say "Mmm" and name the food item, combined with a mild head nod up and down. Independent observers who were unaware of the experimental condition coded approximately 10% of the episodes and indicated that experimenters displayed the intended discrete emotion 95% of the time and did so with at least a moderate level of intensity (rated on a 3-point scale: *low*, *moderate*, and *high*).

Administration was counterbalanced such that dislike displays were presented first to half of children in each group and second to the other half of children in each group. Administration was also counterbalanced such that the experimenter started on his or her left-hand side for half of the children in each group and on the right-hand side for the other half.

Coding—All three coders (two undergraduate research assistants and one Master's-level research assistant) were unaware of the research questions being asked. For each trial, they coded imitation and giving behaviors. The presence of negative emotional display was coded if the child's facial display changed in the direction of any of the negative facial actions units (eyebrows drawn down and together causing vertical furrows or bulging between the brows, nasal root and nasal bridge broadened or bulged, eyes narrowed or

squinted, mouth opened, lips tensed, and lower lip lowered) presented by the experimenter during the trial. The presence of positive facial emotional display was coded if the child's facial display changed in the direction of any of the positive facial actions (smile or cheek raise) presented by the experimenter during the trial. The presence of vocal imitation was coded if the child produced vocalizations that sounded like the negative vocalizations made by the experimenter ("Eww, __ [food item]") or the positive vocalizations made by the experimenter ("Mmm, __ [food item]") during that trial. Because we were not interested in duration of facial display in this study, we did not use onset and offset for displays. Rather, coders noted the presence of any of the facial action units or vocalizations during the time immediately following the experimenter's display.

The timing of the facial or vocal imitation was also coded. A behavior was marked as *immediate mimicry* if the child reproduced the experimenter's facial or vocal display either during or 0 to 3 s after the experimenter's emotional display ended. A behavior was coded as an *intentional imitation* if the child reproduced the experimenter's facial or vocal display after being given the food items, which was generally 3 s after the ending of the second affective display made by the experimenter. All coded behaviors fell into one of these two temporal categories.

In addition, each trial was coded for correct *gives*. If the child gave the experimenter the food item that the experimenter had expressed a liking for, then that was coded as a *correct give*. If the child gave the food item that the experimenter expressed dislike over, then that was coded as an *incorrect give*. It was possible for a child to be coded for both a correct and an incorrect give if they gave both food items in response to the prompt. If the child did not give any food items, that was coded as a *refusal*. There was an additional category of *tease*, where the child gave the disliked food item, but with a knowing grin, a behavior observed in typically developing children (Repacholi & Gopnik, 1997); but no instances of teases were observed in any of the trials in this study. Each trial was also coded for the presence of attempts to convince the experimenter that the disliked food item was really desirable. Examples of convincing behavior include the child saying "Potato chips are yummy" after the experimenter made a negative facial display or encouraging the experimenter to try a disliked food item again saying that they would like it.

Percentage agreement was calculated on 40% of the Yummy–Yucky administrations. Agreement scores were calculated by each coded dimension and each trial. Percentage agreement scores were calculated across both groups; scores were high for each dimension and ranged from 80% to 100%.

Analyses

This study was focused on comparing emotional responsivity in young children with Williams syndrome to other children with developmental disabilities in order to inform science and practice in these populations. As such, the analytic emphasis is on estimating quantities of interest (e.g., between-group differences in proportions) rather than on conducting dichotomous-outcome null-hypothesis significance tests. Consistent with the recommendations generated by the American Psychological Association (APA) Task Force on Statistical Inference (Wilkinson & APA Task Force, 1999), we presented unstandardized

point and interval estimates as the primary results instead of significance values. Although interval estimates can be interpreted in a significance testing fashion (i.e., an interval either does or does not contain a point null), they have the important advantage of offering a full range of plausible values for the parameter of interest. An interval estimate as a whole also conveys the degree of precision with which a parameter has been estimated. In sum, it is of interest here to address the "how much" questions (e.g., how much is the difference?) rather than the less informative dichotomous response "is there" questions (e.g., Is there a difference?)

In this study, the primary quantities of interest were each group's absolute rates of mimicry/imitation and the between-group differences in the rates of mimicry/imitation. Each group's rate of emotional responsivity is computed here as a proportion of individuals in a group displaying a particular characteristic. A useful measure of the between-group differences is the ratio of the proportions of individuals displaying a characteristic. Such a measure, which is called the "relative likelihood" here, offers an easily interpretable description of the relative difference in proportions between groups (e.g., a relative likelihood of 3 means that the proportion of individuals in one group displaying a characteristic is three times larger than the proportion displaying the same characteristic in another group). All relative likelihood statistics presented here (and associated confidence intervals) are comparisons of children in the Williams syndrome group relative to those in the mixed comparison group. Therefore, relative likelihoods greater than 1 indicate that a higher proportion of children with Williams syndrome displayed a particular characteristic. Likewise, a relative likelihood less than 1 indicates that a higher proportion of children in the mixed comparison group displayed a particular characteristic.

Results

Responsivity to Affective Displays

In terms of immediate mimicry of the experimenter's facial display, 56.5% of the Williams syndrome group mimicked the displays, and 40.0% of those in the mixed comparison group did so. The relative likelihood of mimicking the facial display in the Williams syndrome group compared to the mixed comparison group was 1.4 (95% CI: .8, 2.5). For mimicry of vocal displays, 34.8% mimicked the experimenter's vocalizations, whereas 10.0% of children in the mixed comparison group did so. The relative likelihood of mimicking the experimenter's vocalizations in the Williams syndrome group compared to the mixed comparison group was 3.5 (95% CI: 1.0, 11.7). When the children with Down syndrome were removed from the mixed comparison group, we observed similar findings.

For intentional imitation of the experimenter's facial display, 56.5% in the Williams syndrome group and 16.7% in the mixed comparison group imitated the facial displays The relative likelihood of imitating the facial display in the Williams syndrome group compared to the mixed comparison group was 3.4 (95% CI: 1.4, 8.1). For imitation of vocal displays, 52.2% imitated the experimenter's vocalizations, while only 10.0% of children in the mixed comparison group did so. The relative likelihood of imitating the experimenter's vocalizations in the Williams syndrome group compared to the mixed group was 5.2 (95%

CI: 1.7, 16.4). When the children with Down syndrome were removed from the mixed comparison group, we observed similar findings.

In the mixed comparison group, 2 children (6.7%) showed both immediate facial mimicry and facial imitation once presented with the food. The pattern of behavior was different in the Williams syndrome group, where 30.4% showed both immediate mimicry and later imitation, yielding a relative likelihood of 4.6 (95% CI: 1.0, 19.9). In addition, children with Williams syndrome were more likely than comparison group children to reproduce (mimic or imitate) both positive and negative facial affect. Although 21.7% of children with Williams syndrome reproduced only positive affect and 13.0% reproduced only negative affect, 47.8% reproduced both positive and negative displays made by the experimenter during the Yummy–Yucky task. In contrast, 23.3% of children in the mixed comparison group reproduced negative affect only, 23.3% reproduced positive affect only, and 3.3% reproduced both. The relative likelihood of reproducing both positive and negative facial affect in the Williams syndrome group compared to the mixed comparison group was 14.3 (95% CI: 2.0, 103.3). No differences were observed between the two groups for valence of vocal mimicry/imitation, possibly due to the small number of children who imitated vocal affect in the comparison group

We conducted subsequent analyses to explore whether children in each group who reproduced affect (either mimicked or imitated) had stronger verbal skills. A small advantage for Mullen Scales of Early Learning verbal MA was observed in children who reproduced facial affect in both groups (Williams syndrome yes M = 33.5, SD = 15.02; no M = 26.3, SD = 8.51; mixed comparison yes M = 30.36, SD = 12.98; no M = 24.15, SD = 7.35). For children in the mixed comparison group, those who reproduced vocal affect showed verbal MA scores that were approximately 15 months higher than those who did not (yes M = 37.66, SD = 13.58; no M = 24.70, SD = 8.63). No meaningful differences were observed in the Williams syndrome group for verbal MA for those who reproduced vocal affect and those who did not (yes M = 32.56, SD = 16.32; no M = 32.17, SD = 8.73).

Correct gives—Despite the higher rates of emotional responsivity to facial and vocal displays in the form of mimicry and imitation in the Williams syndrome group, the differences observed between the two groups in the percentage of children who gave the correct (i.e., liked) food item to the experimenter were small. Only 30.0% of children in the comparison group gave the correct food item to the experimenter, and only 39.1% of children with Williams syndrome did so (relative likelihood = 1.3; 95% CI: 0.6, 2.8). In fact, many children in each group gave the experimenter the disliked food item (William syndrome = 36.4%; mixed comparison = 46.7%). It is important to note that 2 children in the mixed group and 1 child in the Williams syndrome group gave both the liked and the disliked food items to the experimenter. There was also a notable number of children in each group who refused to give any food item (William syndrome = 26.1%; mixed comparison = 30.0%).

Groups differed little in the proportion of children who ate the disliked food item (William syndrome = 56.5%; mixed comparison = 58.6%; relative likelihood = 1.0; 95% CI: 0.6, 1.5) or in the proportion of children who reached for the liked food item before it was handed to

them (William syndrome = 47.8%; mixed comparison = 40.0%; relative likelihood = 1.2; 95% CI: 0.6, 2.2). In addition, imitating the facial or vocal display was not associated with eating the disliked food item in either group. Table 2 contains a reporting of giving behavior relative to affective behavior in each group. Data in this table suggest that reproducing the displays was not strongly associated with giving behavior in either group. However, it is notable that the most common pattern observed in the Williams syndrome group was reproducing of affect combined with incorrect giving behavior, whereas the most common pattern observed in the mixed comparison group was a lack of reproducing affect combined with incorrect giving behavior. Findings were similar when giving behavior was analyzed by mimicry only and imitation only (see Table 3).

Subsequent analyses were conducted to explore whether children in each group who gave the correct food item had stronger verbal skills. For children in the mixed comparison group, no meaningful differences for Mullen Scales of Early Learning verbal MA were observed between the children who gave the correct food item and those who did not (mixed comparison yes M = 23.5, SD = 8.4; no M = 29.0, SD = 11.6). However, for children with Williams syndrome, correct giving behavior was related to a 12-month advantage on Mullen Scales of Early Learning verbal MA (Williams syndrome yes M = 40.7, SD = 19.7; no M = 28.3, SD = 8.9).

Attempts to Convince

Though increased rates of facial and vocal affect (both immediate and delayed, both positive and negative) in both the mimicked and the intentional imitative responses and vocal mimicry were observed in the Williams syndrome group, there is evidence that these behaviors did not reflect an intersubjective understanding of the meaning of the adult's display. Frequency counts were computed to examine the number of children in each group who attempted to convince the experimenter that the disliked food item was really likable. Once again, a larger percentage (26.1% vs. 3.1%) of children with Williams syndrome attempted to convince the experimenter that the disliked food was really likable, with a relative likelihood of 7.8 (95% CI: 1.0, 60.6). Examples of convinces included a child pointing to the disliked food item after the experimenter's affective display and saying "they're good" or "these are yummy," saying "mmm [food item]" as the experimenter vocalized dislike.

Additional analyses were conducted to explore whether there was a connection between convincing behavior and verbal skills. For children with Williams syndrome, convincing behavior was related to a substantial advantage on Mullen Scales of Early Learning verbal MA (Williams syndrome yes M = 45.4, SD = 21.6; no M = 28.4, SD = 8.6). There was only 1 child in the mixed group who attempted to convince, though this child's performance was roughly 9 months ahead of the verbal MA performance of the rest of the mixed comparison group.

Discussion

Theorists have argued that early affective skills comprise an important foundation for the establishment of later social cognitive processes. Hobson (1993), for example, argued that

> it is only through patterned interpersonal affective coordination, and the infant's capacity to register in her own feelings the emotional attitudes of others … that the infant comes to understand what it means to share experiences, and ultimately what it means to be a person who has subjective mental life. (p. 289).

The coordination of affect between a caregiver and an infant in the form of emotional responsivity—or the capacity of the infant to register the emotional attitudes of others in his or her own feelings—is thus thought to be a crucial foundational behavior that leads to later intersubjective skills. In fact, Hobson noted that it is only through this affective connection that "the infant subsequently comes to distinguish among 'persons' who have their own psychological states that are both similar yet distinct from the infant's own" (p. 289).

Findings from this study offer initial support for the hypothesis that young children with Williams syndrome show heightened levels of emotional responsivity relative to other children with developmental disabilities. Children with Williams syndrome and a nonverbal-MA matched comparison group engaged in a modified version of Repacholi and Gopnik's (1997) Yummy–Yucky paradigm, where an experimenter makes affective displays of liking and disliking certain food items. The children were then asked to make a social decision regarding the affective displays observed when the experimenter asks the child to give them additional snack food.

Children with Williams syndrome were more likely to mimic and/or intentionally imitate the emotional displays made by the experimenters. In addition, roughly one third of children with Williams syndrome showed *both* intentional imitation and immediate mimicry of the facial display. This phenomenon was observed in multiple modalities because children reproduced both facial and vocal affect at higher rates in the Williams syndrome group. Children with Williams syndrome were also more likely to reproduce both negative and positive affect in comparison with children in the mixed group, who were much more likely to reproduce only negative affective displays. Thus, our findings suggest that young children with Williams syndrome are more likely to reproduce affect relative to other children with developmental disabilities, and this phenomenon is flexible—occurring in multiple modalities and for different valences of emotion.

Yet, although children with Williams syndrome in this study appear to be more responsive to other's displays, heightened performance in this area did not seem to translate into improved performance in other areas of social functioning, in particular social decision-making. Fewer than half of the children in each group gave the "correct" (i.e., liked) food item when prompted, and the children with Williams syndrome performed comparably to the children in the mixed developmental disabilities on this task. Thus, despite the strong propensity to respond to the emotional displays observed, this advantage did not translate into a distinct advantage in the area of decision-making based on the emotional display.

A closer examination of these findings yields an interesting, and perhaps perplexing, finding. Within-group analyses suggest that reproducing facial or vocal affect did not translate into an advantage in giving behavior in either group. That is, although there were many children in the Williams syndrome group who reproduced affect and did not give the correct food item, there were also children in the mixed comparison group who showed the

same pattern, though fewer children reproduced affect overall in the mixed comparison group. Thus, although it may be notable that children with Williams syndrome showed equally poor performance on the giving task despite increased mimicry/imitation, they do not appear to be showing a uniquely disordered pathway, given that there were a number of children in the mixed group who both reproduced affect and did not give the correct item. Instead, it may be that children in both groups had not reached a developmental level wherein they could make the appropriate decision regarding preferences, despite the fact that they appear to have reached the requisite developmental level of 18 months reported for typically developing children in Repacholi and Gopnik's (1997) original study. Nonetheless, a subtle trend could be observed upon examination of Tables 1, 2, and 3, wherein children with Williams syndrome were more likely to show a pattern of incorrect giving coupled with reproducing facial affect than children in the mixed comparison group. In addition, it is noteworthy that there was a small percentage of children in each group who did not reproduce affect, but did show correct giving behavior.

There may be additional evidence for difficulties with perspective-taking in this population due to the finding that a larger percentage of children with Williams syndrome attempted to convince the experimenter that the disliked food item was really likable. Although it may be that children with Williams syndrome were simply showing scripted behavior, these findings may alternately suggest that they had a more difficult time understanding that other individuals may hold opinions or preferences that are different from their own. Understanding that other people hold different perspectives and that one may hold a preference that is different from another's is a crucial aspect of the development of theory of mind (Feinfield, Lee, Flavell, Green, & Flavell, 1999). Thus, although emotional responsivity may be an important precursor to social relatedness, findings in our study suggest that this skill does not comprise the entire skill set necessary to enable one to extract the underlying meaning of the behavior of others.

In the context of the apparent disruption between the development of emotional responsivity and intersubjective perspective-taking in Williams syndrome, as first referenced by Tager-Flusberg and Sullivan (2000), there are some additional puzzling findings that warrant further exploration. In exploring the relationship between verbal skills and the social decision-making measures in the Williams syndrome group, it appeared that higher verbal skills were associated with both increased rates of correct giving behavior and increased rates of attempting to convince. That is, higher verbal MA seems to be linked to both improved performance in social decision-making (giving the correct food item) as well as increased rates of a behavior that evidences a lack of perspective-taking (attempting to convince). There are a few possible explanations for this finding. The first relates to the fact that children had to have stronger verbal skills in order to attempt to convince the experimenter that the disliked food was likable, given that they had to produce utterances with enough complexity to convey their attempt to convince. Thus, the association between verbal performance and convincing behavior may be an artifact of the definition of convincing behavior used in this study.

A second explanation relates to motivation: It may be that children with Williams syndrome who had stronger verbal skills simply sought to extend the social interaction with the

experimenter and, thus, persisted with questions regardless of whether they understood that preferences differed. It is also possible that the giving measure did not embody the final, mature form of social decision-making and that it is possible for children to make the correct choice in terms of giving behavior, but they may still be confused about why a social partner may not hold the same set of preferences that they hold. If this is true, then it may be important to study the development of these types of social decisions more deeply, perhaps with a longitudinal study design, in order to better understand how these behaviors emerge in children with Williams syndrome over time.

Another issue that should be addressed relates to the coding of imitation and mimicry on this task. First, though many measures of imitation that have been used in the developmental disabilities literature present the child with a direct prompt to reproduce a behavior performed by an examiner (e.g., Motor Imitation Scale—Stone, Ousley, & Littleford, 1997; Imitation Battery—Rogers, Hepburn, Stackhouse, & Wehner, 2003), the paradigm used in this study did not make a direct press for imitation or mimicry. Rather, the child passively observed the examiner displaying an emotional response to tasting a food item and the unprompted reactions of the children were coded. In addition, although most explorations in the developmental disabilities literature have focused on imitation involving goal-directed behaviors, in this study we focused on the reproduction of affect, both in the form of imitation and mimicry that naturally occurred during a snack activity. The distinction between mimicry and imitation made it possible to identify the nature of the emotional response, in particular whether it appeared to be reflexive or more intentional in nature.

Mimicry refers to an automatic process, akin to a reflex, where one social partner observes and matches the emotional display of another social partner (Hatfield et al., 1993; Moody & McIntosh, 2006). In contrast, imitation connotes a process that is not automatic but, rather, intentional, involving a mental representation and purposeful reenactment of the other person's behavior (Carpenter, Nagell, & Tomasello, 1998). The distinction between mimicry and imitation of the emotional display was made in terms of the timing of the reproduced affect within our coding procedures. However, a greater conceptual distinction is warranted as well. Imitation behavior, in essence, was a behavioral reenactment that included the child tasting the food items and subsequently reproducing affect in the form of the facial or vocal display. Thus, it appeared to involve accessing a representation of an event that occurred a few seconds earlier. In contrast, the mimicry behavior observed in this study occurred while the child observed the experimenter eating (before they were given the food items) and did not involve a reenactment of the observed event in any way. Instead, the child showed a seemingly reflexive response to the experimenter's emotional display in the form of facial or vocal mimicry. It is notable that despite this distinction, children with Williams syndrome showed a greater likelihood of reproducing affect both in the form of mimicry and imitation, though the effect for imitation was more pronounced.

Though additional studies are warranted to better understand the complex trajectory of intersubjective skills in children with Williams syndrome, findings from this study suggest a pattern of heightened performance in one area of intersubjective development (emotional responsivity) that does not translate into heightened performance in another area of intersubjective development (decision-making based on affective displays). A possible point

of disruption in the path to higher level social cognition in Williams syndrome—though untested in this study—may lie in the transition from dyadic to triadic social interactions or the transition from primary to secondary intersubjectivity (Trevarthen & Aitken, 2001). Despite strengths in primary intersubjectivity, there is some evidence to suggest that young children with Williams syndrome evidence difficulties in the area of secondary intersubjectivity or triadic social interaction, specifically in the development of coordinated joint attention skills (Laing et al., 2002). In addition, an aberrant trajectory has been noted in young children with Williams syndrome in use of a specific joint attention gesture—pointing—such that talking precedes the development of pointing, a pattern that is reversed in typical development (Mervis & Bertrand, 1997). Limitations and abnormalities in the development of gestures that indicate the development of triadic social interactions in young children with Williams syndrome may provide insight into an early disruption in social–cognitive perspective-taking.

Secondary intersubjectivity has been theorized to comprise the foundation for higher level social reasoning—theory of mind abilities, including an understanding of others' beliefs, desires, and intentions (Bartsch & Estes, 1996; Wellman, Phillips, Dunphy-Lelii, & LaLonde, 2004). The ability of an infant to notice and process third entities into their attentional focus with an adult provides a wealth of avenues for acquiring more mature social human behaviors, including language and social skills (Tomasello, 1992, 2003; Trevarthen, 1998). Perhaps such limitations in secondary intersubjectivity in Williams syndrome impact upon the development of an ability to take on another's perspective.

In terms of development in children with Williams syndrome, we suggest here that heightened emotional responsivity coupled with delays in the development of perspective-taking may contribute to the subsequent development of a hypersocial profile. The heightened levels of emotional responsivity observed in this study may be an important developmental precursor to social disinhibition and, hence, an important target for early intervention in this population. This issue is important in that hypersociability in Williams syndrome has been linked to increased vulnerability and susceptibility to coercion and dominance by peers and adults (Davies, Udwin, & Howlin, 1998).

There are several important limitations to this study that must be considered. There were relatively small samples of children in each diagnostic group. As such, parameters of interest can only be estimated rather imprecisely, and the study warrants replication with larger sample sizes. In addition, the comparison group of children with developmental disabilities was well-matched to the Williams syndrome group based on overall developmental measures; however, the lack of a typically developing comparison group limits the explanatory power of the results of the study. Future researchers should seek to recruit a well-matched group of typically developing children in order to verify the utility of this measure in its adapted form and to discern whether the difficulty observed with giving behaviors were a function of children's disability status. In addition, the coding procedures used to detect mimicry may have been too gross to detect some of the more subtle aspects of mimicry that may only be apparent with the psychophysiological techniques of electromyography, introducing a conservative bias to the findings of this study (e.g., Moody & McIntosh, 2006).

Further, because these data were derived from a nonrandom sample, inference is not strictly valid. It is for this reason that we primarily discuss the observed percentages and relative likelihoods. Confidence intervals were presented, however, for two reasons. First, they offer a rough range of plausible values for the true relative likelihood. Second, the large width of the intervals highlights the imprecision with which such parameters are estimated. The extent of bias due to using a recruited sample of children to estimate characteristics of populations (the norm in research on development in genetic disorders) remains a concern, nonetheless.

As a preliminary exploration, the results of this study suggest that young children with Williams syndrome may show a profile of heightened emotional responsivity in the form of affect mimicry and/or imitation. This heightened responsivity appears not to directly impact performance in other areas of intersubjective development, such as perspective-taking and decision-making based on affective cues, which may have important implications for later adaptation in social contexts. Future researchers should attempt to explore the nature of this profile in greater depth and develop targeted interventions to prevent the potential downstream effects of this profile in early childhood.

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Table 1

Demographic Information by Diagnostic Group

	Williams syndrome			Mixed etiologies			
Characteristic	**Mean/%**	***SD***	**Range**	**Mean/%**	***SD***	**Range**	***t* or χ^2**
Child gender (% male)	39.1			40			.004
Child ethnicity (%)							
Caucasian	95.7			74.1			
Hispanic				14.8			5.14
Native American				3.7			
Biracial	4.3			7.4			
Child							
CA	47.83	18.53	27–100	43.57	13.93	24–71	−.93
Overall MA	25.94	6.76	15.75–42.25	28.81	12.62	13–67.5	.88
Verbal MA	32.45	14.33	15.50–83	27.48	11.02	11–62	−1.37
Mothers							
Age (years)	33.65	5.34	20–42	37.72	6.47	26–54	2.43*
Education level	4.52	1.16	2–5	3.86	1.12	2–6	2.06*
Fathers							
Age (years)	35.61	7.61	21–51	40.07	6.21	30–57	2.31*
Education level	4.17	1.03	2–6	4.21	1.11	2–6	.11

* $p < .05$.

Table 2

Proportion of Children Who Reproduced Any Affect (Imitation or Mimicked) Based on Giving Behavior

	Correct give		Incorrect/No give	
Group	***n***	**%**	***n***	**%**
Williams syndrome				
Reproduced facial affect	7	30.4	12	40.0
Did not reproduce facial affect	2	8.7	2	6.67
Reproduced vocal affect	5	21.7	11	47.8
Did not reproduce vocal affect	4	17.4	3	13.0
Mixed comparison group				
Reproduced facial affect	4	13.3	10	30.0
Did not reproduce facial affect	5	16.7	11	36.6
Reproduced vocal affect	2	6.67	4	13.3
Did not reproduce vocal affect	7	23.3	17	56.7

Table 3

Proportion of Children Who Imitated and Mimicked Based on Giving Behavior

	Correct give		Incorrect/Refused	
Group	***n***	**%**	***n***	**%**
Imitated behavior				
Williams syndrome				
Imitated facial display	7	30.4	7	30.4
Did not imitate facial display	2	8.7	7	30.4
Imitated vocal affect	5	21.7	6	26.1
Did not Imitate vocal affect	4	17.3	8	34.8
Mixed comparison group				
Imitated facial display	1	3.3	4	13.3
Did not imitate facial display	8	26.7	17	56.6
Imitated vocal affect	1	3.3	3	10.0
Did not imitate vocal affect	8	26.7	18	60.0
Mimicked behavior				
Williams syndrome				
Mimicked facial display	4	17.3	9	39.1
Did not mimic facial display	5	21.7	5	21.7
Mimicked vocal affect	2	8.7	6	26.1
Did not mimic vocal affect	7	30.4	8	34.8
Mixed comparison group				
Mimicked facial display	4	13.3	8	26.6
Did not mimic facial display	5	16.7	13	43.3
Mimicked vocal affect	2	6.7	1	3.3
Did not mimic vocal affect	8	23.3	19	63.3